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DON EDWARDS SAN FRANCISCO BAY NATIONAL WILDLIFE REFUGE

WARM SPRINGS SEASONAL WETLAND UNIT 2019 ANNUAL REPORT



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LIST OF ACRONYMS

AMV	Alkali milk-vetch
AU	Animal unit
AUM	Animal unit month
CCG	Contra Costa Goldfields
CLMA	Cooperative Land Management Agreement
CNPS	California Native Plant Society
CTP	Congdon's tar plant
CTS	California tiger salamander
KEA	Key Ecological Attribute
NRMP	Natural Resources Management Plan
RDM	Residual dry matter
SFBBO	San Francisco Bay Bird Observatory
SCVHA	Santa Clara Valley Habitat Agency
SJSS	San Joaquin spearscale
VFS	Versatile fairy shrimp
VPTS	Vernal pool tadpole shrimp
WS	USDA-APHIS Wildlife Services

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EXECUTIVE SUMMARY

Year 2019 was another unusual year in terms of precipitation. The wet season came late in February after a dry fall and early winter. The strong storm events in February and in spring resulted in above average total precipitation and inundated the pools until late spring with a mean maximum hydroperiod of 115 days. All 58 of the monitored pools had a hydroperiod longer than 54 days, the minimum number of days of inundation VPTS needs to complete a breeding cycle successfully. Forty-six pools of the 58 surveyed had a hydroperiod of 100 days or longer, our benchmark for successful CTS metamorphosis to occur. Three inter-connected pools in Pasture 10, stayed inundated for the whole year because they were charged by an artesian well.

Year 2019 was one of the relatively good years for our aquatic species at Warm Springs. Out of the 58 pools we sample,-we found 29 pools with CTS breeding activity. All but two of these pools had a hydroperiod long enough to support CTS metamorphosis. Vernal pool tadpole shrimp were observed in 47 of the 58 monitored pools. The NRMP viability measures status for both VPTS and CTS were ranked "Very good" (Table 1).

In the 19 vernal pools we monitor for vegetation in the spring, native wetland species relative cover, an indicator for vernal pool viability, reached 41% close to last year's 43%. Total native species relative cover at the pools was estimated at 56%. According to the viability scale for the vernal pool vegetation composition, these values show that overall, monitored pools are in "good" condition and meet our management goal for this year. Considering each pool separately, eight year trend data show that generally most of the pools are improving or remain stable, however, the negative trajectory for some pools is a subject of concern. Contra Costa goldfields (CCG) had an average year in 2019. Very wet and cool conditions in the early to mid-spring resulted in a late and brief blooming period. Still, we estimated 0.314 acres of CCG and this gives the CCG abundance a "good" rating in our viability scale (Table 2). This report discusses some unusual findings in the grazing exclosure study which found CCG cover more extensive in some exclosures than in the grazed areas in the first year of exclosure installation.

Site-wide native vegetation conditions show improvement based on the Summer Vegetation Survey, albeit still not at our long-term management goal set for 2032 (Table 3). In two pastures native absolute cover exceeded 50% and were ranked as in "good" condition, six pastures were ranked "fair" and two pastures ranked "poor". This year with assistance from the Inventory and Monitoring Program we started drafting the Summer Vegetation Survey protocol following USFWS guidelines. The process revealed several weak points in the current methodology and highlighted the need for alternative data management strategies. The botanist built an Access™ relational database. There is ongoing discussion among Refuge staff of what would be the best approach given technical and staff limitations. The report discusses the problem and the current situation.

Regarding target weeds, the Summer Vegetation Survey data showed that in 2019 we met our goal to keep target invasive plant species cover below 30%. However, we are noticing an increase in the spread of *Dittrichia*, a species that we put a lot of effort in controlling. Another species that is not abundant in cover but has increased in distribution is *Lepidium latifolium*. *Bassia hyssopifolia* invaded the southern part of Pasture 5, most likely through seed that came in 2017 from flooding of an adjacent channel. Our efforts to control this species in 2019 via herbicide were not successful and we decided to try different herbicides and/or approaches moving forward. For all the weed species, several available methods and management tools were employed to perform integrated pest management.

Year 2019 was the first year recorded with no successful breeding owls in Warm Springs. This year Talon was leading the monitoring effort with a changed protocol. In March, during their walk-in-transect monthly survey, Talon surveyors reported one pair and five single adults. In the beginning of April, Talon saw one pair in Pasture 3 and one adult in Pasture 6. On April 13, Talon initiated supplemental feeding activities in the two used burrows. After three feedings they noticed that the owls were not using the burrows anymore and they installed cameras to verify their observations. Despite the high surveying effort, Talon did not detect any breeding owls since May. Some BUOW activity was reported in September, most likely from dispersing or winter migrants in Pasture 3, 1, and 7. Specifically they saw one owl and three used burrows. There was a general decrease in the number of breeding owls throughout the South Bay.

A rotational grazing program is used at Warm Springs to shape vegetation structure, decrease thatch, and extend the pond hydroperiod. The program is our main strategy to control annual grass biomass. The overall grazing stocking rate in 2019 was 88 AU, which was a 10% decrease from last year. In 2019, the calculated carrying capacity of 1.57 AUMs per acre was the lowest recorded at Warm Springs, which means that annual grass production was very low this year. RDM levels were generally on target or low. Five fields were within target range and therefore "very good" on the indicator scale, one field was close to target and was "good", three fields were "fair" (two because they were above target and one because it was below), and two fields were overgrazed and scored "poor". While analyzing the grazing data this year, questions arose about carrying capacity calculations and this led staff to initiate discussions with an NRCS grazing expert (He, personal communication 2020) and to conduct further literature review on forage production. We confirmed that annual precipitation totals, precipitation timing, and temperatures are highly variable and have a very strong influence on carrying capacity; this results in high annual variability in carrying capacity. It is thus not appropriate to continue to calculate "target stocking rates" based on average carrying capacity, but to instead use end of season RDM, fall weather conditions, and visual assessments throughout the season to guide grazing management decisions. Adaptive grazing management allows for the refuge manager and cooperative rancher to reduce or rotate animals in-season as needed to protect the natural

resources from over-grazing (e.g. trampling, soil compaction), or increase the size of the herd to meet desired ecological parameter values. We will continue to calculate the carrying capacity but only to better interpret the conditions on the ground and the RDM values recorded.

While this report adheres to the old reporting style, used before 2018, we incorporated several new features and products of data analysis related to the new NRMP. Tables 1 through 3, summarize the management goals and the associated scores for the indicators and objectives for 2019.

Table 1. 2019 status of key ecological attributes for the Vernal Pool grassland conservation target: California Tiger Salamander breeding activity and vernal pool hydrology

KEA: California tiger salamander breeding activity and vernal pool hydrology

Nested KEA: Presence of vernal pool tadpole shrimp and vernal pool hydrology

Management Goal: Over the next 5 years (FY18-FY22): a) California tiger salamanders are present in >27 pools (of the 58 pools monitored AND with hydroperiod long enough for metamorphosis to occur, typically 100+ days) and b) Vernal pool tadpole shrimps are present in >40 pools (of the 58 pools monitored AND with hydroperiod long enough to complete breeding cycle, typically 54 days) at the Warm springs unit of Don Edwards San Francisco Bay NWR. The measure is based on the average of the best 3 of the last 5 years.

Survey Name: 1) CA tiger salamander and vernal pool tadpole shrimp survey and 2) Vernal pool hydroperiod survey

Indicator	Poor	Fair	Good	Very Good	Current Measure	Current Rating	Current Measure Year	Desired future rating or measure	Meet Complex Workplan Goal/ Objective
Number of pools (of 58 that are monitored in Warm Springs Unit) with CTS larvae present **AND** hydroperiod adequate to allow for metamorphosis to occur (typically 100 days continuous inundation)	<12 pools with CTS AND hydroperiod >100 days	12-19 pools with CTS AND hydroperiod >100 days	20-26 pools with CTS AND hydroperiod >100 days	>27 pools with CTS AND hydroperiod >100 days	30 pools	Very Good	2015-2019, 3 best years average	Very Good	Goal met
Number of pools (of 58 that are monitored in Warm Springs Unit) with VPTS present and hydroperiod adequate to allow for completion of breeding cycle (typically 54 days).	<18 pools with VPTS AND hydroperiod >54 days	19-31pools with VPTS AND hydroperiod >54 days	32-39 pools with VPTS AND hydroperiod >54 days	>40 pools with VPTS AND hydroperiod >54 days	49 pools	Very Good	2015-2019, 3 best years average	Very Good	Goal met

Table 2. 2019 status of key ecological attributes for the Vernal Pool grassland conservation target: Vernal pool vegetation composition

	KEA: Vernal Pool vegetation composition Nested KEA: Abundance of Contra Costa Goldfields
	Management Goals: 1) By 2032, relative cover of native vernal pool and wetland plant species is ≥35% at the Warm Springs unit of Don Edwards San Francisco Bay NWR. Measure based on an average of 19 pools monitored, 2) In the 7 year period between 2020 and 2026 at Warms Spring Unit and in the 19 vernal pools monitored for vegetation, maintain or increase the number of native vernal pool and wetland plant species that were found during the period of 2013-2019 surveys. 3) For the 19 pools we monitor as a representative subset at the Warm Springs Unit, achieve a good Contra Costa Goldfield acreage rating (0.21-0.35 acres) in at least 3 of the last 5 years
	Survey Name: Vernal Pool Vegetation Survey

Indicator	**Poor**	**Fair**	**Good**	**Very Good**	**Current Measure**	**Current Rating**	**Current Measure Year**	**Desired future rating or measure**	**Meet Complex Workplan Goal/ Objective**
% relative cover of native vernal pool & wetland plant species	<25%	25%-34%	35%-49%	>50%	41%	Good	2019	Good	Goal met
Native vernal pool and wetland plant species richness	TDB		TBD		86 native species				Species list Appendix I
Acreage of Contra Costa Goldfields	<0.05 acres	0.05-0.2 acres	0.21-0.35 acres	>0.35 acres	0.314 acres	Good	2019	Good	Goal met

Table 3. 2019 status of key ecological attributes for the Vernal Pool grassland conservation target: Grassland vegetation structure and composition

KEA :Grassland vegetation structure and composition

Complex Workplan Goals: 1) By 2032, absolute native plant species cover increase to ≥50% in 4 pastures and ≥20% in 4 additional pastures at the Warm Springs unit of Don Edwards San Francisco Bay NWR, and **2)** In the 7 year period between 2020 and 2026 at Warms Springs Unit maintain or increase the number of native plant species that were found during the period of 2013-2019 data of summer vegetation surveys (aka invasive species surveys) **Complex Workplan Objectives:** 1) Annually maintain/reduce invasive plants (excluding grasses) on Warm Springs Unit to less than 30 percent cover, **2)** Annually achieve a Residual dry matter rating "Very good" in 7 out of 10 fields and a minimum of "fair" in the rest

Survey name: Summer Vegetation Survey

Indicator	Poor	Fair	Good	Very Good	Current Measure	Current Rating	Desired future rating or measure	Meet Complex Workplan Goal/ Objective
% absolute cover native plant species (for each pasture)	<20% cover of native species	20%-49%	50%-70%	>70%	37% (>50% in 2 pastures, >20% in 6 additional pastures, <20% in 2 pastures)	Fair	Good	Goal set for 2032. In 2019, goal was not achieved.
Site-wide native plant species richness measured in a 7 year period	TBD	TBD	TBD	TBD	54 native species	Baseline		Species list Appendix II
Invasive species (as defined in target summary) cover					2.255%		<30%	**objective** met
Residual dry matter (lb./acre) at the end of the growing season	>3500 or <900 lb./acre	2001-3500 or 900-949 lb./acre	1501-2000 or 950-999 lb./acre	1000-1500 lb./acre	1384 lb./acre	Fair	Good	**Objectives** was not met (4 pastures rated "very good"1 pastures rated good, 3 "fair, and 2"poor")

1.0 INTRODUCTION

This report presents the results of biological monitoring and management performed in the 2019 monitoring year (October 1, 2018-September 30, 2019) at the Warm Springs Unit ("Warm Springs") of the Don Edwards San Francisco Bay National Wildlife Refuge ("Refuge") in Fremont, California (Figure 1). Biological monitoring is divided into hydrology, grazing, and the broad categories of wildlife and vegetation monitoring. In addition, we report on maintenance, management, and public use activities for the year. The report elements adhere to the San Francisco Bay National Wildlife Refuge Complex (SFBNWR) Natural Resources Management Plan (NRMP) and the SFBNWR Inventory and Monitoring Plan (IMP) (U.S. Fish and Wildlife Service, 2019), two documents that list biological monitoring needs, conservation priorities, strategies, as well as SMART goals and objectives and describe the rationale associated with all conservation targets in the SFBNWR Complex. The Vernal Pool Grassland Ecosystem is one of these conservation targets, which in the Complex is found only at Warm Springs. From 2012 to 2017 a monitoring program was administered at Warm Springs based on methods outlined in the Biological Monitoring Plan for Warm Springs ("Monitoring Plan") (WRA 2012). For that same period, the annual reports were following a consistent format and structure to facilitate easier navigation among sections in a single annual report as well as among the reports of consecutive years. Since 2018, the Warm Springs annual report format was slightly modified to better align with the SFBNWR Complex NRMP and IMP reporting requirements and to allow for clear reporting on management goals and priorities. We tried nevertheless to stay close to the previously used format.

Warm Springs site history, previous monitoring history, and Initial Survey Instructions (ISI) for most of the surveys monitoring program can be found in the 2012 Warm Springs Unit Monitoring Plan. The Conservation Target Summary for the Vernal Pool Grassland Ecosystem in the Natural Resources Management Plan for the San Francisco Bay NWR Complex, a product of the aforementioned Complex-wide conservation prioritization process, describes the ecological model, the rational of priorities selection, the main strategies and how they ranked, and a whole suit of other information and references related to conservation priorities and management at Warm Springs.

Warm Springs is composed of 719 acres of vernal pool grassland located adjacent to South San Francisco Bay. Vernal pools are precipitation-filled topographic depressions that alternate between periods of inundation in the winter and desiccation in the summer. In California, vernal pools often host a suite of endangered and special status species. California's vernal pool ecosystems have been significantly fragmented and reduced in size by anthropogenic habitat alterations including urbanization, agricultural conversion, unsuitable grazing regimes, and non-native plant

invasion. As a result, many of the endemic species that inhabit these vanishing wetlands have experienced population declines. Three such species that reside in Warm Springs' vernal pools are the federally endangered vernal pool tadpole shrimp (VPTS; *Lepidurus packardi*), Contra Costa goldfield (CCG; *Lasthenia conjugens*), and the federally threatened California tiger salamander (CTS; *Ambystoma californiense*). In addition, Warm Springs supports the Western Burrowing Owl (BUOW: *Athene cunicularia hypugaea*), a state species of special concern. Warm Springs contains 250 distinct vernal pools, with a total wetland area of over 145 acres (Figure 2) that along with the upland areas provide potential habitat for these and other species.

Long term monitoring of Warm Springs has established that ideal habitat conditions for focal species and groups are relatively stable and self-sustaining, provided that management actions such as grazing and invasive weed control are carefully maintained. In addition, the need to include strategies involving research and active restoration activities was highlighted in the NRMP (U.S. Fish and Wildlife Service, 2019). Finally, continuous monitoring that informs management activities and lead strategies is critical due to fast changing of conditions imposed by development and change of land use in the surrounding area as well as climate change. With exception to the burrowing owl monitoring and the Summer Vegetation Survey, for all other surveys, instructions are listed in the Biological Monitoring Plan for Warm Springs Unit (WRA 2012). For burrowing owls, a separate project run by partners with external funds provided rigorous monitoring of the species on Warm Springs since 2015. Partner reports for this species and reports are saved in the common drive (Z:\REFUGES & PROGRAMS\Don Edwards\Warm Springs\BUOW\SCVHA BUOW\2019). For the Summer Vegetation Survey, the initial instructions used currently for monitoring are described in the "Site-specific Protocol for Summer Vegetation Monitoring at Don Edwards San Francisco Bay National Wildlife Refuge" (2019), a document that is currently in a draft stage (Z:\REFUGES & PROGRAMS\Don Edwards\Warm Springs\Monitoring Plans\SummerVegetationSurvey\SummerVegetationSurvey\Products\Reports).

Figure 1. Warm Springs Overview Map

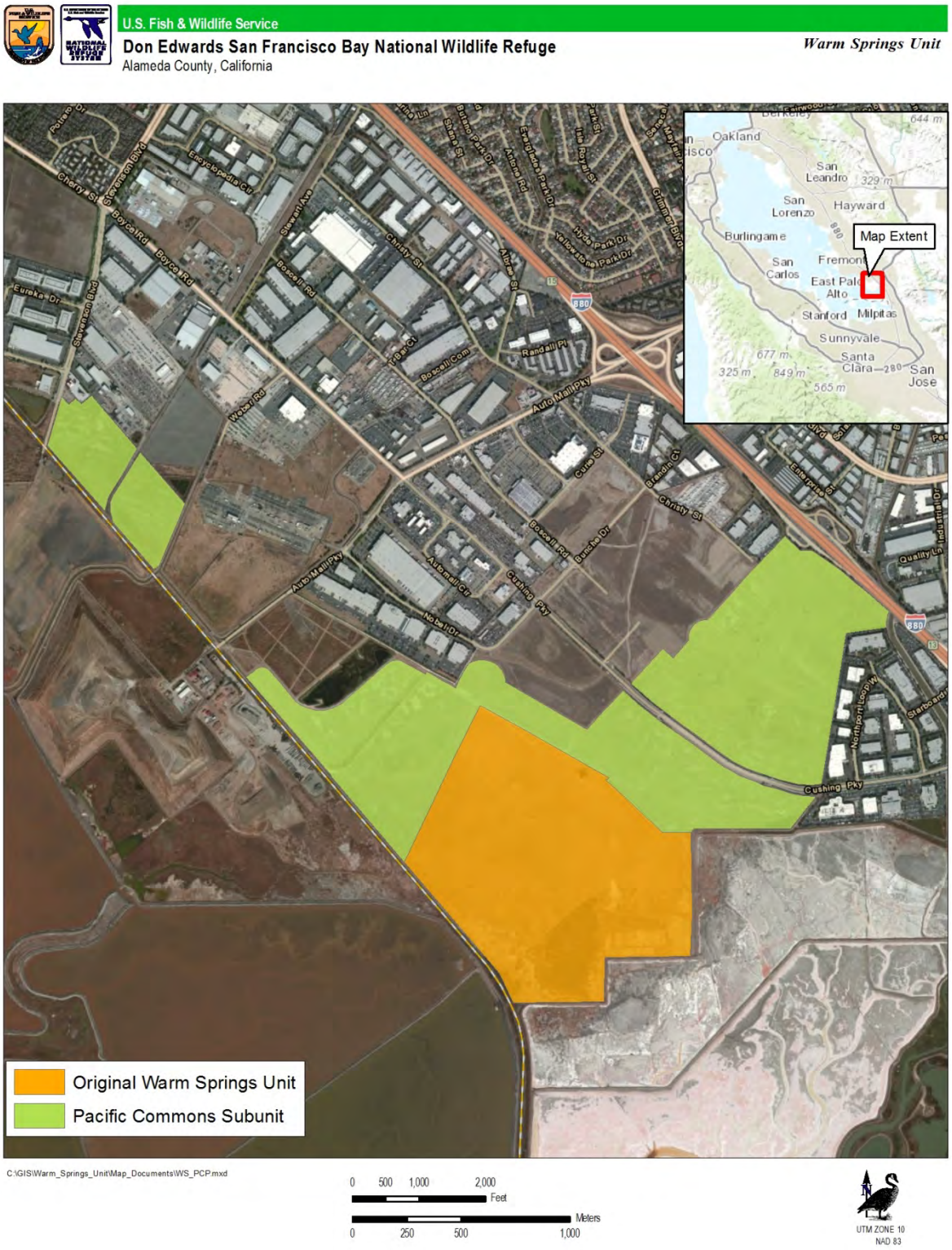


Figure 2. Vernal Pools and Pastures at Warm Springs


U.S. Fish & Wildlife Service
Warm Springs Pastures and Vernal Pools
Pasture 1
Pasture 2
Pasture 3
Pasture 4
Pasture 5
Pasture 6
Pasture 7
Pasture 8
Pasture 9
Pasture 10
0 500 1,000 2,000 Feet
880
Auto Mall Pky
Bonetta Dr
Boscell Rd
Cushing Pky
Automall Cir
Nobel Dr
Christy St
Enterprise St
S Grimmer Blvd
Northport Loop W
Warm Springs Blvd
Warm Springs Blvd
Warm Springs Blvd

2.0 WETLAND HYDROLOGY MONITORING

Vernal pool ecosystems depend on a sufficient amount of rainfall during the rainy season, and the duration of ponding in individual pools typically determines whether resident vernal pool species can successfully complete their life cycles. Thus, hydrology monitoring at Warm Springs is crucial to understand broad-scale patterns in habitat conditions, vegetation, and wildlife populations. Specifically, information on the period of inundation is used with aquatic surveys data to evaluate the breeding success of vernal pool tadpole shrimp and the California tiger salamander in the pools sampled at Warm Springs. Hydrology at Warm Springs is typically studied through observations of ponding within a sample of 58 vernal pools, referenced with rainfall data.

2.1 MONITORING METHODOLOGY

Given the large number of pools and other seasonal features present in Warm Springs, a representative subset of vernal pools is monitored annually. The rationale of the pool subset selection is discussed in the 2012 Monitoring plan (WRA 2012). Monitoring of hydrology, VPTS, and CTS occur in the same subset of pools through two surveys: the Vernal Pool Hydroperiod Survey and California Tiger Salamander and Vernal Pool Tadpole Shrimp Survey (IMP codes VPG-3 and VPG-5 respectively). The subset of monitored pools includes 58 pools total, with 45 first-priority pools and 13 second-priority pools (Figure 3). Hydroperiod monitoring is initiated following the first significant storm(s) of the fall/winter period, when initial inundation of at least the longer-duration pools is expected, and continues through the precipitation season and spring until pools dry down.

The goal of the Vernal Pool Hydroperiod Survey is to identify the pool hydroperiod by documenting the annual inundation and dry-down dates for each monitored pool, including pools that pond and/or dry-down more than once within a precipitation season. The detailed methodology can be found in the 2012 Monitoring Plan. The extend of the hydroperiod is inextricably connected with the breeding success of CTS, which is one of the key ecological attributes (KEA) we selected to monitor as an indicator of the Vernal pool grassland ecosystem health (USFWS 2019).

In the annual report, we mainly report the results of the systematic monitoring of the sampled pool subset. However we may include notable information on the hydrology of other pools when this relates to management actions.

2.2 2019 VERNAL POOL HYDROPERIOD SURVEY RESULTS

2.2.1 RESULTS

Climate

Rainfall patterns affect pool inundation periods and timing, as well as maximum pool depths. Therefore, reproductive success of aquatic breeding organisms and germination of vernal pool plants are greatly affected by rainfall patterns and amounts. Prior to 2018, monthly precipitation data was collected using a rain logger onsite. However, due to major malfunction of the logger in 2018 and consistent failures in the previous years, we decided to use precipitation data from the National Oceanic and Atmospheric Administration's Newark weather station (NCDC #6144), located approximately 4 miles west of Warm Springs (Table 1) (Retrieved from: https://www.ncdc.noaa.gov/cdo-web/datasets/GHCND/stations/GHCND:USC00046144/detail). Precipitation received prior to November or after April is typically ineffective at influencing wetland water level regimes because of high evapotranspiration demand in comparison to the very small amounts of precipitation normally received. However, in 2019, because the pools started getting inundated later than usual and the weather pattern and the abundance of the precipitation in May was very high and critical in prolonging the inundation period of the pools, we decided to include the rain data for May in this report.

In the Northern Hemisphere, November marks the end of climatological fall which is the time of year when solar heating decreases and an expanding circumpolar vortex forces the jet stream to migrate southward. Polar air masses influence the weather over the contiguous U.S. more, and the warm, dry subtropical high pressure belts influence the weather less. The upper level circulation in November 2018 was locked into a longwave pattern which included a longwave ridge along the West Coast. The western ridge kept weather systems out of California. The prolonged dry period and the strong Santa Ana–type winds resulted in catastrophic wildfires in California. The western ridge broke towards the end of the month and heavy rains fell on many areas in California (NOAA 2018) Temperature was warmer than average for the months of November, December, and January in Coastal California (NOAA 2019a). Precipitation during these months in the area of Fremont was sporadic with generally weak rain events. Notably, in January a couple of stronger rain events occurred. Precipitation was above average and temperatures fell considerably in the months of February and March. This pattern was interrupted in April, which was characterized with dry and above average warm weather. However in May, temperature fell once again and by mid-May a storm system resulted in very strong rain events throughout California. The Newark station closest to Warm Springs recorded 1.92inches of precipitation, 400% of normal.

The total precipitation in 2019 was above average (Table 4 and Figures 4 and 5). Figure 5 shows the long-term trend in November-April precipitation beginning in 2000. The graph shows the deviation from the long-term normal precipitation at Newark, which is 12.84 inches.

The seasonal rainfall amount is the most important variable affecting pool hydrology. The timing of the storm activity and its strength are also important factors determining the inundation pattern at the pools.

Figure 3. Vernal Pools Monitored for Hydrology, VPTS, and CTS at Warm Springs.

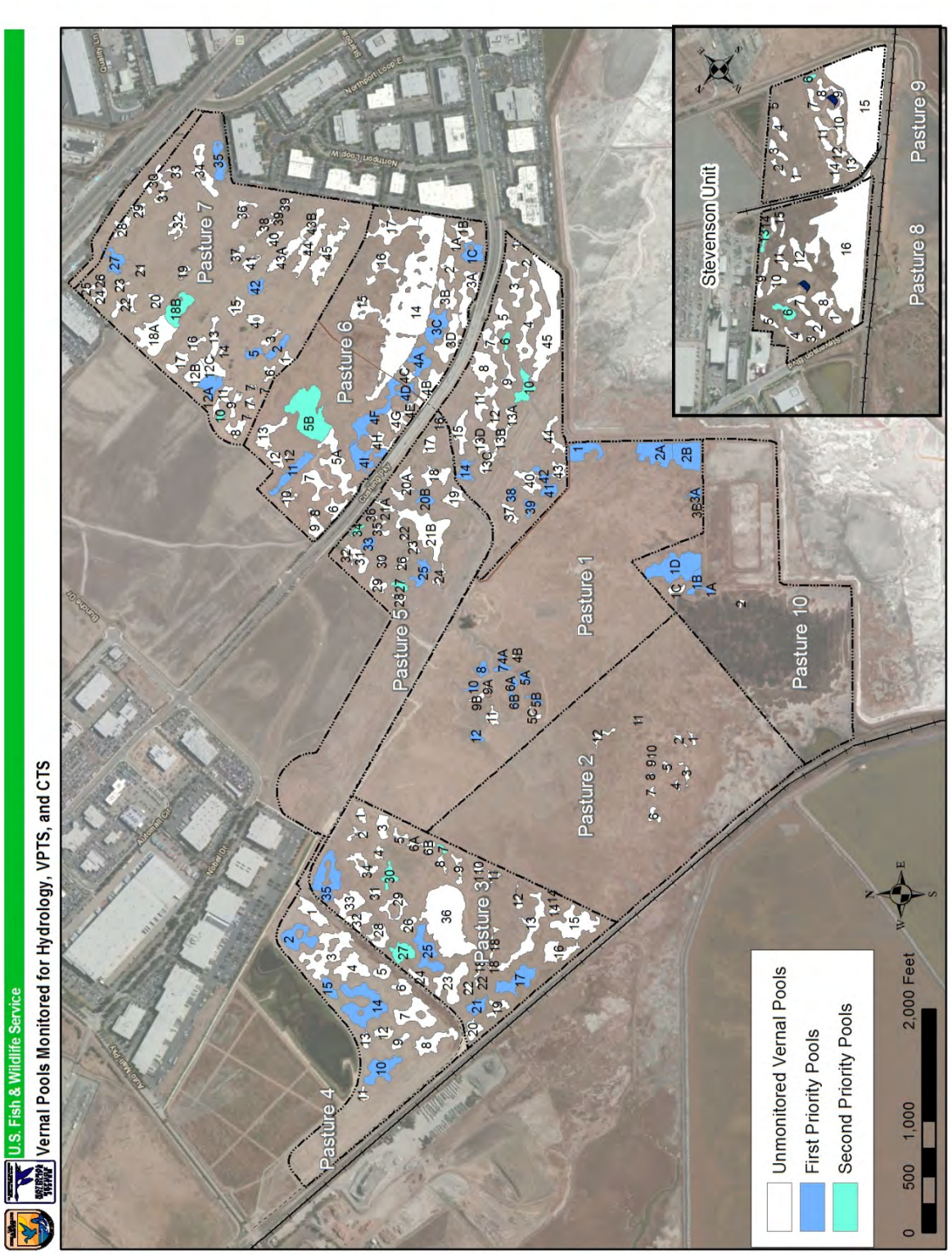


Table 4. Monthly rainfall totals from the Warm Springs Weather Station between 1999 and 2019. Note that occasional gaps in the data set were filled with data from nearby weather stations including Newark (NCDC #6144) and Union City (CIMIS #171). The mean normal was calculated over the period of thirty years from 1981-2010 and was provided by the National Centers for Environmental Information.

	Nov	**Dec**	**Jan**	**Feb**	**Mar**	**April**	**Total**
1999	2.00	0.82	2.33	3.89	1.71	1.30	12.05
2000	0.78	0.14	4.12	5.02	1.48	0.62	12.16
2001	0.84	0.42	2.25	3.72	1.58	1.40	10.21
2002	3.02	4.88	0.77	0.9	1.54	0.36	11.47
2003	1.6	5.97	0.5	1.98	0.84	3.00	13.89
2004	1.62	2.94	1.64	3.23	0.36	0.06	9.85
2005	.85	3.98	2.24	3.69	2.76	1.55	15.07
2006	0.72	4.86	2.49	0.96	5.45	2.83	17.31
2007	1.30	1.88	0.82	3.19	0.2	1.53	8.92
2008	0.51	1.58	5.18	2.30	.09	.03	9.69
2009	1.09	1.84	1.16	3.78	1.9	0.34	10.11
2010	0.32	1.62	5.31	2.14	2.26	3.28	14.93
2011	1.69	3.34	0.79	2.61	4.45	0.09	12.97
2012	1.54	0.18	1.72	0.72	2.59	2.14	8.89
2013	3.56	4.99	0.29	0.46	0.81	0.22	10.33
2014	1.15	0.24	0.05	2.96	2.18	1.18	7.76
2015	1.34	8.95	0	1.65	0.38	1.56	13.88
2016	2.12	2.24	3.78	0.68	2.68	1.38	12.88
2017	1.08	2.51	5.59	5.18	2.21	1.34	17.91
2018	2.03	0.06	3.47	0.49	2.08	1.46	9.59
2019	**1.6**	**1.27**	**2.09**	**4.95**	**3.91**	**0.35**	**14.17**
Mean normal	1.78	2.46	2.96	2.52	2.1	1.02	12.84

Figure 4. 2019 Monthly Rainfall Totals Compared to Average. Data used in this graph is presented in Table 4.

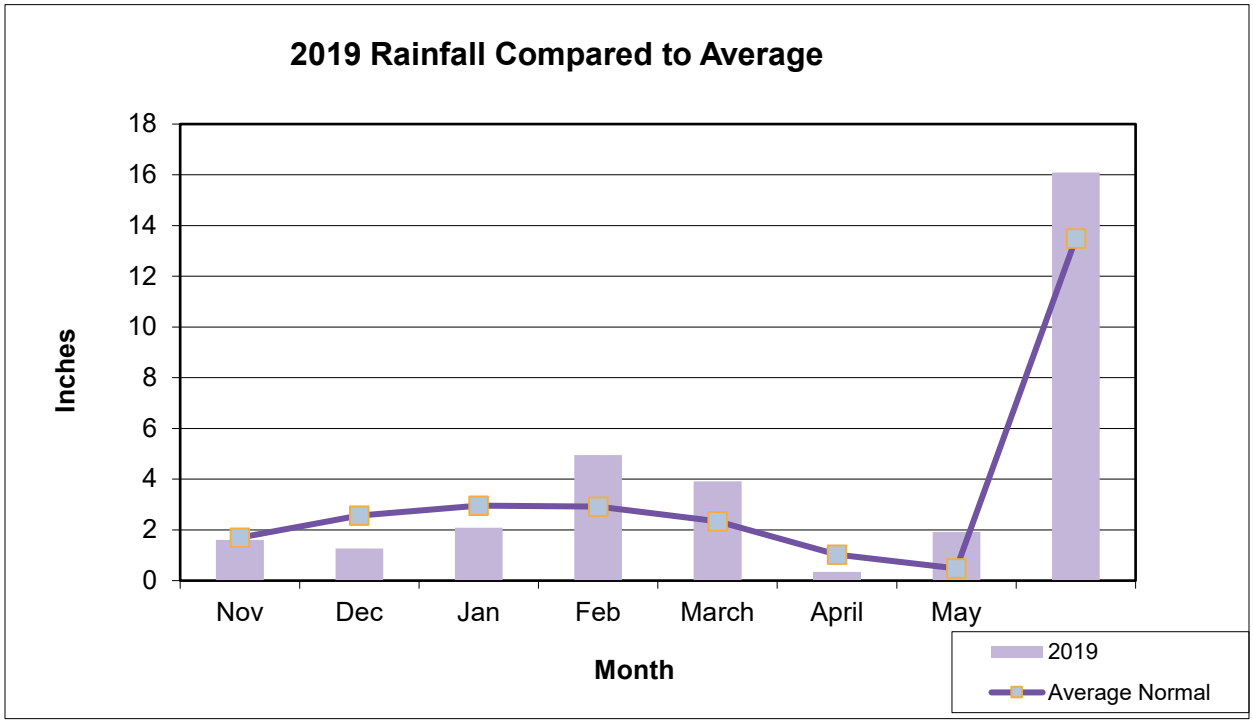
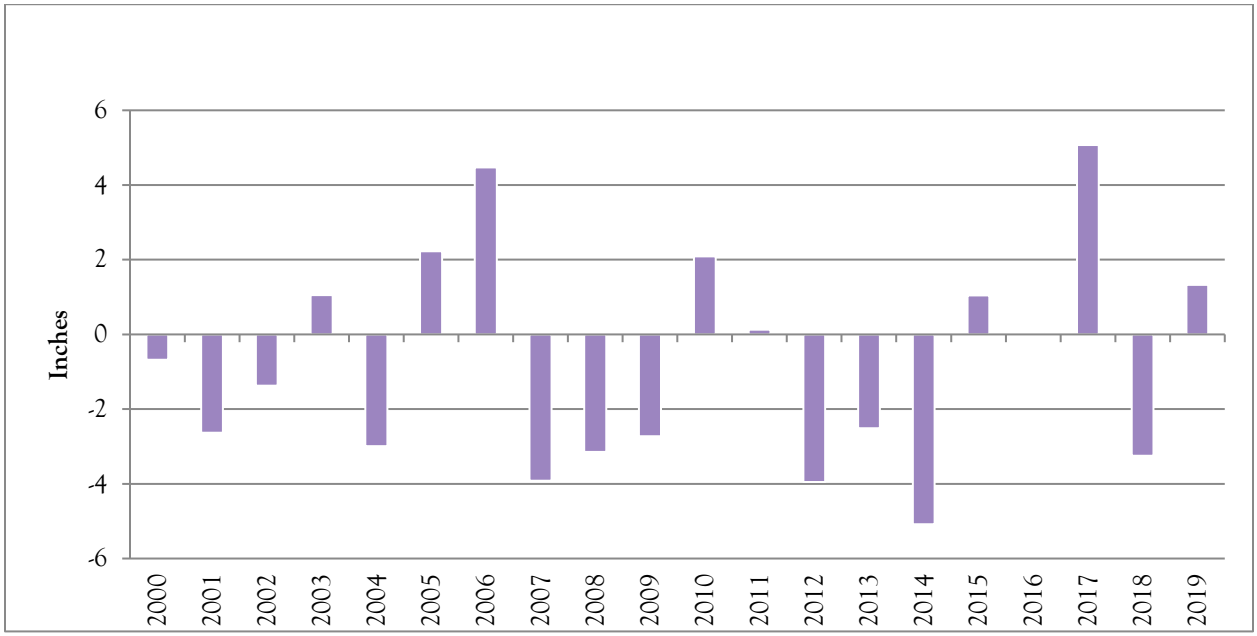


Figure 5. Deviation in Rainy Season Precipitation from Normal between 2000 and 2019. The mean Normal was calculated over the period from 1948-2010.



Vernal Pool Hydrology

The first strong precipitation events in fall occurred in the last week of November. A total of 1.6 inches of rain was received during that week which was not enough to inundate the majority of pools. With the exception of one pool in Pasture 3, Pool 3-35, which got inundated and the three pools in Pasture 10, which were continuously inundated due to the feed of an artesian well, no other pools filled in November. More precipitation came in December through sporadic and weak rain events dispersed throughout December. The majority of the pools filled in mid-January (Table 5). Above normal precipitation in February and March kept pools well inundated for the whole of April, despite the warm temperatures in that month. Then, an exceptionally wet May prolonged inundation of the deepest pools for most of May. Several pools dried in mid-June, a phenomenon relatively rare at Warm Springs. Table 5 shows the temporal inundation pattern and the longest observed hydroperiod for each of all 58 pools surveyed. All pools had a hydroperiod longer than 54 days, the minimum number of days of inundation VPTS needs to complete a breeding cycle successfully (Helm 1998). Forty six pools of the 58 surveyed had a hydroperiod of 100 days or longer, our benchmark for successful CTS metamorphosis to occur. Excluding the three pools in Pasture 10, which were charged by an artesian well and stayed inundated for the whole year, hydroperiod for the rest of the surveyed pools ranged from 66 to 220 days and the mean length of the maximum hydroperiod was 115 days. Excluding the pools in Pasture 10, the earliest inundation occurred at the end of November and the latest drying time was in early June. Inundation period, or the length of time the pool holds water, is an important factor in determining which vernal pools provide suitable breeding habitat for VPTS and CTS. On average, vernal pools with VPTS or CTS larvae exhibit greater maximum depths and inundation periods than vernal pools in which these species were not observed.

For a fifth year in a row, the three monitored pools in pasture 10 were inundated for the whole year. These pools have lost seasonality and they feature elements that are typical of permanent wetlands. The Refuge wants to cap the well that feeds these pools and install a valve that will allow to elongate the hydroperiod in dryer years to improve chances for successful metamorphosis of CTS larvae. The Warm Springs manager, and the Don Edwards San Francisco Bay National Wildlife Refuge Manager have met with U.S. Fish and Wildlife engineer and with a potential contractor in August and September 2019. Because of the presence of endangered species and the nature of the job to be done, some investigative, on-site contractor work is necessary to take place in summer 2020, before any further action. On a separate note, pool 5-45, which is not included in our monitoring sample but stayed inundated for consecutive years due to a broken flap valve, dried in August 2019. The Warm Springs manager has contacted the Alameda Flood Control District for repairs needed. We assume that work done at the broken flap valve at the Laguna Creek flood control channel resolved the problem. However, we need to do a more thorough inspection to avoid intrusion of bay and/or flood control channel water in the future.

Table 5. Warm Springs monitored pools inundation period for 2019. The maximum hydroperiod is reported in the last column where green denotes inundation longer than 99 days, and yellow longer than 54 but less than 100 days.

Pool #	Nov				Dec				Jan				Feb				Mar				Apr				May				Jun				Hydro-period
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	(Days)
1-1																																	138
1-2A																																	143
1-2B																																	149
1-3A																																	105
1-4A																																	92
1-5A																																	107
1-5B																																	109
1-6A																																	101
1-6B																																	101
1-7																																	111
1-8																																	119
1-10																																	111
1-12																																	109
3-7																																	155
3-17																																	148
3-21																																	161
3-25																																	102
3-27																																	129
3-30																																	74
3-35																																	220
4-2																																	126
4-10																																	102
4-14																																	102
4-15																																	98
5-6																																	100
5-10																																	185
5-14																																	139
5-20B																																	109
5-25																																	98
5-27																																	98
5-33																																	139
5-34																																	106
5-38																																	100
5-39																																	84
5-41																																	102
5-42																																	103
6-1C																																	148
6-3C																																	114
6-4A																																	105
6-4D																																	114
6-4F																																	114
6-4I																																	114
6-5B																																	103
6-11																																	148
7-2																																	79
7-5																																	139
7-10																																	69
7-12A																																	134
7-18B																																	66
7-27																																	94
7-35																																	142
7-42																																	105
8-6																																	85
8-13																																	88
9-6																																	114
10-1A																																	365
10-1B																																	365
10-1D																																	365

2.2.2 Discussion

Although the rainy season started with some abnormally warm and dry weather, storm systems that formed later resulted in above average precipitation for 2019. Because the pools in Warm Springs do not have a distinct type of hardpan but they retain water due to the shrink-swell capacity of the clayey soil, a time of priming is required for them to become impermeable. Despite the occurrence of rain in November and December, priming this year took more time because of the low intensity of the rain and the warm temperature which would dry pools quickly between rain events. Even though below average precipitation in the months of December and January delayed ponding, strong storm systems in February and March kept the pools inundated past April. Then, an exceptionally wet May pushed the hydroperiod length even further so that all monitored pools had a hydroperiod longer than 54 days while 79% of the pools had hydroperiod of 100 day and more. With respect to pool hydrology, 2019 was a strange year because of the late distribution of precipitation; however, in 2019 a good number of pools registered inundation long enough to support the breeding efforts of VPTS and CTS.

3.0 WILDLIFE MONITORING AND MANAGEMENT

Monitoring of wildlife at Warm Springs focuses on special status species, including VPTS, CTS, versatile fairy shrimp (*Branchinecta lindahli*), and burrowing owl (*Athene cunicularia*).

3.1 AQUATIC WILDLIFE MONITORING

Each of the pools in the hydrology monitoring subset discussed in Section 2.1 are monitored annually for aquatic wildlife including VPTS, versatile fairy shrimp, and larval CTS. The survey results help us to assess the viability of the vernal pool grassland ecosystem. In the Complex NRMP we identified the presence of breeding CTS and VPTS as key ecological attributes of the vernal pool grassland ecosystem. Specifically the indicators we use to assess the viability are:

a) The number of pools (of 58 that are monitored in Warm Springs Unit) with CTS larvae present and hydroperiod adequate (typically >100 days) to allow for metamorphosis to occur and
b) The number of pools (of 58 that are monitored in Warm Springs Unit) with VPTS larvae present and hydroperiod adequate (typically >54 days) to allow for metamorphosis to occur.

For the above indicators, we use as a measure the average of the 3 best of the last 5 years (Table 1).

3.1.1 MONITORING METHODOLOGY

We annually perform a California Tiger Salamander and Vernal Pool Tadpole Shrimp Survey to assess presence of the two species on Warm Springs Unit. The general methodology for monitoring aquatic wildlife is summarized below. A more detailed explanation of methods can be found in the Monitoring Plan.

- An established subset of the vernal pools at Warm Springs is monitored annually, as shown in Figure 3.

- Biologists use 80-micron mesh dip-nets to sample for VPTS, fairy shrimp, other invertebrates, and amphibian larvae from the beginning of the monitoring period through approximately mid-March. At this time, if pool depths allow, the sampling method may switch to seining to more efficiently capture CTS larvae. Seines are 10 feet wide with 0.25-inch mesh. Each pool will typically be sampled with two to four seine pulls during a visit.

- Representative portions of each pool should be covered via both dip-net and seine sampling for VPTS, fairy shrimp, other invertebrates, CTS, and other amphibian larvae.

- The length of VPTS and total length of CTS larvae captured are measured, until a suitable sub-sample of animals has been measured from each pool. This sub-sample will typically comprise approximately eight individuals per pool although a larger sub-sample may be appropriate if more than one size cohort is observed within a pool during a discrete sampling event.

- During each visit to a given pool, sampling continues until 1) a suitable sub-sample of VPTS and/or CTS has been captured, or 2) the biologist(s) present believe that the pool has been adequately sampled, and the results (including negative results) are representative of pool conditions.

- The presence of macro-invertebrate groups in each pool will be noted during surveys.

Timing

The timing of aquatic wildlife monitoring is as follows:

- Each pool should first be sampled after approximately four weeks of continuous ponding.

- Pools are re-sampled approximately every four weeks, assuming ponding has been continuous since the previous visit, or until the Refuge Manager is satisfied with data collection for that year.

3.1.2 2019 MONITORING RESULTS

For the CTS and VPTS survey to start, pools need to have held water continuously for 4 weeks and need to be at least 5 cm deep in order to conduct aquatic sampling. The first round of dip netting started in early February (2/7/2018) and ended on February 28th, 2019 surveying pools when they met our monitoring criteria of inundation. We surveyed all 58 pools. The second round of surveys took place from March 13th until April 1st and we surveyed again the whole set of 58 pools. Finally, the 3rd round lasted from April 23rd to April 25th at only the pools that had CTS presence in one of the previous two rounds.

Vernal Pool Tadpole Shrimp

Vernal pool tadpole shrimp were observed in 47 of the 58 monitored pools. This is a high number although not the highest recorded, which was 51 pools with VPTS presence in 2017. A hydroperiod of 54 days is considered long enough for the VPTS to complete their cycle. All the 47 ponds with occurrences of VPTS had a long enough hydroperiod to sustain the complete cycle of the VPTS. In fact, the shortest hydroperiod was 66 days which is well above the minimum requirement.

California Tiger Salamander

In 2019, we found 29 pools with CTS breeding activity out of the 58 we sample. Although the ponding started late and CTS breeding activity was late too, we were worried that they would not have enough time to fully metamorphose since in a typical year most pools have completely dried by mid-May or even earlier. However, the exceptionally wet weather this May has pushed the hydroperiod to lengthier regimes with 27 of the 29 pools with CTS had a hydroperiod of 100 or more days. The other two pools did not make the cut of the 100 days, however they were very close to this 98 and 84 days, which theoretically is within the adequate range to complete metamorphosis. Overall, this was a good year for CTS at Warm Springs.

Fairy Shrimp

Versatile fairy shrimp were observed in 31 of the 58 monitored ponds. The presence of this species was recorded mostly in the first round of surveys in February and only in two pools during the second session.

Nuisance species

During the aquatic surveys we found fish in the pools 10-1B and 10-1D. In the pool 10-1D, we had found fish last year as well. The two pools along with 10-1A are inundated continuously for the last 2-3 years because of an artesian well. The Warm Springs manager and the Refuge Manager have initiated a process to cap the well (see Vernal Pool Hydrology paragraph above).We also found fish during the third monitoring session in pools 1-1. We found fish again there in 2017 and concluded that fish came in when the nearby flood control channel topped off and the water spill went into the pond. We think something like this has happened this year as well. Finally, we found a half-eaten fish in pool 6-1C. We assume that a bird most likely dropped the fish as we did not find any other evidence of fish presence in this pool.

3.1.3 DISCUSSION

Year 2019 was one of the relatively good years for our aquatic species at Warm Springs. Despite the late start of the wet season, most pools filled in January and all of the sampled pools had hydroperiod long enough to sustain the VPTS breeding cycle and more than 70% of these pools had inundation long enough for CTS to metamorphose. It is very well documented that hydroperiod, the length of inundation, is the predominant factor in structuring temporary wetland communities (Schneider & Frost, 1996; Zokan & Drake, 2015, O'Neill 2016) and affects the abundance of VPTS (Kneitel et.al. 2017) as well as the reproductive activity and success of CTS (Ford et al. 2013).

Both species are known as boom and bust species, an evolutionary adaptation to survive through years with extremely unfavorable conditions. Therefore long term trends are more indicative than one year data. Table 6 shows the results of aquatic monitoring in the 8 years since the new monitoring program began. In terms of viability analysis, for both species, we use the average of the best 3 of the last 5 years as an indicator of the health of this vernal pool grassland ecosystem. Years 2015, 2017, and 2019 are the three best years from the last five years for both VPTS and CTS. Data from these years are used to calculate the indicator we chose to assess viability, which is the average of the best 3 years (Table 1). The metric this year for VPTS is 49 pools and for CTS is 30 pools. According to the viability scales we developed (Table 1) the status for both VPTS and CTS is "Very Good". Which can be translated as in the last five year the breeding effort of CTS was strong and with good chances for success. In addition, Figures 6 and 7 shows the trends of the VPTS and CTWS indexes (the average of the best 3 of the last years) respectively for years 2016 to 2019 based on data collected since 2012. From these it is noticeable that VPTS status looks pretty steady at "Very Good" status while the CTS is swaying between the "Good" and "Very Good" Status.

Table 6. The number of pools containing VPTS, CTS, and fairy shrimp 2012-2019. When all pools with VPTS and CTS present, did not have a hydroperiod long enough to complete the life cycle for VPTS (>54 days) and for CTS metamorphosis to occur (>100 days), the number in parenthesis shows how many pools met both conditions (i.e. focal species presence AND adequate hydroperiod).

	2012	2013	2014	2015	2016	2017	2018	2019
VPTS	2	43	0	**50**	36 (**34**)	**51**	3 (1)	47
CTS	1	31	0	**31**	**12**	**32**	1	29(27)
VFS	7	27	0	27	48	42	3	31

Figure 6. VPTS presence index at Warm Springs for years 2016-2019. The index is calculated as the rolling average of the three highest VPTS indicator values that occurred in the last five years. VPTS indicator is defined as the number of pools (of 58 that are monitored in Warm Springs Unit) with CTS larvae present and hydroperiod adequate to allow for completion of breeding cycle (typically 54 days).

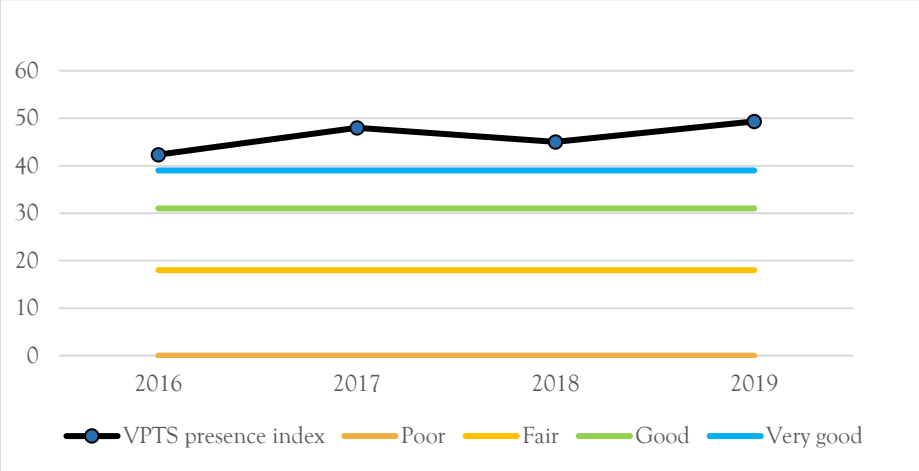
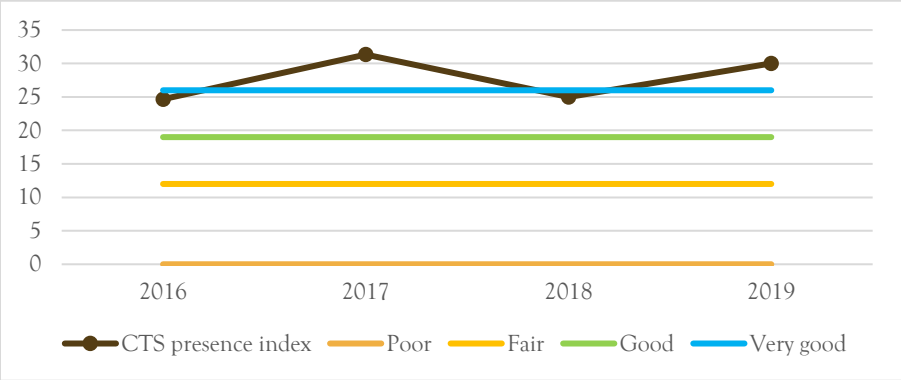


Figure 7. CTS presence index at Warm Springs for years 2019 based on data collected from 2012- 2019. The index is calculated as the rolling average of the three highest CTS presence indicator values that occurred in the last five years. CTS indicator is defined as the number of pools (of 58 that are monitored in Warm Springs Unit) with CTS larvae present and hydroperiod adequate to allow for metamorphosis to occur (typically 100 days continuous inundation)



3.2 BURROWING OWL

The managed grasslands of Warm Springs provide suitable habitat for the Western burrowing owl (owl), a Species of Special Concern for the State of California, and this species has utilized the site for many years. In addition to the annual breeding surveys which began in 2013, several new owl projects were initiated in 2015 and continued through 2018 using outside funding. In 2019, the two major projects related to the study and habitat enhancement of owls were:

1) Burrowing Owl Surveys and Habitat Enhancement: The Santa Clara Valley Habitat Agency (SCVHA) provided funds to San Francisco Bay Bird Observatory (SFBBO) and Talon Ecological Research Group (Talon) to conduct several monitoring and habitat enhancement tasks in collaboration with the Refuge to better understand the status of the owl population and to improve the nesting and foraging habitat of this species at Warm Springs. To meet its goals, the project allocates funds for predator control conducted by the USDA-APHIS Wildlife Services. The project contract is for 5 years with annual disbursements based on the findings of the preceding project years. Year 2019 was the fifth year of project implementation. In 2019, Talon was leading this project since the start of the breeding season in February and SFBBO worked on vegetation management for habitat enhancement.

2) Breeding Burrowing Owl Banding: For a fifth year, Debra Chromczak, an independent burrowing owl expert, banded breeding adults and chicks at Warm Springs. This banding program was funded by SCVHA.

Both, Debra Chromczak and SFBBO provided an annual report describing their methods and findings (Chromczak 2018, Cech et al. 2019). Talon sent separate monthly reports for their BUOW monitoring activities. This section provides only a rough summary of the burrowing owl's population status and the banding effort at Warm Springs based on the aforementioned reports and the USFWS staff observations.

3.2.1. 2019 POPULATION STATUS AND BREEDING SUCCESS OF BURROWING OWLS AT WARM SPRINGS

On December 12, 13, and 14, 2018, winter population surveys by SFBBO staff and volunteers recorded 7 burrowing owls and several burrows with signs of use. Pastures 1 and 3 had two owls each, Pastures 5, 6, and 7 had one owl each. SFBBO did not survey the Stevenson parcel, which has not had any records of burrowing owls and little to no ground squirrel activity for the past five years. This winter population estimate was lower than previous winters when 8-18 owls were present.

The breeding season BUOW monitoring started in March 2019. This year Talon was leading the monitoring effort and the protocols were changed. Specifically, Talon performed a monthly transect survey starting in March. No focused surveys took place on nests. However, cameras were planned to be installed at active nests and Talon carried out supplemental feeding, which in turn would result in closer monitoring of the used burrows.

The Refuge ecologist first detected a pair of owls in Pasture 5 North at the end of February. In March, during their walk-in-transect monthly survey, Talon surveyors reported one pair and five single adults. Beginning in April, Talon saw one pair in Pasture 3 and one adult in Pasture 6. On April 13, Talon initiated supplemental feeding activities in the two used burrows. After three feedings they noticed that the owls were not using the burrows anymore and they installed cameras to verify their observations. On May 10, 2019, Talon did not detect any owls. In the months of June and July, Talon, in addition to their usual walk-in-transect surveys, installed bownets with MP3 players playing the BUOW primary call and a dead mouse as a visual attractant. The reason they pursued these activities was to increase certainty of their findings of no BUOWs in Warm Springs. Some BUOW activity was reported in September most likely from dispersing or winter migrants in Pasture 3, 1, and 7. Specifically they saw one owl and three used burrows. Debra Cromczak has summarized the 5 year population estimates for the breeding and wintering population (Table 8) for the project funded by SCVHA.

Table 7. History of Warm Spring's burrowing owl breeding population from 2015 to 2019 (Chromczak, 2019)

Breeding Season	Adults	Previously Banded Adults	Chicks	Owls Banded This Season		Nests (Females)	Successful Nests (Females)	Percent Nest Success	Productivity Estimate (mean brood size)		Average Distance Moved Between Seasons
				Adults	Chicks				Successful Nests	ALL Nests	
2015	6	0	13	5	12	3	3	100%	4.33	4.33	—
2016	8	4	13	1	8	4	2	50%	6.50	3.25	1.72 miles
2017	11-12	8	7	2	4	4	2	50%	3.50	1.75	0.50 miles
2018	5-6	5	5-6	0	5	3	1	33%	5.00	1.67	1.19 miles
2019	**3**	**—**	**0**	**0**	**0**	**1**	**0**	**0%**	**0.00**	**0.00**	**—**

3.2.2. HABITAT MANAGEMENT FOR BUOW.

Most of the habitat management for BUOW consisted of vegetation control activities to maintain short vegetation height in nesting areas and combat target weed species that spread fast and degrade the BUOW habitat quality. Since the main goal of these management activities aligns with the Refuge vegetation management priorities, they are described more analytically in the Vegetation Management paragraph of this report. In a nutshell, SFBBO performed vegetation management which included spraying, pulling, and weed whacking after receiving guidance from Talon and the Refuge. More information on their work can be found in the "Invasive Species" section of this report.

In addition to vegetation management, on February 15, 2019, staff from Talon, SFBBO, and USFWS collaboratively installed a total of ten artificial burrows in Pasture 2. They installed two artificial burrows each in mounds L2-7 and L2-3 that already contained two artificial burrows each. They also installed two artificial burrows each in L2-1, L2-4, and L2-5, which did not previously contain artificial burrows.

Finally, Talon, SFBBO and Refuge Staff knocked down artificial rock piles that were taller that desired to reduce perching by predators.

3.2.3 DISCUSSION

Year 2019 was the first year of no successful breeding pairs of owls at Warm Springs on record. There was an obvious downward trend since the 2017 breeding season in the breeding success. The SCVHA funded project for the enhancement of the BUOW habitat in Warm Springs started in 2015. While there was an increase in the number of adult owls for three consecutive years (2015-2017), the decrease in the number of chicks started in 2017. But even before that, unsuccessful breeding effort of nests were documented since 2016 when two out of four nests were unexpectedly abandoned around the time of chick emergence. Unfortunately, there is no detailed data for the years before, especially in respect to nesting success to help us better understand the reason for this trend. A plethora of factors may be associated with the BUOW population decline at Warm Springs. In the last five years most of the surrounding open space lands were developed or changed land use. This may have a direct impact on the owls through the decrease of the foraging habitat, direct disturbance, and an increase in predation pressure. The latter is evident by the large number of depredated owls we found on the site in recent years and observations of avian predators attacking burrowing owls. Mammalian predation was addressed by the predator management program also funded by SCVHA. In 2019, Talon who took the lead on the project, tried to minimize the risk of predation to the BUOWs as well as increase their fitness and therefore their breeding success by initiating supplemental feeding. Specifically, they would leave in the inner skirt of the burrow entrance one rodent at regular time intervals. The rationale here is that the owls would not have to travel long distances to forage, thus the risk to be depredated decreases and at the same time their diet is boosted They applied this strategy in the previous two years at other sites and they reported positive results for at least one site in terms of an increase in chicks produced. Initially, the Unit manager and the ecologist were hesitant to adopt this strategy, which is in general against the approach of the Refuge and could attract more predators. However, due to the the rapidly declining BUOW populations throughout the entire South Bay as well as the positive results of supplemental feeding reported by owl researchers locally and throughout the BUOW's range, the Refuge agreed to try this emergency measure with the hope to increase the number of chicks produced and to keep a viable BUOW breeding population at the Refuge. Unfortunately, it did not work.

At the fall 2019 meeting of the South Bay Burrowing Owl Surveying Network, Talon lead biologist Phil Higgins presented some data regarding the supplemental feeding study. They had been utilizing supplemental feeding at other sites for a couple of years. Unfortunately there was not a robust study design to allow for high certainty in the conclusions. Moreover, the analysis did not show a strong difference between fed and unfed burrows for all years. They actually had only two years of data with fed and unfed burrows. Because of the very limited number of nests and some initial promising results, and captive breeding and rearing experiments performed in other areas and/or countries, they decided to feed all of the nests. Failed/abandoned nests, such as the case of Warm Springs, were not included in the analysis and interpretation. This approach however

creates many questions as to whether supplemental feeding is in fact helping or not and under what conditions. Clearly, we need to examine more carefully both, positive and negative results to decrease bias and avoid making assumptions even if they are theoretically sound.

From the perspective of vegetation conditions, from our assessment and Talon's assessment, conditions were almost ideal especially in the target areas. SFBBO conducted vegetation management in a well-organized manner and kept in check all the problematic weeds that could compromise habitat quality. Ground squirrel activity was also high. Therefore, vegetation conditions and burrow availability are not considered as limiting factors in 2019.

Talon had some concerns about disturbance. Specifically they visited one day that the cooperative rancher with a large workgroup was moving cows and they commented on the very high degree of noise, trampling by the cows, and potential disturbance in Pasture 1. They also expressed concern about potential disturbance by the vernal pool vegetation tours which took place in April and May, again in Pasture 1. Note that there was no active nests or signs of recent burrow activity in Pasture 1 in mid-April. Talon saw 1 pair and one individual in Pasture 1 in early March. We did not observe these owls in the reported locations during field visits. March is the month with presence of both wintering and breeding owls. Therefore, owl activity at specific burrows in March does not always lead to nesting at those burrows (Botanist/ecologist personal experience, SFBBO 2015 & 2016 reports). The fact that the site was very wet in spring further complicates the picture this year. Regardless, we believe that more care need to be taken during the sensitive time of breeding initiation. For this reason, the Unit Manager had a conversation with the rancher regarding practices that may cause disturbance and potential mitigation measures. The tours are performed by holding the group tight and without having people "wandering around".

One of the concerns we have is that the methodology of one survey a month to scan the whole site might not give enough information on the owl activities especially in the months that they are pairing up and are very mobile choosing nest burrows etc. Perhaps more focused surveys are needed during this time to ensure we have adequate information to adapt management. In the past, the focused surveys and retrieving camera records every week-ten days were very useful to create a deeper understanding of the situation in each used burrow.

3.3 PREDATOR MANAGEMENT

In 2019, predator management at Warm Springs was conducted through two separate projects/goals:

1. Mammalian predator control focusing on nonnative common BUOW predators was conducted by USDA-APHIS Wildlife Services through their contract with SFBBO and SCVHA as mentioned above to enhance habitat quality for the burrowing owls.
2. Avian predator nest removal as part of the Don Edwards San Francisco Bay NWR Avian Predator Management Plan (http://www.fws.gov/refuge/Don_Edwards_San_Francisco_Bay/planning.html) and with a permit from the USFWS Migratory Bird Office.

3.3.1 MAMMALIAN PREDATOR CONTROL

As in the previous three years, USDA-APHIS Wildlife Services conducted predator control as part of the SFBBO led/SCVHA funded BUOW. Trapping focused on potential mammalian predators of burrowing owls, especially feral cats (*Felis catus*), striped skunks (*Mephitis mephitis*), and Virginia opossum (*Didelphis virginiana*). Between March, 2019 and September 30, 2019, cage traps were set for 49.5 nights, resulting in 105 trap-nights. A trap-night is defined as one trap being open for one night. All target animals captured were euthanized; no animals were relocated. The total numbers of each species removed are shown in Table 9.

Table 8. Animals Controlled at Warm Springs. In 2019, work performed under this agreement covers only the work performed in Warm Springs Unit. In previous years, this report has contained information on both Warm Springs Pasture and Warm Springs A22/A23, but that information has been removed.

Year	*Red Fox*	*Cat*	*Raccoon*	*Skunk*	*Opossum*	*Total*	*Trap-nights*	*#/10 Trap-nights*
2019	*0*	*3*	*1*	*15*	*1*	***20***	***105***	***1.90***
2018	*0*	*7*	*0*	*46*	*8*	***61***	***375***	***1.62***
2017	*0*	*12*	*1*	*57*	*28*	***98***	***313***	***3.13***
2016	*1*	*14*	*2*	*41*	*18*	***76***	***275***	***2.76***
2015	*6*	*8*	*0*	*27*	*2*	***43***	***226***	***1.90***

3.4 OTHER SPECIES INCIDENTAL OBSERVATIONS

In 2018, Merav Voshnak, a post-doc entomologist, visited Warm Springs and among other insects she identified old man tiger beetle (*Cicindela senilis ssp. senilis*). *C. senilis* is graded as a N1/N2 (critically imperiled) in United States in NatureServe Explorer. C. senilis ssp. senilis is covered by the Tidal marsh recovery plan, albeit is a non-listed species. At Warm Springs, we found a good size population at the salt flats in Pasture 2 South, close to the corner to Pasture 10. In 2019, Merav and other entomologists visited again the site and found the C. senilis during their visits in Spring and summer. The actual locations were not exactly the same with 2018 but all were located in the general area found in 2018. Merav, has also helped to start a project on recording species found at Warm Springs through an application called iNaturalist and lead small groups of entomologists and naturalists to record species through the seasons. By creating a project area, every observation made in Warm Springs at any time using iNaturalist, it will be included in the project's list. In addition, the Talon team recorded bird species during the burrowing owl surveys. Most of them were included to the eBird application. Talon reported the list of birds found to the Refuge as well. The use of apps such as iNaturalist and eBird is a very efficient way to record species presence, especially for species that no formal surveys are in need or possible, and allow for different parties such as partners, other experts etc. to input data in real time, which can be retrieved at any time later. These not only save time from data entry and data transformation to shape them appropriately, they also allow for a cohesive way of data recording (i.e. fields and format remain the same as defined in the project) within each application. Finally, both applications obscure the exact location of listed species, making it safe to share publicly data. A compiled list of species per taxa category is presented in Appendix III. These lists rely on iNaturalist, eBird, and old bird lists or Refuge records.

4.0 VEGETATION MONITORING AND MANAGEMENT

Vegetation composition and structure can drive the ecological integrity of the vernal pool grassland ecosystem and reflect the state of key ecological processes at Warm Springs. Two of the three KEAs (Key Ecological Attributes) we identified during the Complex-wide conservation prioritization process involve vegetation composition. Vegetation compositions relates to management goals, and is associated with viability scales, which we developed to enable assessment and goal attainment evaluation. Specifically, one KEA involves grassland vegetation composition and structure while the other refers to vernal pool vegetation. Table 2 and 3 present the two KEAs, their associated indicators and related management goals and objectives. We conduct vegetation monitoring annually to track the conditions of the ecosystem and to evaluate management strategies.

Prior to 2018, vegetation monitored at Warm Springs included vernal pool vegetation, upland vegetation, rare plants, and invasive plants. One survey was conducted for each of these attributes. During the Complex-wide NRMP development we identified that we could acquire the information needed for management purposes from two surveys: a vernal pool vegetation survey and a site wide vegetation survey performed in the early summer when identification of most species is still possible and the warm season species, including target weeds, are emerging. We decided to discontinue the upland vegetation survey, which used to occur in May. Its restricted sampling size did not accurately describe the vegetation composition in each pasture or across the whole site. This deviation was noted by the Warm Springs manager and the botanist over the years, and staff instead relied on the summer vegetation surveys (previously called "Invasive Species Survey") for a better measure of vegetation changes. We also discontinued the dedicated rare plant surveys which we used to perform for three species: San Joaquin spearscale (SJSS; *Extriplex joaquiniana*, CNPS List 1B.2), Congdon's tarplant (CTP; *Centromadia parryi* ssp. *congdonii*, CNPS List 1B.2), and alkali milk-vetch (AMV; *Astragalus tener* var. *tener*, CNPS List 1B.2). During the complex-wide planning process we identified that due to resource and personnel time shortage, surveys that do not directly impact management decisions have to be discontinued. While the rare plant surveys added to our knowledge of the plant community, they were not informing our management in a direct way. For the CTP, we should have a good sense of its presence at Warm Springs since it appears in several quadrats of the Summer Vegetation Survey. For the AMV and SJSS we will no longer survey but will keep notes on all incidental observations of the species. Finally, we modified the previously named "Invasive Species Survey" into "Summer Vegetation Survey" and are collecting data on all plant species. This gives the Refuge information on site wide vegetation conditions including invasive species and how their spread compares to native species cover. We modified the survey by adding more vegetative cover classes (previously only 3) in order to better detect species' changes.

In 2019, for vegetation and management we followed the general directions established in 2018.

4.1 WETLAND VEGETATION AND CONTRA COSTA GOLDFIELDS

Vernal pools and other wetlands at Warm Springs support a suite of native plant species adapted for wetland conditions. While these species are generally found only in wetlands, most are not considered rare. However, several rare species are also found at Warm Springs, including the endangered Contra Costa goldfield (CCG). Monitoring of CCG populations and wetland vegetation are considered an interconnected task.

The assembly and abundance of vernal pool species is largely dependent on factors such as precipitation schemes, inundation, air temperature temporal variation, grazing management, seedbank, pollinators, plant community dynamics, and invasive species effects. Therefore, abundance of vernal pool forbs may vary considerably from year to year. Relative cover of vernal pool obligate species, wetland species, CCG abundance indicate the state of ecosystem processes, particularly those that relate to vernal pool hydrology and its interplay with other biotic and abiotic factors.

It is well documented that thatch accumulation is one of the primary factors to negatively impact native vernal pool communities. The grazing program at Warm Springs was initiated as a means to reduce thatch accumulation, increase bare ground (up to a level) and improve germination conditions for the vernal pool plant species. Because of the importance of this program, since its start, in addition to the vernal pool vegetation monitoring, a special study of grazing exclosures was incorporated into the monitoring of vernal pool vegetation. The idea is to access the effect of grazing, short and long term, on the vernal pool plant community and particularly on the CCG .

Therefore, the Vernal Pool Vegetation Survey intends to:

1. Assess the state of the ecosystem through indicator measurement of key ecological attributes
2. Identify trends in vegetation community through space and time and support interpretation of trends
3. Directly measure the impact of management strategies on targets and inform further management decisions to improve the conditions that support this sensitive community and ultimately the ecosystem health.

4.1.1 MONITORING METHODOLOGY

Monitoring of wetland vegetation and CCG at Warm Springs utilizes a modified relevè approach, to be employed within a limited number of target pools treated as permanent plots, in addition to a CCG exclosures comparative study.

TARGET POOLS

Given the large number of pools and other seasonal features present at Warm Springs, a representative subset of vernal pools has been selected for annual wetland vegetation and CCG monitoring. While this subset of pools are the focus of monitoring efforts, any incidental occurrences of CCG observed within Warm Springs should be noted if they are not within the subset of monitoring pools. The Warm Springs Biological Monitoring Plan (WRA 2012) lists the selection criteria for these pools.

The subset of pools for wetland vegetation and CCG monitoring includes 19 pools total, with 11 first-priority and 8 second-priority (Figure 8). Of the 11 first-priority pools, 7 were identified as being likely to contain populations of CCG, while 2 second-priority pools are likely to contain CCG. It has to be noted however, that since 2012 all pools, first and second priority, have been surveyed annually.

TIMING

The Vernal Pool Vegetation Survey is conducted annually. Wetland vegetation and CCG monitoring should ideally occur during the peak blooming period of vernal pool plant species to increase the likelihood of correctly identifying each species and estimating its prevalence. This is typically between April and mid-May, depending on the amount of rainfall for a given year and the resulting hydroperiod of the individual pools. The determination of when the peak bloom is occurring and/or the determination of the most appropriate time for monitoring must be made annually by site managers using best professional judgment.

It should be noted that CCG peak bloom is typically 1-3 weeks earlier than this of most other vernal pool species such as flatface downingia, although bloom times overlap. As a result, monitoring data may show slightly more or less of these species in relation to one another depending on the timing of the monitoring.

4.1.1.1 WARM SPRINGS RELEVÉ-BASED VEGETATION SAMPLING METHOD

The Warm Springs relevé-based field sampling method is based on concepts outlined in CNPS Protocols (CNPS 2007). Monitoring of both wetland vegetation and CCG are done during the same site visit.

While traditional relevè methodology (CNPS 2007) seeks to identify relatively small plots that will be representative of a large stand of vegetation, the methodology used at Warm Springs considers each pool to be its own plot, and monitors the entire vernal pool community within each monitored pool.

As a first step, the survey area is defined, and then delineated using the handheld GPS. The survey area extends to the outer edge of vegetation communities representative of typical vernal pool conditions. In most cases this will be the area dominated by obligate wetland species and/or accepted vernal pool species such as flatface downingia (*Downingia pulchella*), woolly marbles (*Psilocarphus sp.*), coyote thistle (*Eryngium sp.*) spike rush (*Eleocharis macrostachya*), and three or more species of goldfields (*Lasthenia spp.*) adapted to wetland conditions. This portion of a vernal pool also tends to include a larger area of bare ground and shorter vegetation.

Having defined the survey area, monitoring biologists conceptually divide the survey area into smaller sampling sections in order to estimate species cover with the greatest degree of accuracy. The sampling sections are roughly equal in area, and small enough that accurate visual cover classes can be assigned to individual species within each section. A single sampling section may be sufficient for small pools, while 3-4 may be adequate for most pools, and five or more may be necessary for larger pools. The sampling sections are for conceptual purposes only while monitoring the pool, and do not need to be mapped unless they are of unequal size. Cover classes for each species in each section are recorded, using the cover classes presented in Table 9.

The GPS polygon of the survey area is kept on file, and the area of the polygon will be considered equivalent to the area of vernal pool vegetation habitat provided by each pool for each year. Species cover values are entered in a database. All cover classes are converted to midpoints for the particular cover class (Table 9), and all midpoint data measurements for each species for each equal area section of a pool should be averaged. If sampling sections are of unequal size, the cover values are weighted before averaging. The resulting percentage will be taken to represent overall cover for each species within the pool.

Table 9. Cover classes for estimating canopy cover of monitored vegetation[Error! Bookmark not defined.]

Cover class	Percent cover range	Midpoint
0	0	0%
1	>0 and ≤1	0.5%
2	>1 and ≤5	3%
3	>5 and ≤15	10%
4	>15 and ≤25	20%
5	>25 and ≤50	38%
6	>50 and ≤75	63%
7	>75	88%

Cover classes are modified from Braun-Blanquet (1928) and CNPS recommendations (CNPS 2007).

4.1.1.2 CONTRA COSTA GOLDFIELDS EXCLOSURE STUDY

Fenced exclosures, or small areas fenced off to prevent grazing within a larger grazed pasture, are utilized at Warm Springs to provide a visual and quantitative comparison of CCG abundance in grazed versus un-grazed areas. These plots are the best indicator of the effects of grazing since the paired plots compare vegetation within the same pool and within the same year.

The exclosures are located in areas that typically contain high concentrations of CCG, and are moved to new locations every five to six years. Year 2018 was the last year for the grazing exclosures that were established 6 years ago in the summer of 2012 (Figure 9). In spring 2018, four pairs of new plots were selected and in fall of 2018 (FY 2019), the new exclosures were built. The paired plots are placed in areas estimated to exhibit relatively consistent ecological conditions, although no formal soil moisture or salinity measurements are taken.
The exclosures study utilizes four sites, each with one set of paired 4m x 4m plots (eight total plots). One plot within each pair was randomly chosen (by coin toss) to be fenced using hog wire and barbed wire in order to exclude cattle. The fences are 5m x 5m in order to allow a buffer zone between the plot and the fence. This plot design does not account for site specific variation; however the overall comparative trend between the grazed and un-grazed plots can be useful.

Monitoring of the plots relies on visual estimates of plant canopy cover within the plot area, using the cover classes presented in Table 10. Cover class data is analyzed using the midpoint of each cover class with exception to the CCG for which the exact absolute cover is identified.

Figure 8. Vernal Pools Monitored for Wetland Vegetation at Warm Springs.

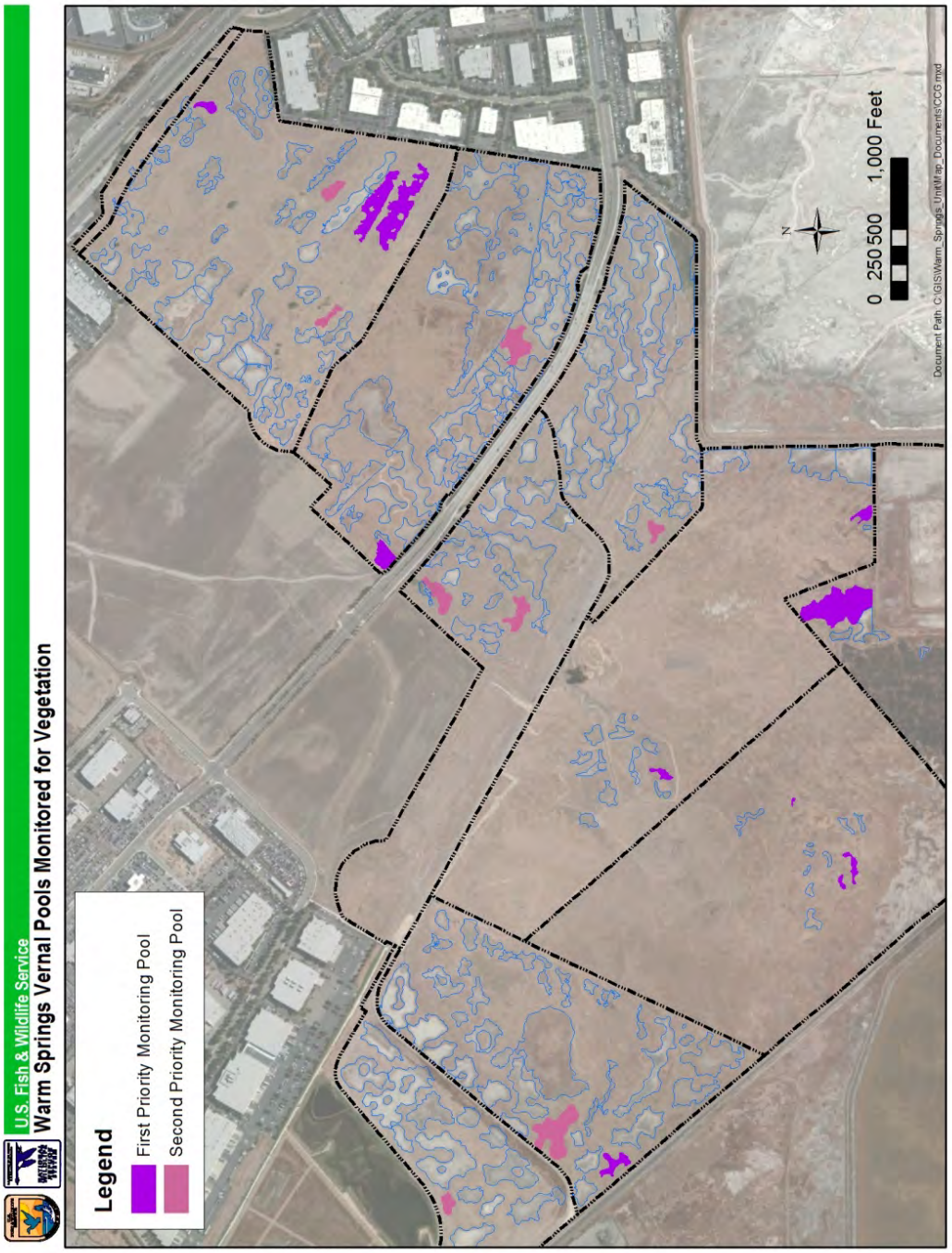


Figure 9. Contra Costa Goldfields Exclosure Locations (2019)



4.1.2 2019 MONITORING RESULTS

4.1.2.1 VERNAL POOL VEGETATION SURVEY

4.1.2.1.1 RESULTS

Monitoring was conducted on several days between May 1st and May 20th. When we monitored pool 10-1D, it was still inundated due to the discharge of an artesian well. However we chose to conduct the survey when vernal pool species were present and before they senesce.

The results of the 2019 wetland vegetation monitoring at Warm Springs are summarized in Table 10. Native wetland species relative cover, an indicator for vernal pool viability, reached 41% (pool average 44%) and slightly differed last year's 43% (2018 pool average 40%). Native relative cover at the pools was estimated at 56% (pool average 59%). According to the viability scale for the vernal pool vegetation composition, these values show that overall, monitored pools are in "good" condition (Table 2). Figure 10 presents the values of the vernal pool and wetland species relative cover indicator from 2012 to 2019.

Looking into each pool separately, 7 pools fall in the "fair" category, 5 pools in the "good" category and 7 pools are in the "very good" category (Figure 11). In comparison, in 2018, 2 pools fell in to the "poor" conditions category, 6 pools in the "fair" category, 10 pools in the "good" category and 4 pools are in the "very good" category.

Trends of relative cover of vernal pool and wetland species for each of the sampled pools are shown in Figure 12. Among years there are significant shifts on the status of the vernal pool and wetland species relative cover indicator. Based on the indicator, conditions in some pools are improving whereas a few of them show degradation.

Year 2019 was the year that we used the vernal pool vegetation surveys data from the last seven years (2013-2019) to create a list of native species and use it as a baseline to ensure that in the future species richness is maintained. In the period between 2013 and 2019 we recorded 86 native species and the list is presented in Appendix I.

In 2019, seven of the pools monitored for wetland vegetation contained CCG, including pools 1-5B, 2-3A, 2-4, 2-11, 7-33, 7-44, and 7-45. Within the 19 pools, CCG made up an average of 3.9% relative cover (or 2.1% relative cover of all vernal pool acreage sampled). This compares to 4.4% relative cover (or 2.9% relative cover of all vernal pool acreage sampled) in 2018. Total acreage (absolute cover) of CCG was 0.314 acres which is lower by 0.082 acres (332 sq. meters), a 20% reduction of the 0.44 acres in 2018, but close to three times more than in 2017 (Figure 13).

Overall, according to the CCG viability stage (Table 2), the CCG acreage indicated good conditions for the species and the pools in general.

In addition to the monitored pools, CCG was seen in Pasture 1, Pasture 2 and Pasture 7 in other pools, swales and low areas. In Pasture 2, particularly, CCG was spread in the wider area surrounding pools 2-3A and 2-4 and some patches near the north east of pool 2-11. In Pasture 1, in addition to pool 1-5B, we noted CCG presence in the area east of the fence by 10-1D pool. This is an area that we typically see CCG almost every year. In Pasture 7, the CCG presence was also very strong, with CCG spreading in small patches in low areas surrounding pools 7-44 and 7-45 as well few individuals in and around pool 7-8.

In 2019, we recorded a total of 49 native species and within these a total of 35 native vernal pool species. The ten most prevalent species at Warm Springs in 2019, as determined by their total estimated area within all pools combined, are presented in Figure 14 and the most prevalent species observed over the last five years are presented in Figure 15.

Table 10. Summary of 2019 Warm Springs wetland vegetation monitoring data. Percentages in bold are weighted to account for the different sizes of the pools; the remaining percentages are not weighted.

	Total of All Pools	Average	High	Low	Standard Deviation 0	Units
Vernal Pool Habitat Sampled	11.57	0.61	2.87	0.044	0.71	acres
Absolute Vegetative Cover	15.28	0.80	3.69	0.063	1.01	acres
Total Species Present	93	31	48	20	7.77	species
CCG Present	7	N/A	N/A	N/A	N/A	# pools
Absolute Cover of CCG	0.314	0.017	0.112	0	0.03	acres
Relative Cover of CCG	**2.1%**	3.9%	26.5%	0.0%	8.8%	%
Number of Natives	49	15	25	8	4.59	species
Relative Native Cover	**56%**	59%	87%	31%	18%	%
Relative Cover of VP/Wetland Species	**41%**	44%	71%	27%	15%	%
Relative Cover of Native Upland Species	**15%**	15%	38%	2%	11%	%
Relative Cover of Non-native Forbs	**21%**	18%	51%	3%	13%	%
Relative Cover of Non-native Grasses	**23%**	24%	63%	1%	17%	%
Relative Veg Cover (visual estimate)	**51%**	58%	85%	11%	17%	%
Relative Thatch Cover (visual)	**1%**	1%	2%	0%	1%	%
Relative Fecal Material Cover (visual)	**1%**	1%	4%	1%	1%	%
Relative Bare Ground Cover (visual)	**47%**	35%	66%	1%	16%	%

Figure 10. Native vernal pool and wetland species relative cover 2012-2019. Lines represent the upper boundaries of the poor (red), fair (yellow), and good (green). Values below red line indicate a poor status and values above the green line indicate very good status.

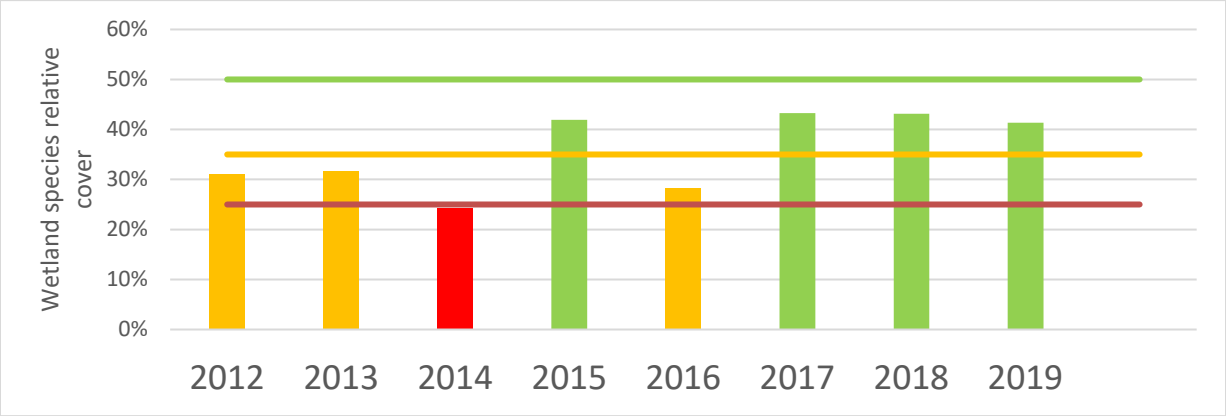


Figure 11. Native vernal pool species relative cover and all native species cover for the 19 monitored pools. Pools in the same pasture are represented with markers of the same color. Pools with CCG present in 2019 show yellow labels. Lines represent the boundaries of the viability scale categories. Values above the blue line characterize the pool status as "very good", values between the blue and green line characterize status as "good", and values between the green and red line denote "fair" status. Values under the red line mark a "poor" status. Lines are based on the viability scale we developed (see Table 1).

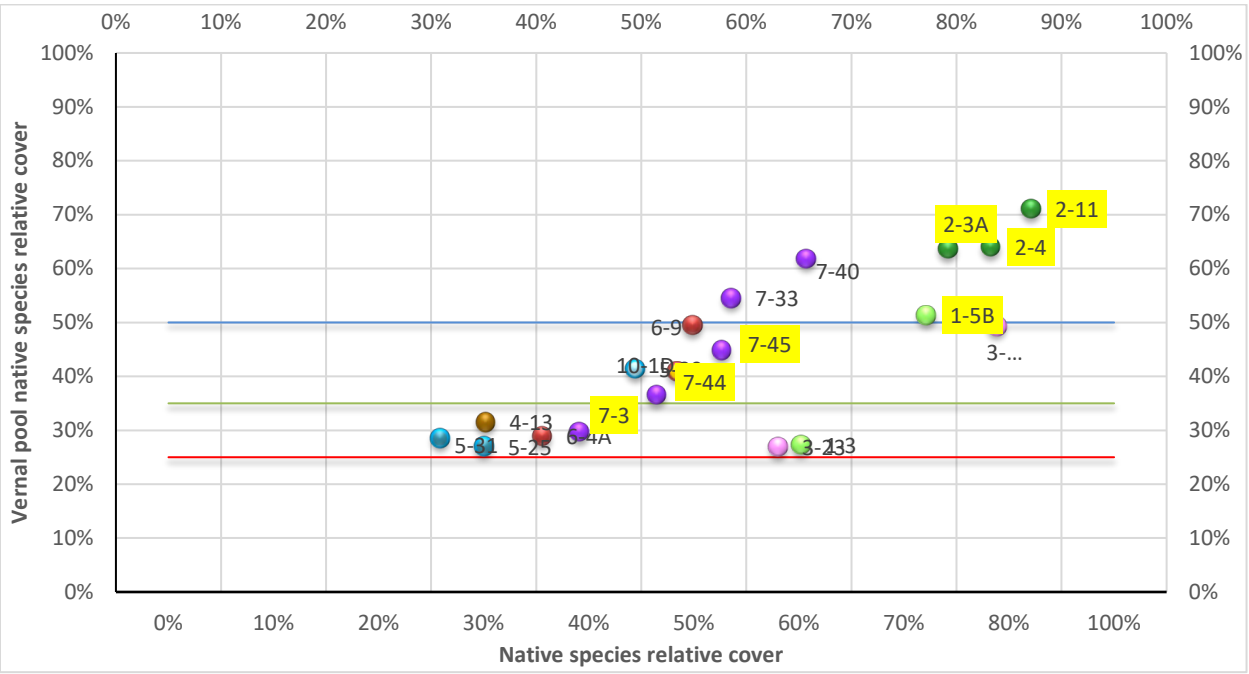
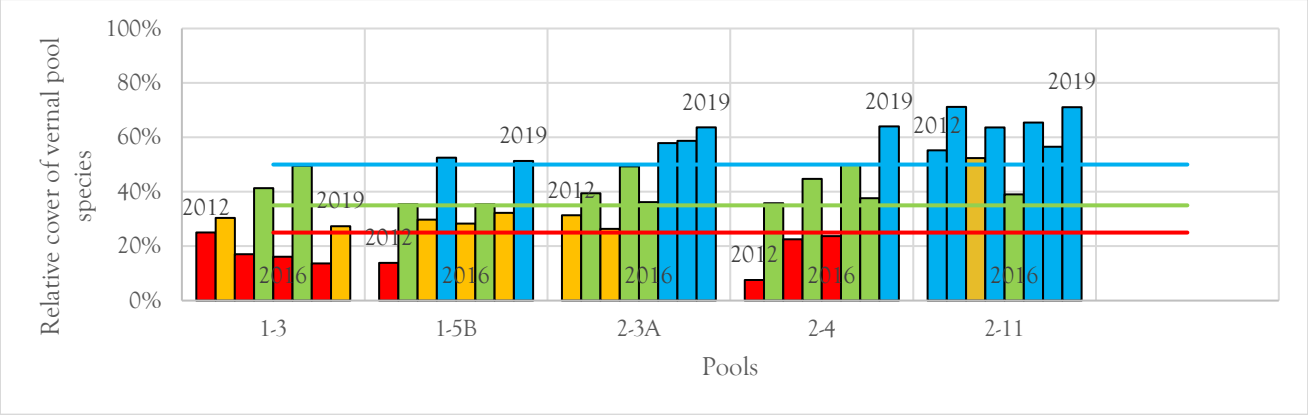
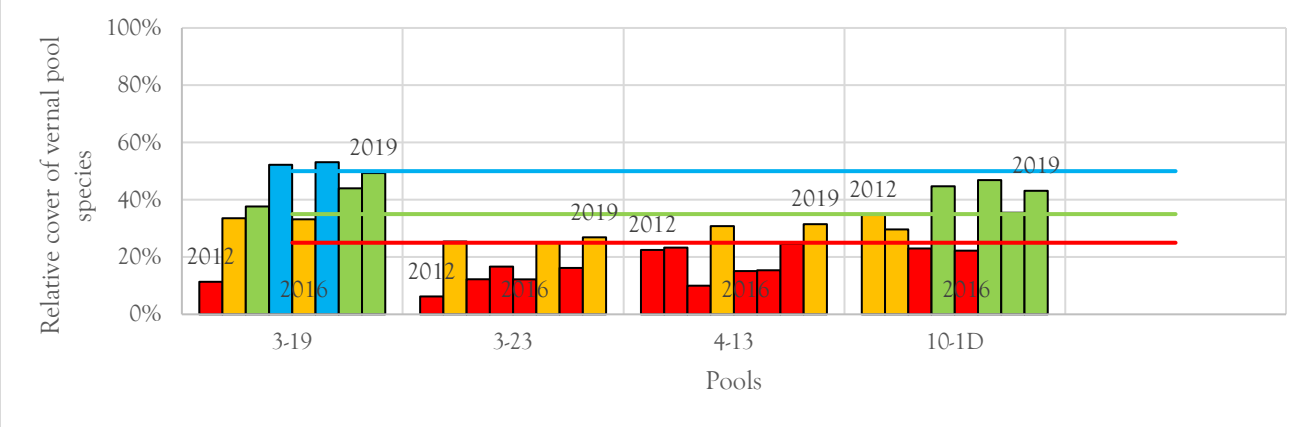


Figure 12. Native species relative cover in viability ranks 2012-2019 for each of the sampled vernal pools. Blue denotes very good status, green denotes good, yellow denotes fair, and red denotes poor. Lines mark the upper boundaries of ranks





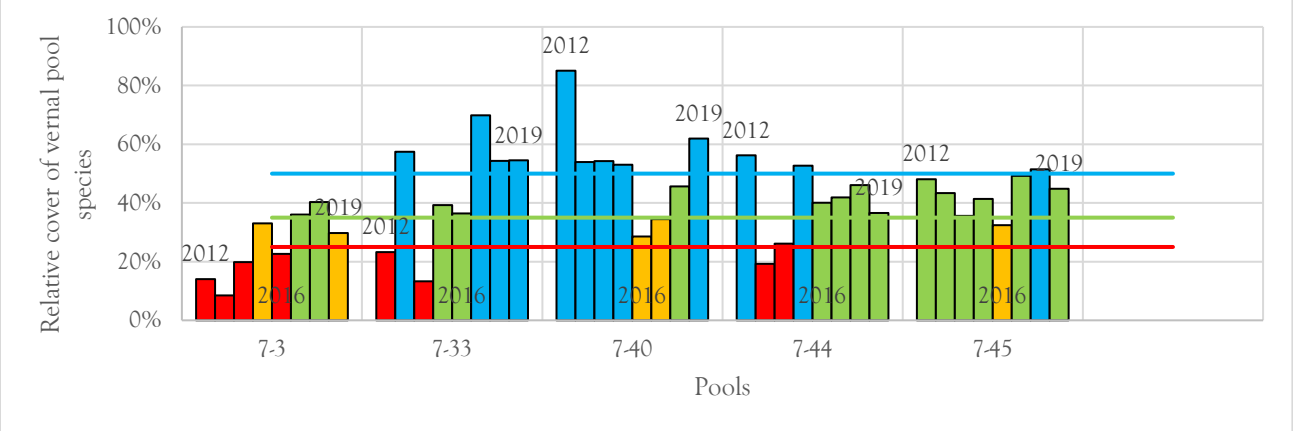


Figure 13. Total CCG absolute cover (acres) in the 19 monitored pools from 2012-2019. **CCG acreage is one of our nested KEA's indicator. Blue denotes very good status, green denotes good, yellow denotes fair, and red denotes poor. Lines mark the upper boundaries of ranks.**

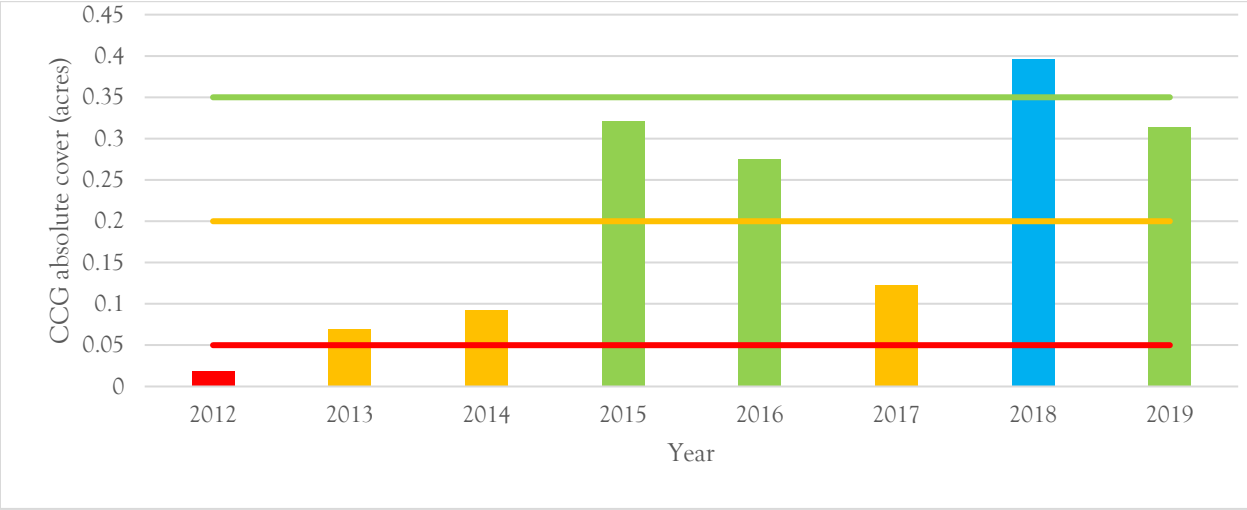


Figure 14. The Ten Most Prevalent Species and CCG Observed within Sampled Warm Springs Vernal Pools in 2019. Relative cover is shown, based on the total acreage of each species across all sampled vernal pools. Native species are shown in green, nonnative forbs are shown in red, and nonnative grasses are shown in orange.

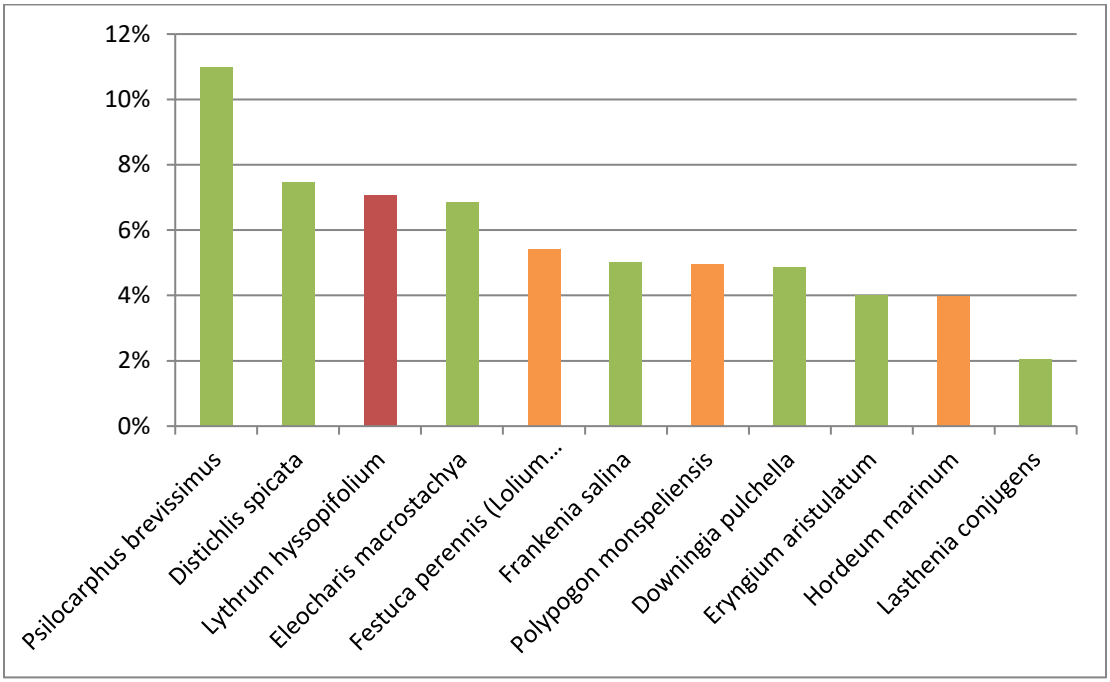
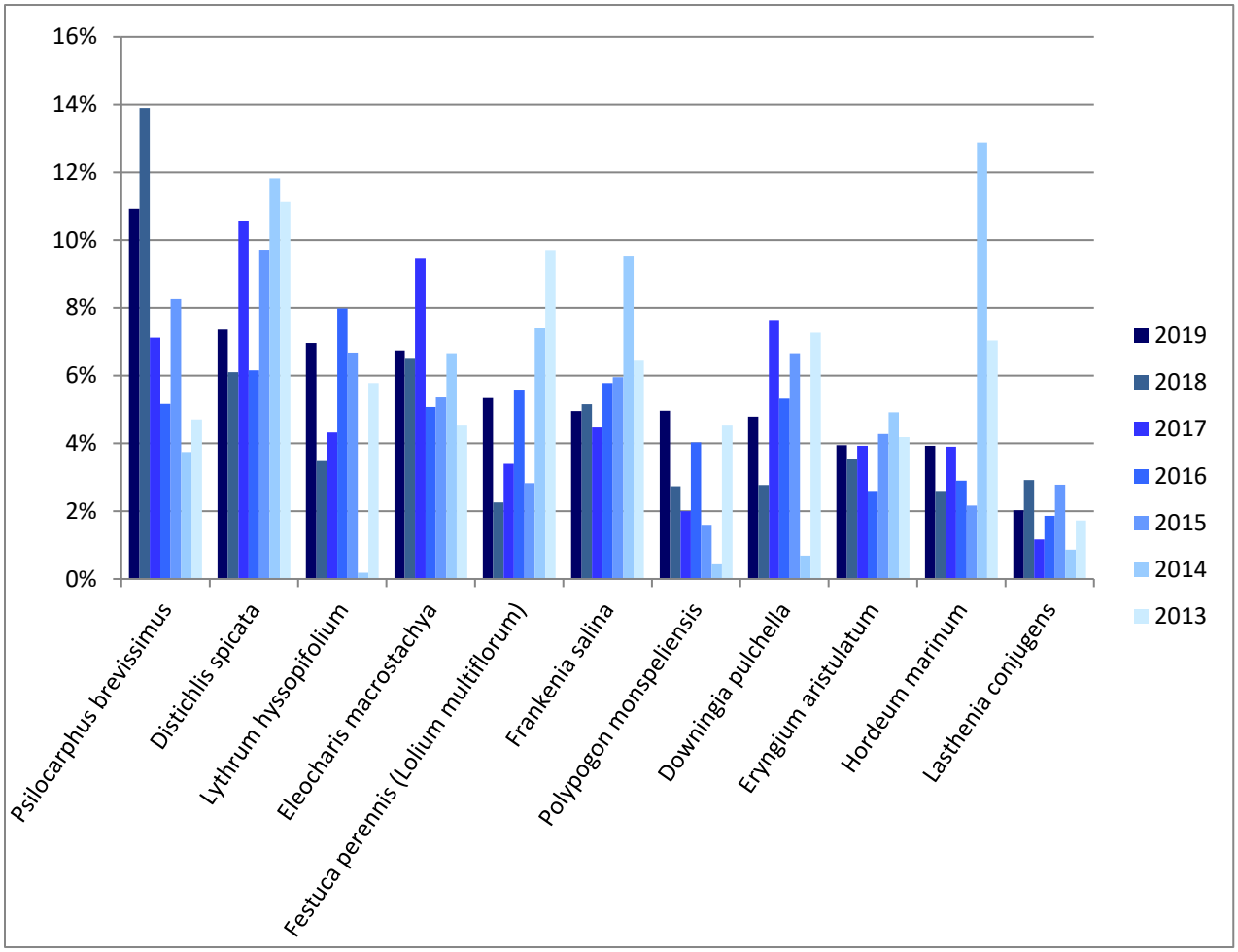


Figure 15. The Ten Most Prevalent Species and CCG Observed within Sampled Warm Springs Vernal Pools in 2013-2019.



4.1.2.1.2 DISCUSSION

Year 2019 was overall a good year in terms of vernal pool vegetation composition. Native species cover continued to dominate this year with mean relative native cover reaching 56% and native vernal pool species cover making up 41% of the pool vegetation. Relative cover of native vernal pool and wetland plant species was chosen as an indicator of the vernal pool grassland ecosystem health during the development of multi-year Work Plan for the San Francisco Bay NWR Complex (Table 2). The values of this attribute in 2019 indicate that overall, our vernal pools are in good shape when it comes to vegetation.

It is also interesting to see where each pool falls within the viability scale (Figure 11). All sampled pools in Pasture 2 are rated as "very good" and are the best in our site regarding dominance of native vernal pool and generally native plants. Most of the pools sampled in Pasture 7 are rated "good" or "very good". The same pattern occurred in 2018. Every year we give priority to accommodate a grazing regime favorable to CCG in Pasture 2 and 7 where the largest populations of CCG occur. Perhaps this can explain in part the better performance of the pools in these Pastures. In addition, all of the pools in Pasture 2 and some in Pasture 7 are natural and not restored so the difference may be an effect of a richer seedbank and more complex micro topography that allows utilization from many native vernal pool species. Because the number of the pools surveyed in each field is very limited, a potential pattern related to grazing and disturbance regime of each pasture may be obscured.

If the surveyed pools were chosen in a random fashion, then we could assume that the average of our indicator for relative cover describes site wide conditions. However, pools were not selected randomly so we should be careful how we interpret this indicator. Because of the above the indicator is summing up the conditions of these specific pools. Due to the high volatility of the indicator and the lack of randomness in the pool sample, it may be more meaningful to take an account of trends for each pool separately and then look for patterns (Figure 12). It is obvious that status in certain pools remain more stable compared with some others. In general it looks like conditions are improving or remaining stable. However there are some pools that look like they are not on the right trajectory. For example pool 1-3, pool 4-13, pool 5-25 and even 6-4A. Investigation of physiographic characteristics, invasive species presence and control, as well as grazing management may be areas to explore. What all these figures (Figure 10-13) suggest is that our indicator may depend heavily on annual weather conditions and therefore it exhibits a high volatility. While this may not be problematic for our management considerations on an annual basis, the fact that our management goal includes only the indicator value for one year (i.e. 2032) may be misleading. Perhaps we should reconsider our indicator value so that it will not depend solely on the annual conditions but will consider a trend or an average similar to the aquatic species indicator but calculated in a meaningful way that considers vernal pool ecology.

Inundation regimes and timing of inundation significantly affect characteristic of the pools such as bare ground and plant community assembly. In 2019, the bare ground value of 47% falls between the 36% observed in 2018, a very dry year, and 61% in 2017, an extremely wet year, when long inundation periods hindered germination of species in the pools. Year 2019 was close to average for total precipitation. Yet, the distribution of the rainfall was atypical with very dry early winter months and very wet spring. This weather pattern may explain the strong presence of grass species in the most dominant species list. Grasses germinate early with minimal moisture requirements while the rains later boosted their growth. This year, Italian rye grass (*Festuca perennis*), Mediterranean barley (*Hordeum marinum*) and Rabitt foot grass (*Polypogon monspeliensis*) were all in the top ten more abundant species list. From the native vernal pool obligate species, wooly marbles (Psilocarphus brevissimus), flatface downingia (*Downingia pulchella*), and button celery (*Eryngium aristulatum*) were in the top 10 list. Salt grass (*Distichlis spicata*) and Alkali heath (*Frankenia salina*), two other wetland natives were included in the top ten list as usual.

Year 2019 was an average year for CCG. Very wet and cool conditions in the early to mid-spring resulted in a late and brief blooming period. Pools with the strongest presence of CCG were the pools in Pasture 2. In Pasture 7, they were less dense. In 2019, CCG ranked the 14th most prevalent species based on measures of the relative cover for all pools.

For a second year in the row, wooly marbles (*Psilocarphus brevissimus*) was the most prevalent plant species. This species is consistently in the top ten species list but in the last two years it is notably more abundant. In natural pools where it seems to have the highest cover values, it grows in dense blanket-like blooms which are very resilient to weeds. The *Trifolium* genus had also very strong presence this year, although they did not record high cover values because most of them had senesced by the time of the surveys. However, the botanist was able to see a lot of species and high abundance earlier in April during the pool and grazing conditions checks. Four native species *T. barbigerum, T. fucatum, T. depauperatum* and the once considered extirpated from the area *T. hydrophilum* were spotted in many pools. The wet spring weather must have favored their wide distribution and strong presence.

Finally, Hyssop loosestrife (*Lythrum hyssopifolia*) was the most prevalent nonnative species in 2019. This species has been appearing in the top ten species list very often in recent years, especially in years with less inundation. It is a species native to the Mediterranean region vernal pools and certain years appears to be more abundant. However, it is very difficult to control because it grows side by side at the same time with native species, so treating could potentially harm the natives as well. We have not attempted any control of this species.

4.1.2.2 CONTRA COSTA GOLDFIELDS EXCLOSURE STUDY

4.1.2.2.1 RESULTS

The current Contra Costa goldfields exclosure plot locations were established in fall 2018. In spring 2018, we selected paired plots that were very similar in species composition and general habitat conditions, in order to observe how the paired plots deviate from one another in future years based on whether they were grazed or ungrazed. Each pair was located in the same pool. Monitoring of these plots occurred on May 1st and May 2nd 2019. Monitoring of the exclosures in 2019 took place about 6 months after installation of the exclosures. We call this the first year of monitoring the exclosures after installation. Year 2018 baseline (before fencing installed) and year 2019 data are presented in Figure 16 for each plot and assigned treatment. Selected 2019 monitoring data is presented in Figures 17 and 18. Photographs of the plots are shown in Figure 19.

Figure 16. Baseline (aka before fence installation) and first year of grazing exclosure installation percent cover data for Contra Costa goldfields in four paired plots. The four pair plots were selected in 2018 with similar cover for CCG and for each pair, one plot was randomly selected to receive grazing exclosure treatment. The presented data for 2018 (in blue bars) is all from open plots. Grazing exclusion treatment was applied later in fall. 2019 data is presented in red.

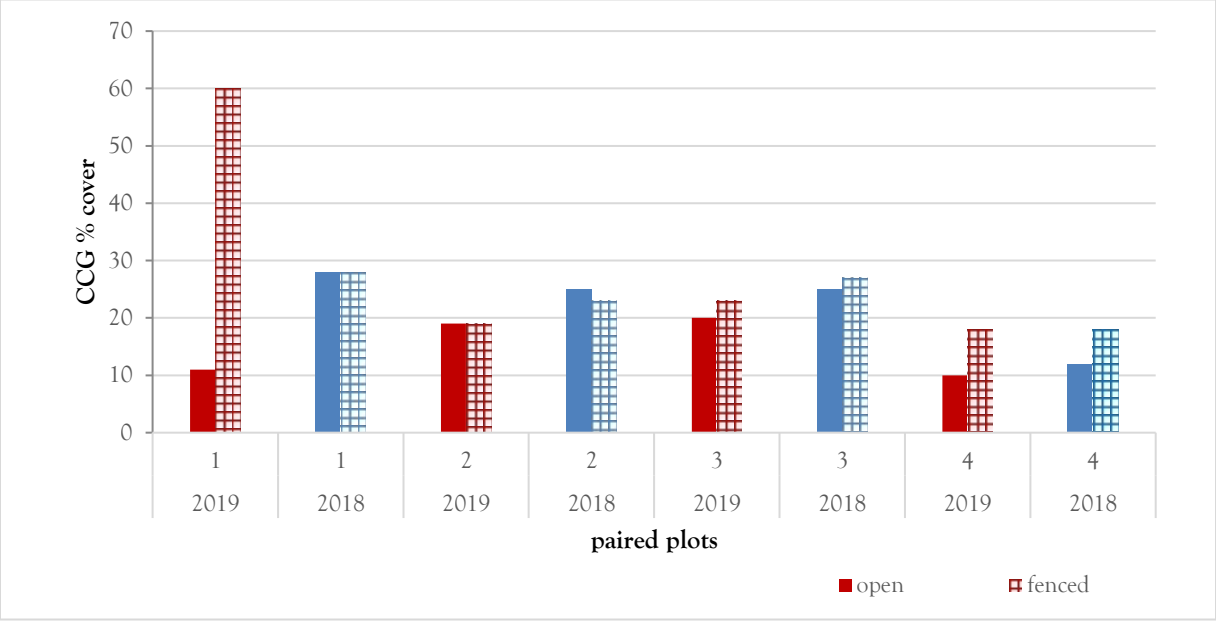


Figure 17. Percent Cover of Vegetation Types in 2019 Contra Costa Goldfields Exclosure Study

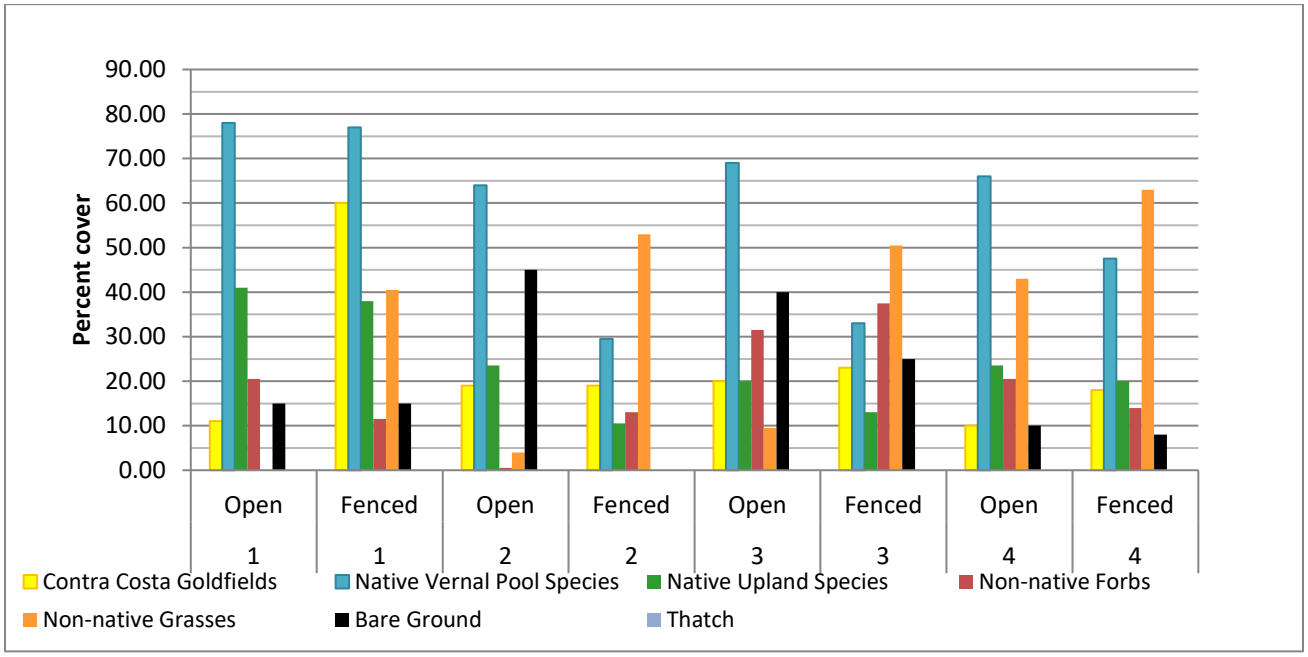


Figure 18. Species Richness in 2019 Contra Costa Goldfields grazed and unglazed plots

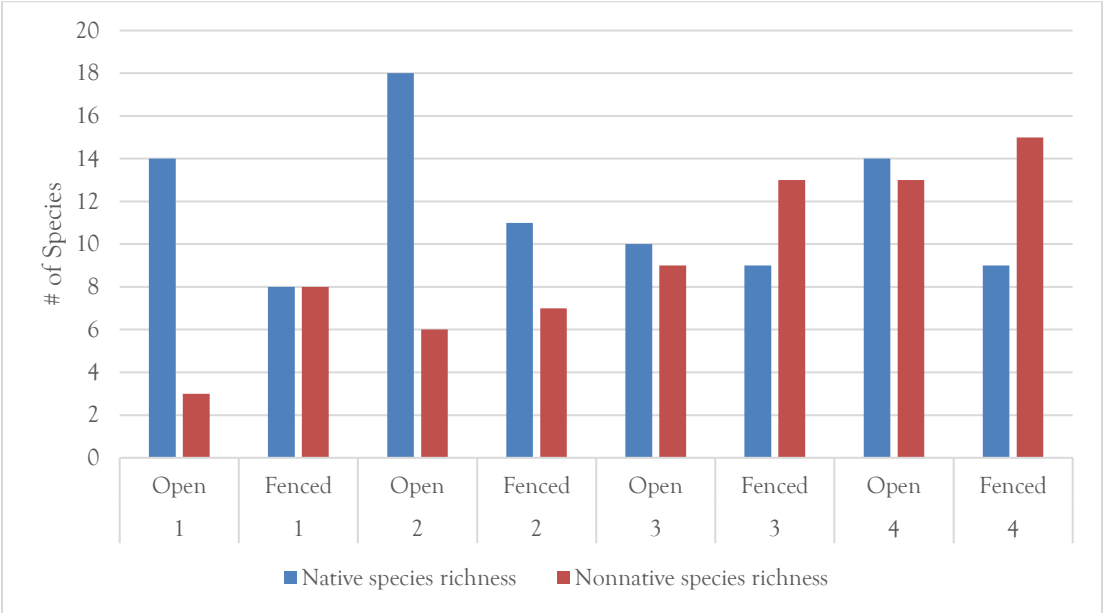


Figure 19. 2018 Photos from Contra Costa Goldfield Exclosure Study.



Exclosure 1 Fenced (ungrazed)



Exclosure 1 Open (grazed)



Exclosure 2 Fenced (ungrazed)



Exclosure 2 Open (grazed)



Exclosure 3 Fenced (ungrazed)



Exclosure 3 Open (grazed)



Exclosure 4 Fenced (ungrazed)



Exclosure 4 Open (grazed)

4.1.2.2.2 DISCUSSION

CCG absolute cover was generally higher in fenced plots than in open plots. Because all, fenced and open plots were grazed six months before the survey, we did not anticipate to see any pronounced difference between the two treatments. However, this year, in average, we saw that CCG cover was higher in the ungrazed exclosure plots than in the open plots. This effect is completely reverse from what we typically record, which is greater CCG cover in the open plots than in the exclosures with exception of a similar trend observed for the set of exclosures in 2004, again the first year after excluding grazing. For the 2019 data it is notable that one exclosure in particular had CCG cover more than six times higher than the open plot, even if in 2018 baseline data looks very similar for CCG in the pair of plots. The rest of the exclosures do not show this pronounced difference, but they do not contradict the trend either.

Several factors may explain this trend. First, the irregular weather pattern in 2019, with the wet season arriving rather late and with high precipitation in spring, created rather wet conditions in the pools until May. From our experience and data, CCG perform better in years when pools dry in early spring. At Warm Springs, they also tend to occupy the shallower areas of the pools. Whereas fenced plots had grasses growing in spring along with CCG, the grazed open plots had less grass and more bare ground. Therefore fenced plots might have been drier than the open plots due to increased absorbance of water by the grasses. Of course, the fenced plots were well grazed six months ago and fencing was followed by a very dry fall and early winter that resulted in a moderate or limited grass growth. For this reason, negative factors associated with cessation of grazing, such as thatch and increased competition for light did not have a significant role in the fenced plots. Perhaps, all these together resulted to this trend.

The other potential explanation is that indeed grazing stressed the growth of CCG, particularly in Pasture 2 where the trend was more noticeable. We noticed that the plots excluded from grazing

were having a lot of CCG seedlings growing earlier than the open plots, while the cows were still grazing in the Pasture 2. Research has shown that CCG may germinate readily even with the first rains of the season in fall (Collinge et al. 2003) but do not begin rapid stem growth until the pools drain down, typically in early spring. Our rationale of allowing cows to graze in the fields with CCG in late winter and early spring is to control the grass growth, which during that time of the year may outcompete CCG. The assumption here is that cattle prefer grazing on grasses, which are typically ample this time of the year and therefore they will not graze in the pools, which are dominated by forbs. This is indeed what we have observed in the field. However, in years with precipitation patterns that result in limited fall grass growth and therefore limited forage availability for the following winter months, cows may be attracted more to the pools which may be greener since they are able to hold more moisture. If the few rains in the winter months were sufficient enough for the CCG to germinate and since until mid-February the pools were generally dry, then cows may have browsed the fresh CCG seedlings directly or because of the low grass availability in the uplands, they spent more time browsing in the pools and ended up trampling a lot of the CCG seedlings. Because we assess fields on a monthly basis, it is very unlikely that we would not have detected CCG seedlings at an advanced stage in which case we would have asked the rancher to move the cows sooner. Of course, if seedlings were browsed before budding, then it is possible that they were not detected.

If any of the above scenarios is real, then perhaps in order to assure minimum negative impacts and maximum cover potential for CCG, we should consider modifying grazing schemes based on potential winter growth of annual grasses. It is well documented that variation in forage production depends heavily on weather pattern, especially precipitation distribution and temperature (Beccheti et al. 2016). Wet and warm fall may result in increased annual grass growth while dry fall or wet and cold fall will result in extremely limited annual grass growth in winter. Perhaps these years we should modify the grazing schedule and avoid grazing in late winter and early spring but graze them later after the onset of the spring growth. Alternatively, we could consider lower animal units (AU) for these months.

Whereas CCG is an endangered species and part of our mission is to work towards its recovery, we have to carefully fine tune our management tools, such as grazing, to ensure that the whole vernal pool plant community will benefit. For example it is clear from our data that both, native vernal pool species cover (Figure 17) and native species richness (Figure 18) were higher in open plots. Clearly the natives over all were benefited by grazing. A greater native species cover means more resistance to nonnatives and indicates a more sustainable community.

The consistency in finding much lower cover of native grasses in open plots than in the fenced plots it is also very indicative of the grazing effectiveness to control nonnative annual grasses. A community dominated by nonnative annual grasses would be inhospitable to the CCG as well. Therefore, any alternative grazing prescription should be monitored very carefully to ensure

conservation of a sustainable community and not one year benefit to one species. Additional data from the exclosures in the following years will assist in our interpretation of this year's data.

4.2 SUMMER VEGETATION SURVEY

During the NRMP development, we identified that site-wide vegetation composition and structure are key ecological attributes for the vernal pool grassland ecosystem and that absolute cover of native species is an indicator whose values may be used to assess its health (Table 3). Based on this reasoning we developed ranks of the absolute cover of natives on which we applied a scale (i.e. poor, fair, good, very good) and a management goal to achieve:
"By 2032, absolute native plant species cover increase to ≥50% in 4 pastures and ≥20% in 4 additional pastures at the Warm Springs Unit of Don Edwards San Francisco Bay NWR." Species richness was another indicator and its values allows us to assess another management goal: In the 7 year period between 2020 and 2026 at Warms Spring Unit maintain or increase the number of native plant species that were found during the period of 2013-2019 data of summer vegetation surveys.

We also identified that invasive species spread is one of the highest threats to the vernal pool grassland integrity and that their distribution and abundance have to be controlled in order to meet the management goals we set. Specifically, one associated objective is to "Annually maintain/reduce invasive plants (excluding grasses) on Warm Springs Unit to less than 30 percent cover". Goal assessment evaluation is based on data produced by the summer vegetation survey.

In this report we call invasive the weeds of major concern at Warm Springs. These include: perennial pepperweed (*Lepidium latifolium*), black mustard (*Brassica nigra*), stinkwort (*Dittrichia graveolens*), hoary cress (*Lepidium draba/chalepense*), Italian thistle (*Carduus pycnocephalus*), purple starthistle (*Centaurea calcitrapa*), alkali Russian thistle (*Salsola soda*), and five hook bassia (*Bassia hyssopifolia*). Invasive forbs within Warm Springs with limited distribution due to prompt eradication efforts include yellow starthistle (*Centaurium solstitialis*) and Russian knapweed (*Acroptilon repens*).

The Summer Vegetation Survey is conducted annually to assess site wide vegetation conditions. The survey methodology draws from the methodology of the "Invasive Species Survey", a survey used until 2016 focused on documenting invasive species. Even if the focus was on invasive species, the survey recorded cover values for all species native and nonnative for over five years. For the reason we wanted to allow detection of long term trends, we decided to retain the basic methodology. However, we made small changes in the monitoring methodology to increase the data resolution. These changes are described below in Section 4.2.1.

In the process of the NRMP development, we identified that we can combine the quantitative monitoring of invasive species with the assessment of site wide vegetation conditions through the summer vegetation survey. In other words, we are using data collected during the summer vegetation survey to evaluate success of our invasive species control strategy and to check if the associated objectives are met. This approach, not only saves time and resources, but it can detect long term trends. However, for the short term invasive weed management, we use other qualitative methods to assess infestation, target areas for treatment, and identify best timing for treatment. These are discussed in section 4.3.

4.2.1 MONITORING METHODOLOGY

The Summer Vegetation Survey utilizes a long transect sampling approach throughout Warm Springs (Figure 20). The same approach has been used since 2013 (and prior to that in Pastures 1, 2, and 10 since 2003). The transects should be monitored annually in June, when cover of the most important invasive plants is close to highest and most other species can be detected and identified (i.e. grasses still hold their seedheads, spring forbs are still present even if they are dry etc.). Figure 17 shows the summer vegetation transects that traverse all suitable pastures within Warm Springs. The transects are spaced approximately 100 meters apart with a permanent set of data collection points at 100-meter intervals along each transect. At each data point, the cover of all species within a 6-meter radius is estimated according to the cover classes listed in Table 11. If one of the target invasive species can be seen nearby but it is outside the 6-meter radius plot, then this species' presence is recorded without assigning a cover estimate. In addition, the absolute percentage of bare ground, fecal material, and thatch in the plot are recorded.

As mentioned in the previous section, the summer vegetation survey uses modified protocols of the previously used Invasive Species Survey. Aside from the slight shift in the timing of the survey, which moved to mid-June from late June/early July, the main modification is that the cover classes increased in number and narrowed in width so that they can provide higher resolution data. The new vegetation classes are set in a way that allows transforming them back to the old classes and thus allowing for comparisons among long term data. Both the old and the new classes are reported in Table 11.

In terms of data analysis, since 2018, we use the new classes to describe the vegetation conditions. For comparisons among years and multi-year trends, we convert data to the old classes and/or we use distribution data (aka percentage of occurrence data showing presence of a species in number of plots).

We should note that quantitative assessment is only part of the invasive species monitoring at Warm Springs, which also includes focused qualitative surveys to locate and map invasive species

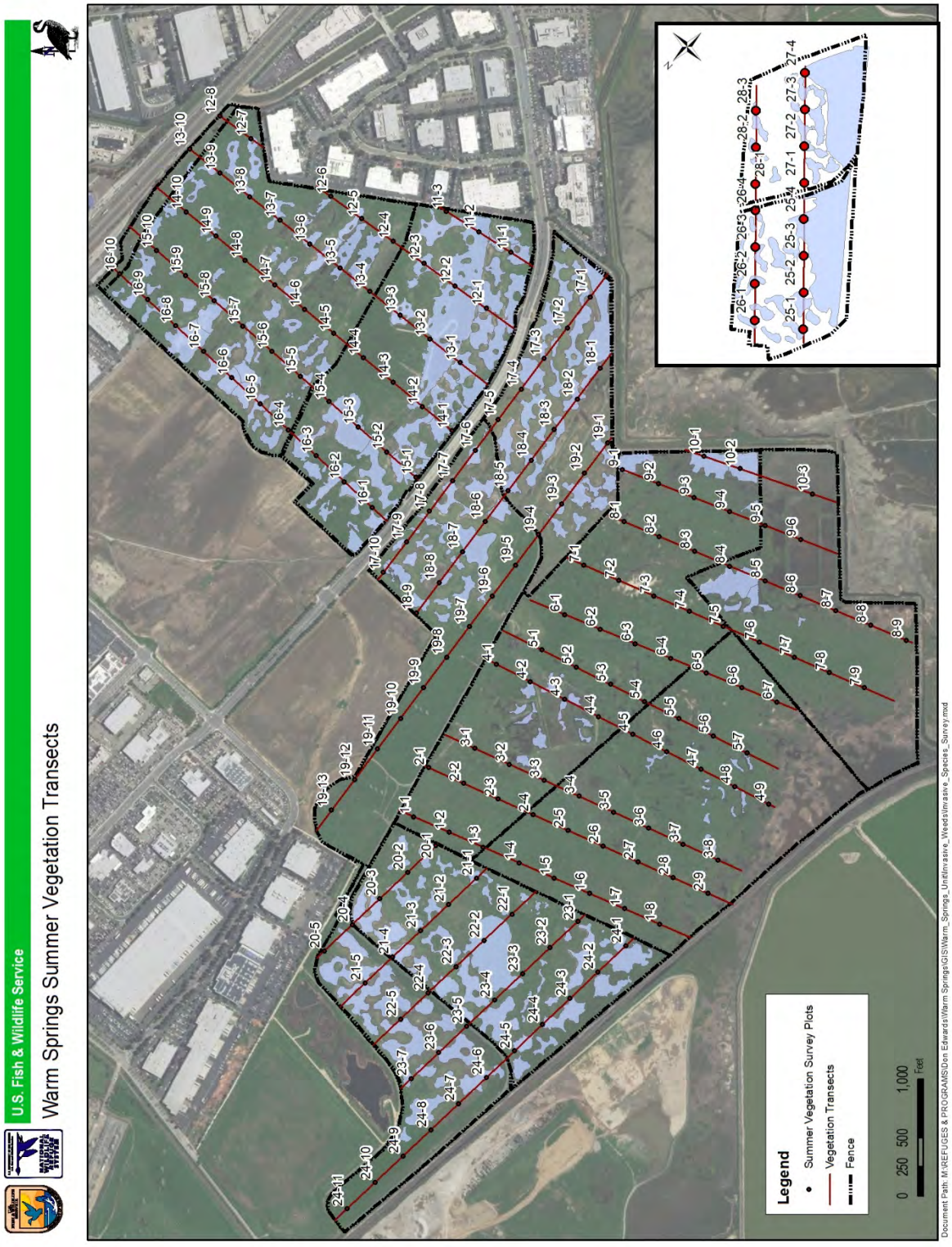
and incidental observations throughout the year. Incidental observations may also identify new infestation areas or species of concern. The purpose of focused qualitative surveys is to provide up to date information for efficient weed control.

Specifically, qualitative surveys seek to build on existing maps of invasive plant populations, which may expand, contract, grow more or less dense, or remain stable. New populations of invasive plants should also be noted. Qualitative data collection may be done during dedicated site visits, or may be done through incidental observations during other management and monitoring activities. It should be noted that in order to increase efficiency and due to shortage of time and personnel, qualitative surveys may focus on parts of Warm Springs, usually where management needs are greater or where more than one tool or strategy are needed. Consequently the products of the qualitative surveys cannot be used to describe or compare conditions in the whole Warm Springs Unit.

Table 11. Cover classes for estimating canopy cover of invasive vegetation.

Old Cover Class	Old class cover values	New Cover Class	New class cover values
0	Absent (not occurring in plot)	0	
1	Occasional (<5% scattered individuals)	1	<1%
		2	1%-4.99%
2	Common (5-30% cover)	3	5%-14.99%
		4	15%-30%
3	Dominant (>30% cover)	5	30%-60%
		6	>60%
N (4)	Used for target species to denote that a species occurs nearby but outside the 6-m radius		

Figure 20. Summer Vegetation Monitoring Transects at Warm Springs.



4.2.2 2019 MONITORING RESULTS

We conducted the 2019 summer vegetation survey between June 13 and June 27. The survey detected a total of 103 plant species, 40 of them native (Figure 21). Species richness varied across the ten pastures with the greatest number of native species recorded in Pasture 2 (24 species) and the greatest overall number of species in Pasture 1 (57 species) (Figure 21). Year 2019 was the 7th year of collecting data on summer vegetation (previously called invasive species surveys). According to the NRMP, one of our management goals at Warms Springs Unit is in the 7 year period between 2020 and 2026, to maintain or increase the number of native plant species that were found during the period of 2013-2019 data of summer vegetation surveys (aka invasive species surveys). Figure 22 shows that 54 native species were detected by the summer vegetation survey between 2013 and 2019 at Warm Springs. The list of species are presented in Appendix II.

Regarding the vegetative cover composition (Figure 23), it is clear that nonnative annual grasses dominate in the landscape. Compared to the 2018 results, in 2019, annual nonnative grasses had an increase in cover by 12%. For the rest of the types of vegetative cover, a small increase was detected in the cover of native forbs (by 4%) and grasses (by 3%). Nonnative forb cover increased by 1%. Bare ground declined by 8%. Nonnative grasses was the dominant vegetative group in all pastures (Figure 24) while the rest of vegetative groups varied among pastures. Native grasses were found in different proportions among pastures and they had their highest cover in Pastures 1, 2, 3, and 7. Native forbs had highest values by far in Pasture 2 but Pastures 1, 3, 6 and 10 also had relatively high values. Overall, the same pattern was observed in 2018.

The absolute cover of native plants, which is used for evaluation of habitat conditions and management goals, is presented in Figure 23 for all Pastures. The percentage of plots within each rank of the viability analysis for each Pasture is shown in Figure 26. Our goal, set for 2032, is to have at least four Pastures with native cover exceeding 50% and another four Pastures with native cover over 20%. While this year we did not meet the goal since we had two pastures meeting the over 50% native cover standard, five pastures over 20% and two pastures under 20% native cover (Figure 25). We saw improved conditions over 2018. In fact, except in Pastures 5 and 8, there was an increase in native cover from last year (Figure 27).

Figure 28 presents native species cover spatial distribution. The average site-wide value of absolute native plant cover reached 30% which according to the viability analysis scale is deemed “fair”.

The majority of site-wide dominant species (in absolute cover) included mostly grasses, with *Frankenia and Centromadia pungens,* as the only forb representatives in the top ten dominant species by absolute cover (Figure 27). Most of the top 10 dominant species were also the most widely distributed (frequency of occurrence) but there were some shifts. Specifically, while curly dock

(*Rumex crispus*) and *Juncus bufonius* did not make it to the top-ten most dominant by cover, they are included in the top-ten of the most common by frequency of occurrence list (Figure 28). Conversely, Bermuda grass (*Cynodon dactylon*) and *Polypogon maritimous* , both included in the top-ten by absolute cover list, are not included in the top-ten of the most common by frequency of occurrence list, shown that these species, although high in cover are not widespread.

Figure 21. Species richness recorded during the Summer Vegetation Survey at Warm Springs Unit in 2019.

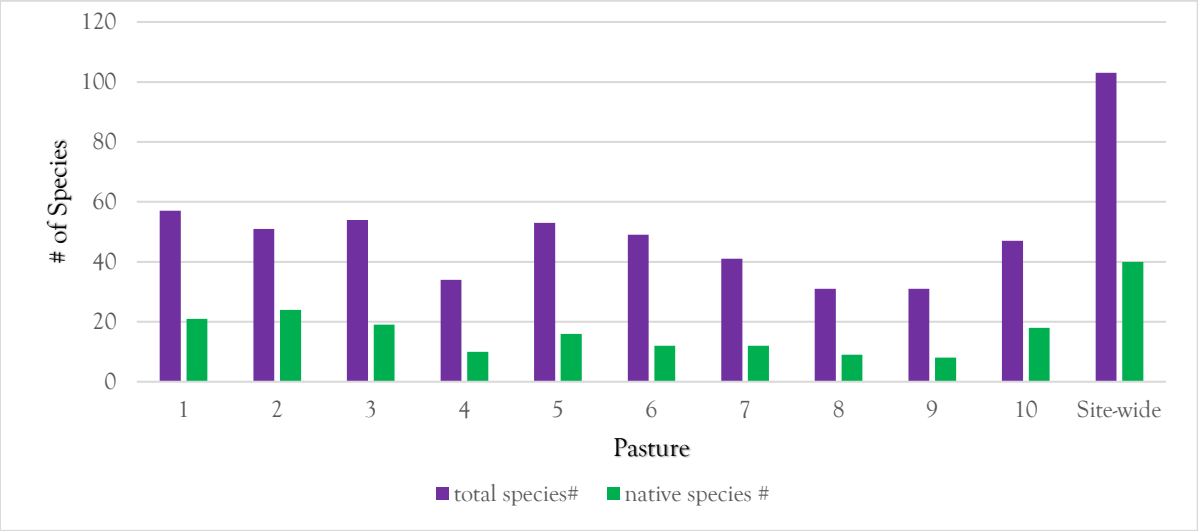


Figure 22. Species number recorded in seven year period (2013-2017).

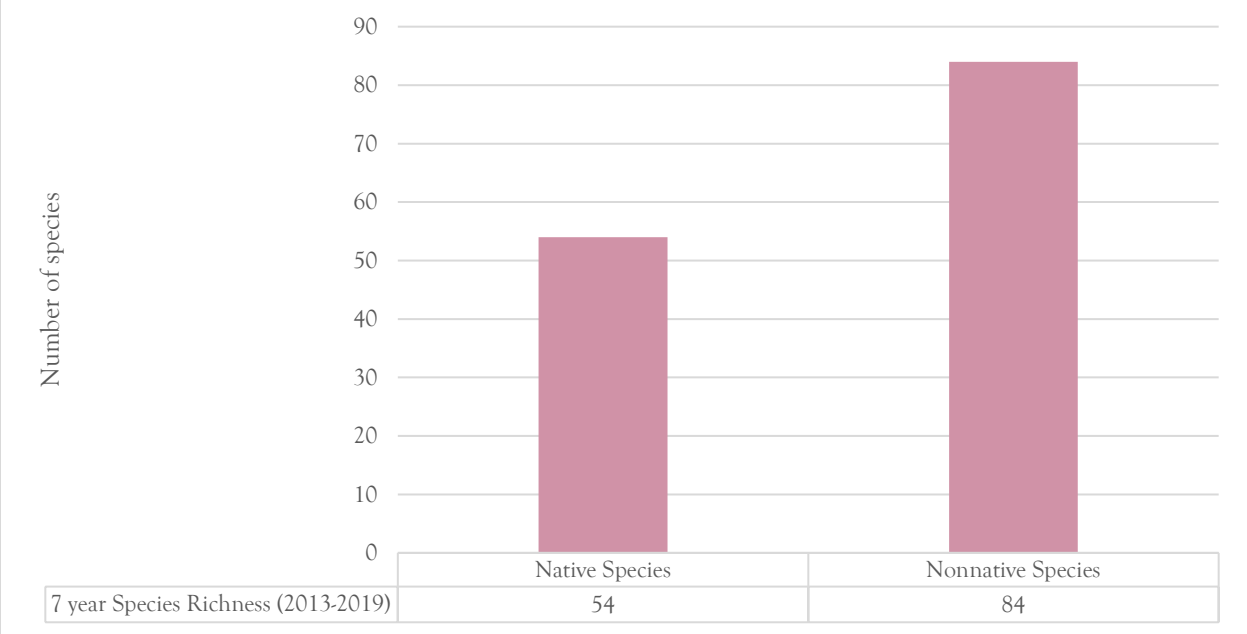
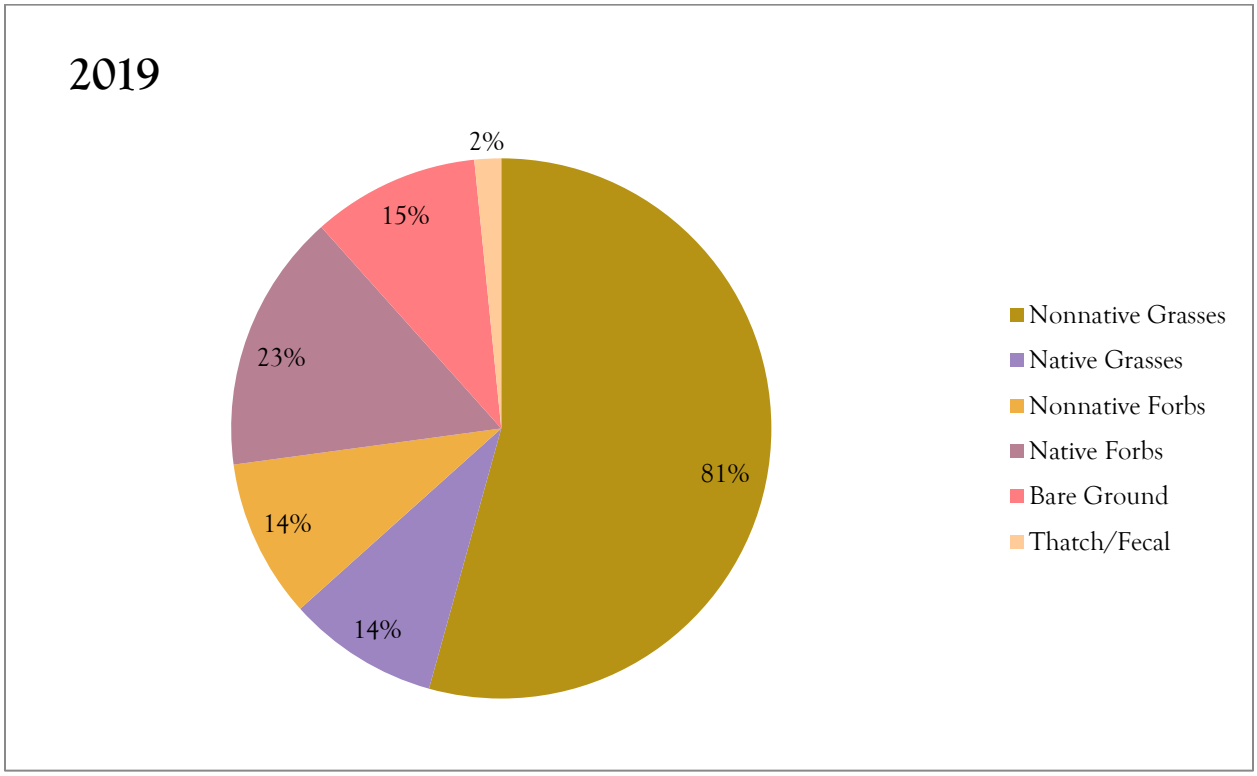


Figure 23. 2019 Average cover of vegetative types based on the Summer Transect Survey. 2018 values are shown for comparison.



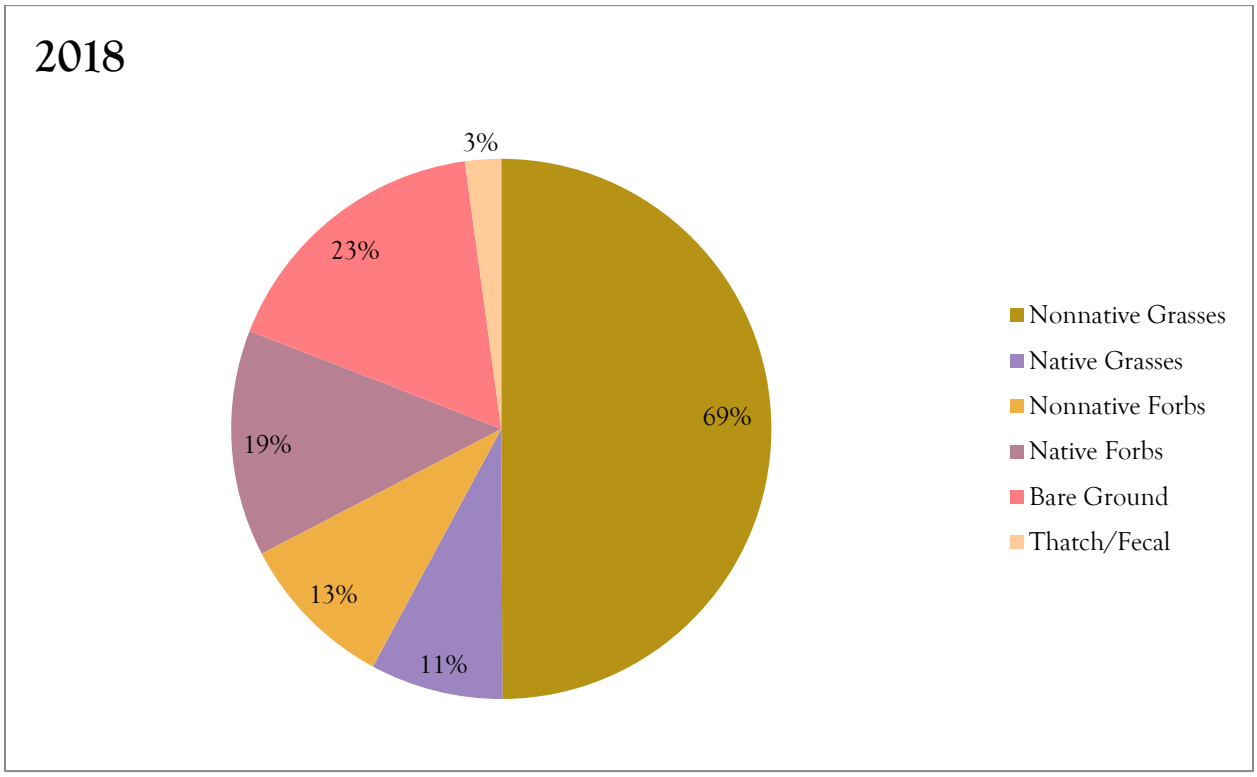


Figure 24. Distribution of vegetative types across pastures in 2019. Values reflect the sum of all species average absolute cover. Therefore, some groups cover may be higher than 100% because several species in the vegetative group overlap in plots. The same effect may be due to the assignment of each class midpoint as the percent value of cover rather than the exact absolute cover of each species.

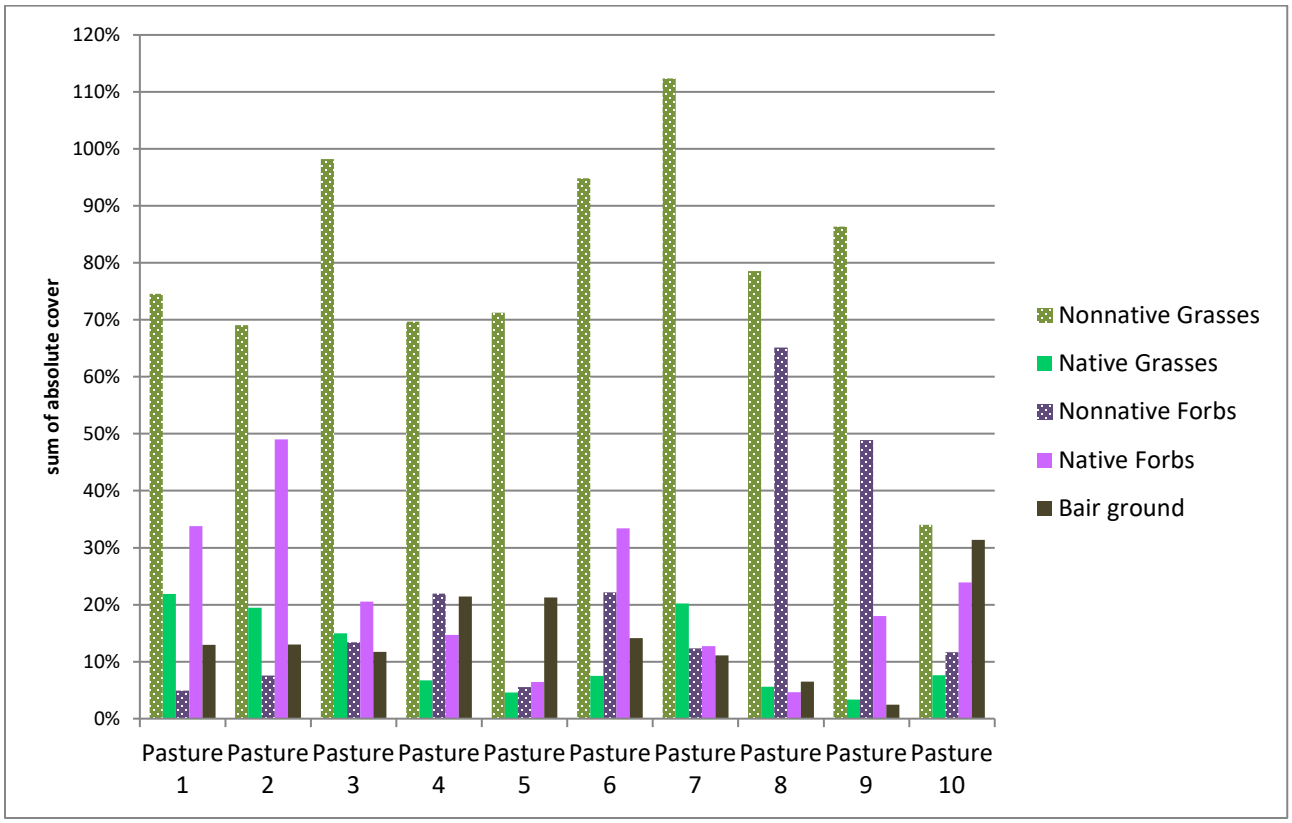


Figure 25. Native species absolute % cover per Pasture at Warm Springs in 2019. Green bars denote good conditions, yellow bars denote fair and red bars denote poor conditions based on the scale developed for the indicator of vegetation composition and structure.

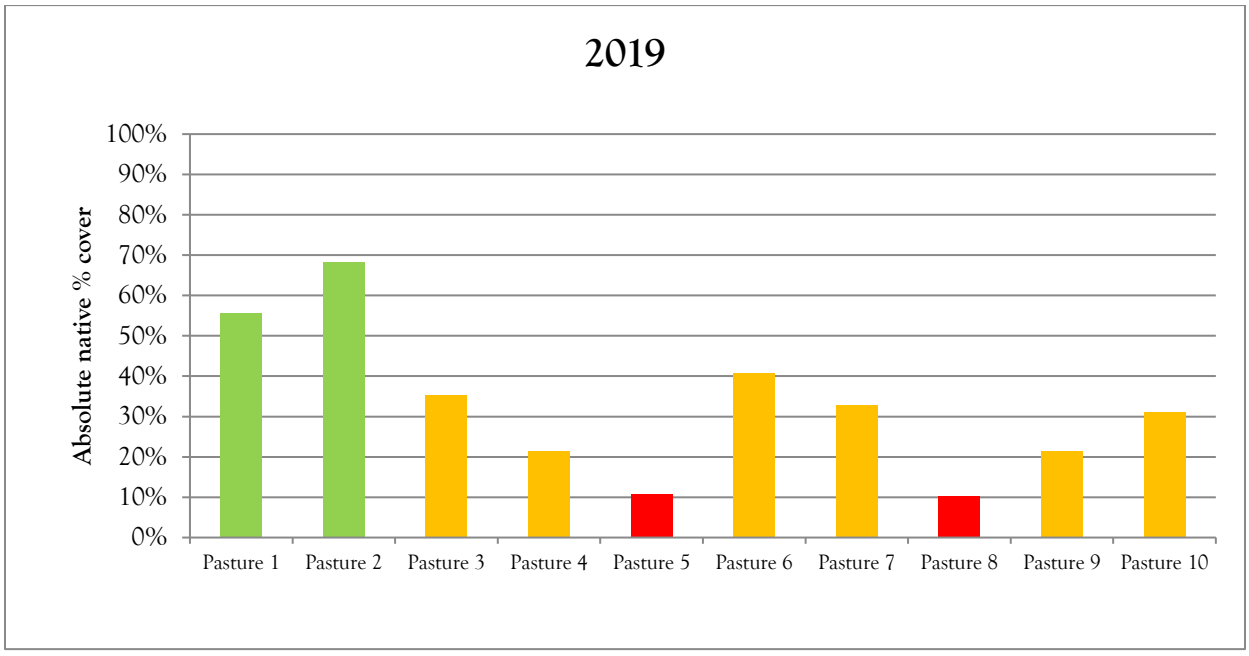


Figure 26. Distribution of plots ranked in the four viability analysis categories across the ten Pastures.

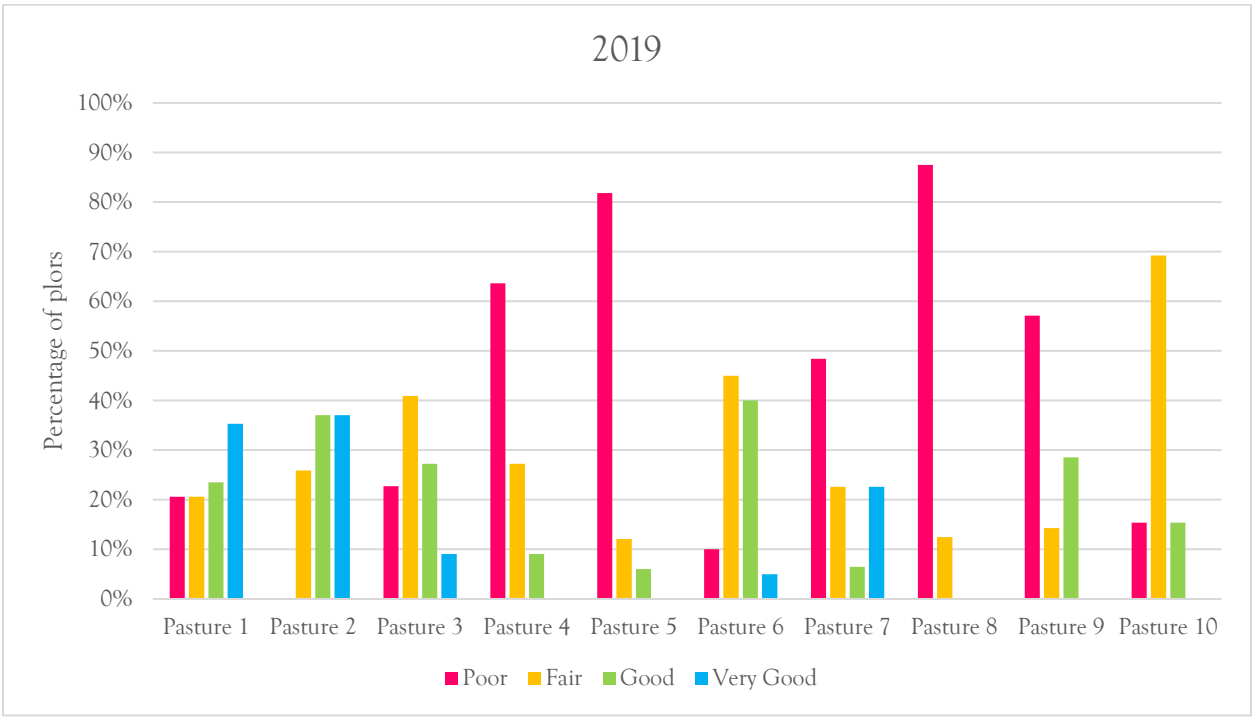


Figure 27. Native species absolute cover per pastures in Warm Springs for the years 2017-2019. Green bars denote good conditions, yellow bars denote fair and red bars denote poor conditions based on the scale developed for the indicator of vegetation composition and structure. Blue, green, and yellow lines represent respectively the lower boundaries of the "very good", "good", and "fair" categories.

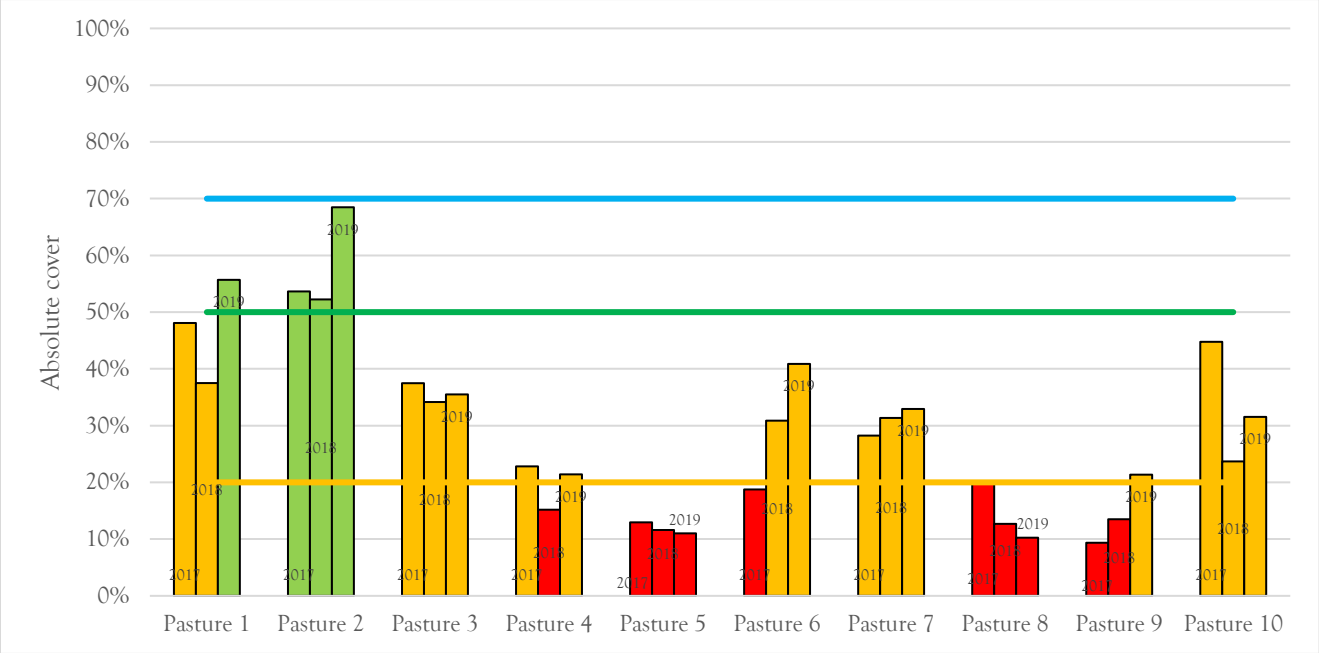


Figure 28. Native plant species absolute cover variation based on 2019 Summer Vegetation Survey data

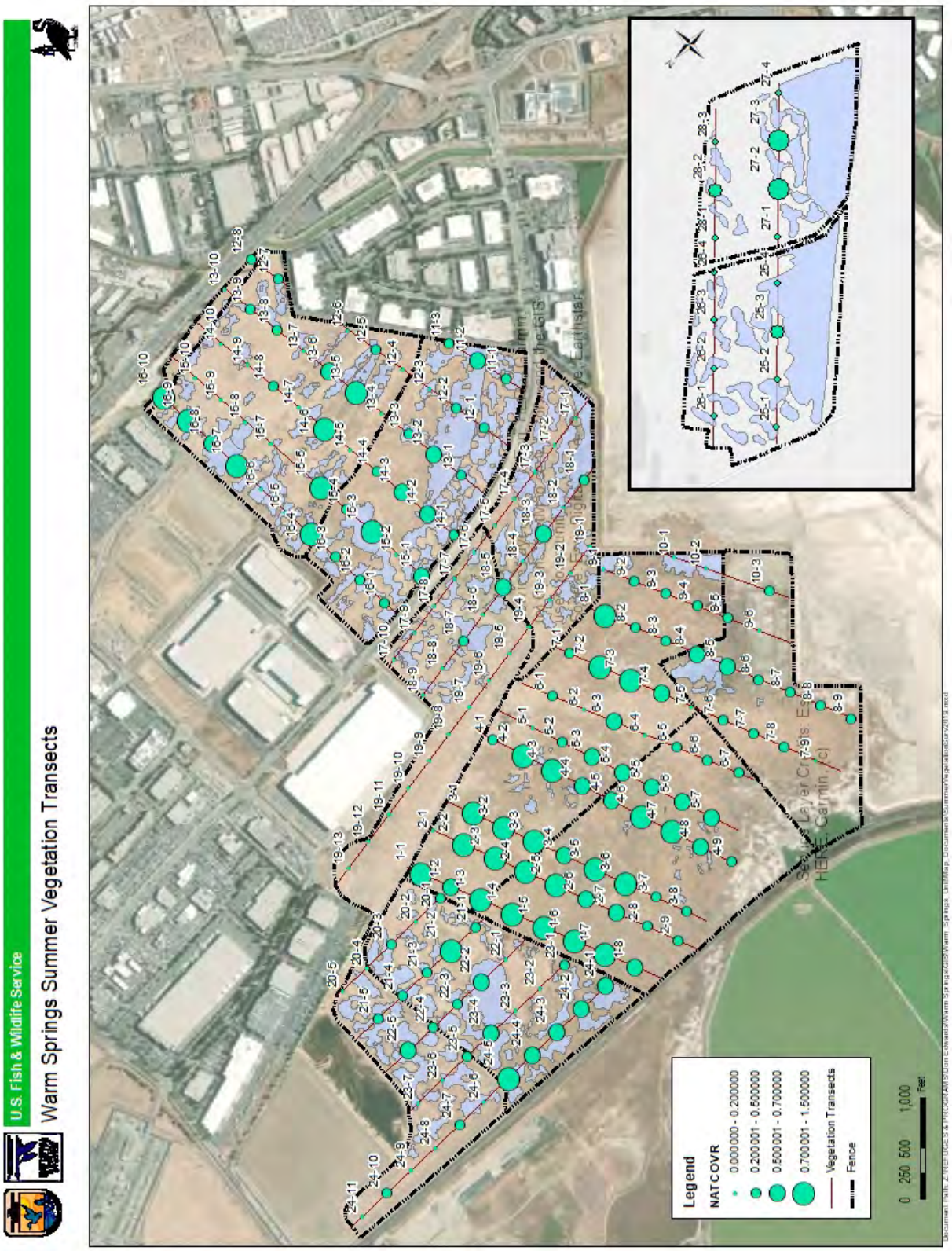


Figure 29. Average absolute cover for the ten most dominant by cover species in 2019

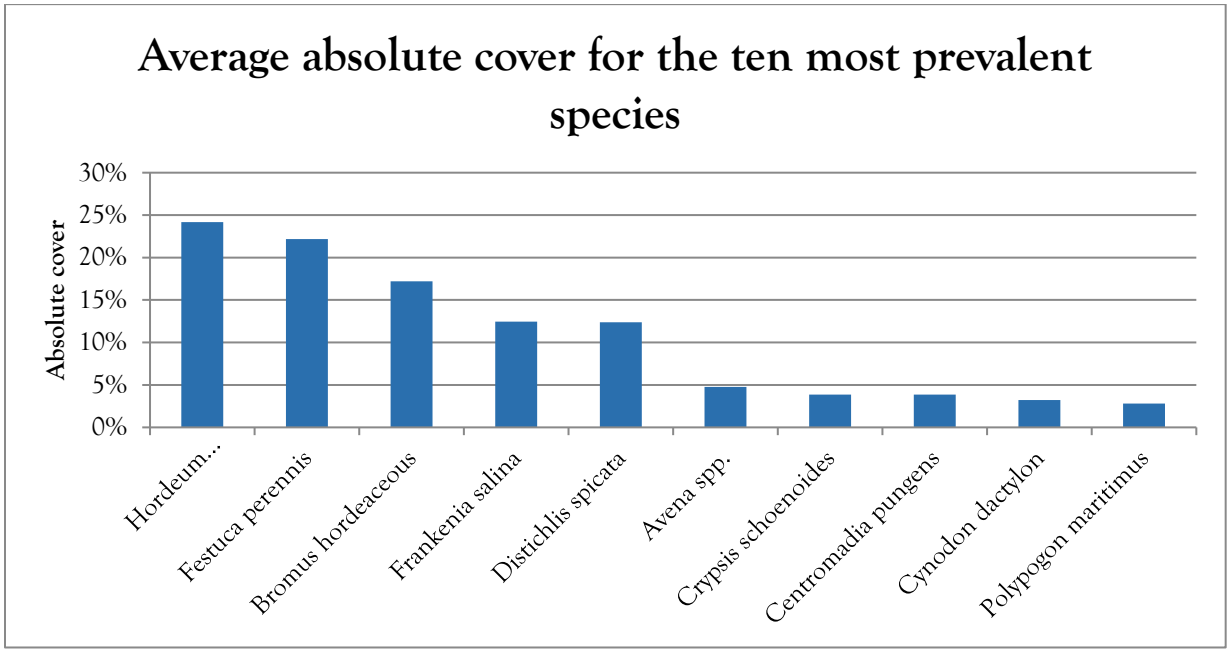
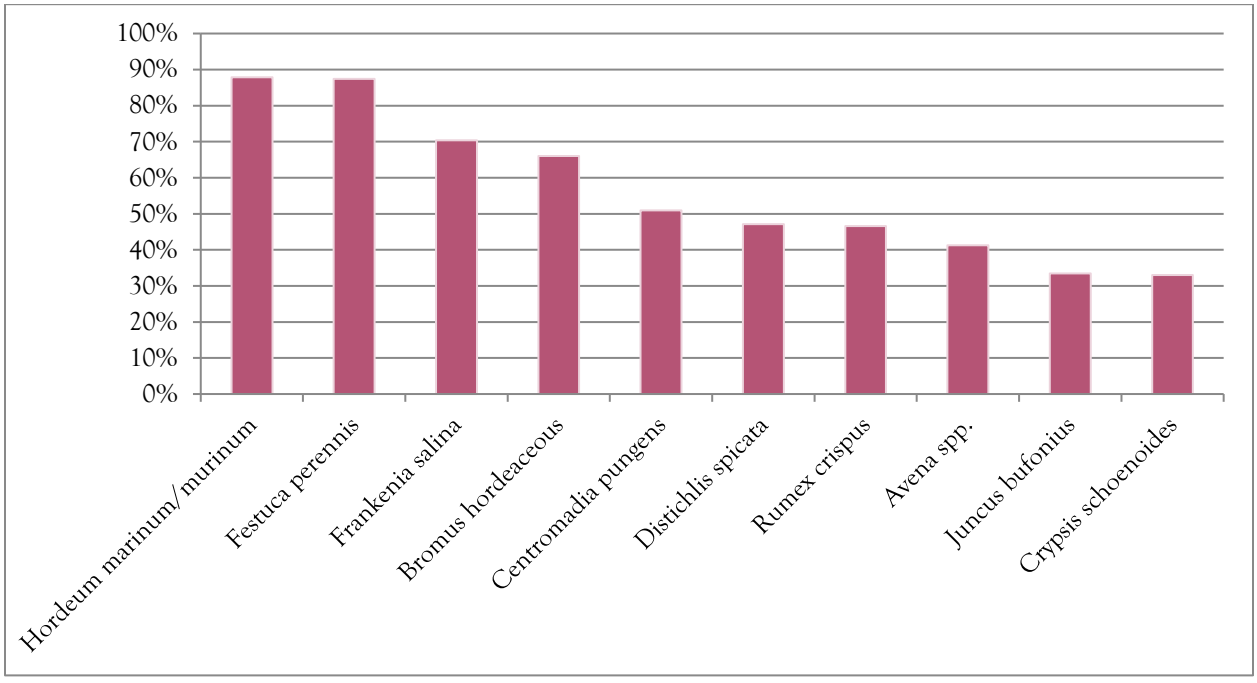


Figure 30. Percentage of occurrence across all plots for the ten most common by distribution species



The five most dominant grass species/species groups by absolute cover (Figures 29) and by frequency of occurrence (Figure 30) were *Hordeum marinum/murinum*, *Fesuca perrenis*, *Bromus hordeaceous*, *Distichlis spicata* and *Avena* sp. Figure 31 shows the top five nonnative grass species by a) site-wide average absolute cover, b) site-wide distribution and c) their absolute cover across fields. Three native species of grass were recorded during the Summer Vegetation Survey in 2019 (Figure32 a). *Distichlis spicata* was the highest in absolute cover and also the one with the widest distribution followed by *Elymus triticoides* (Figure 32 b). *Stipa pulchra* had very limited distribution only found in one plot in Pasture 10 and one plot in Pasture 1. Absolute cover of the three native grass species across the ten pastures is shown in Figure 32 c.

The five most dominant forb species/species groups by absolute cover (Figures 33) and by order of magnitude were *Frankenia salina*, *Centromadia pungens*, *Lotus corniculatus*, *Plantago coronopus*, and *Helminthotheca echioides*. The top five species list based on how widespread species were in the site (by frequency of occurrence) included *Frankenia salina*, *Centromadia pungens*, *Rumex crispus*, *Juncus bufonious*, and *Brassica nigra*. (Figure 34). Figure 35 shows the top five nonnative forbs by a) site-wide average absolute cover, b) site-wide distribution and c) their absolute cover across fields. Metrics for the top five native forbs in 2019 are presented in Figure 36 a, b, and c. *Frankenia salina* and *Centromadia pungens*, were the highest with both: absolute cover and frequency of occurrence occupying the top two positions. Positions number 3 to 5 were occupied by different species in the charts of most dominant versus more widespread species. Cover distribution across fields for *Centromadia parryi* ssp. *congdonii* and *Eryngium aristulatum*, two rare species, are shown in Figure 37.

While the most dominant plant species based on site-wide averages help us understand the overall vegetation conditions at Warm Springs, the list of the most dominant species in each pasture (i.e. based on data from plots in each pasture separately) may be different than the site-wide one. This trait is evident in figures 31c, 32c, 35c and 36c, which show the distribution of dominant species across the pastures. Because attributes such as salinity, distribution of soil types, hydrology, history of disturbance and management, as well as grazing regime may differ among pastures, examination of dominance patterns in the distribution and abundance of species at a pasture level may be more meaningful and instructive when it comes to management decisions. Floristic composition of the ten most dominant species in each pasture is presented in Appendix IV in a series of "treemap" charts.

Figure 31. The top five dominant grass species by cover.

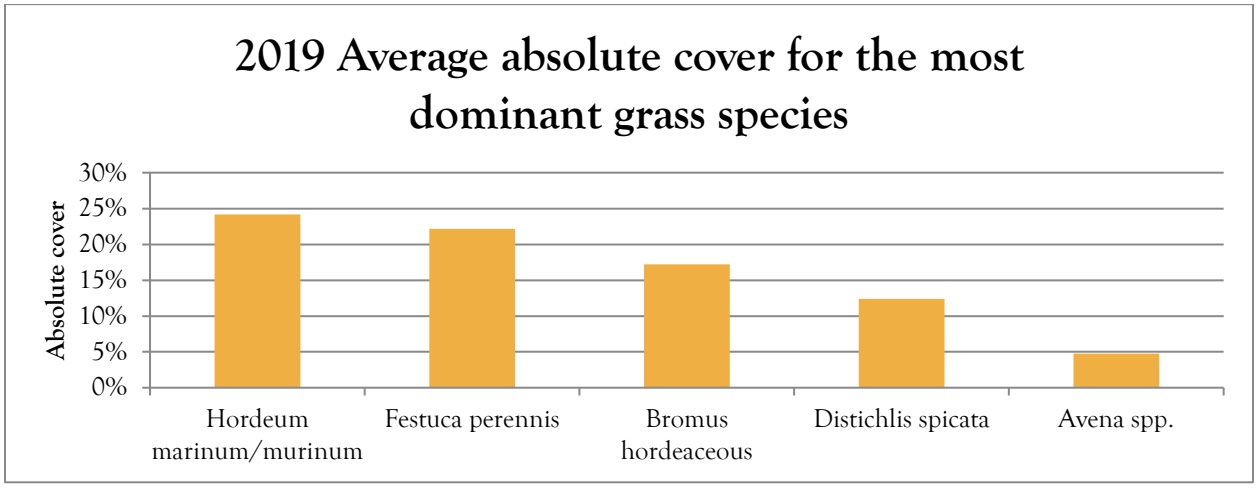


Figure 32. The top five widespread grass species by frequency of occurrence.

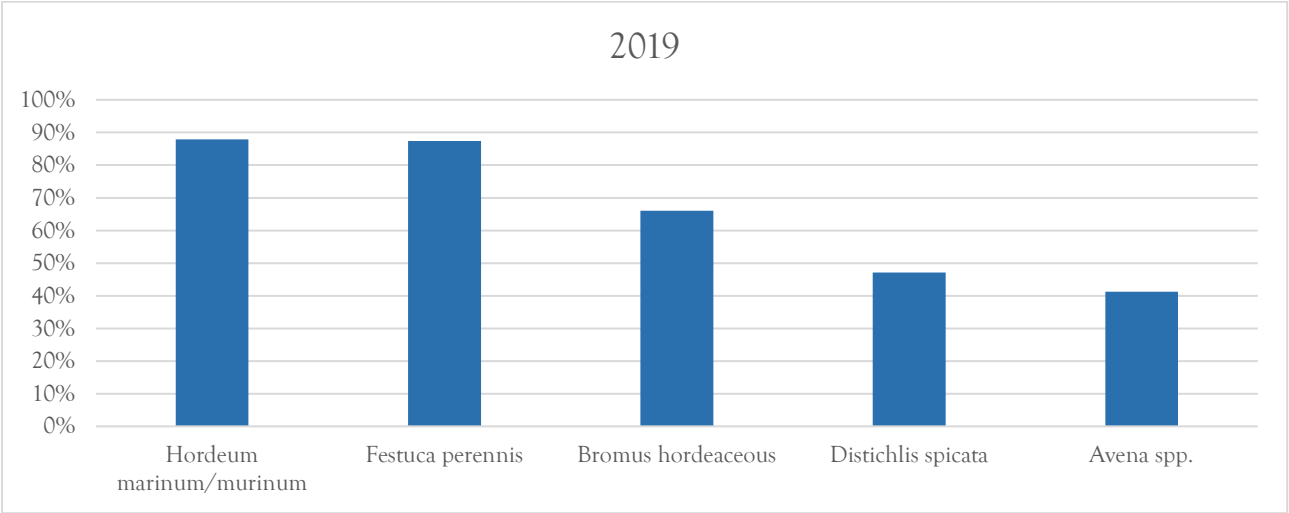
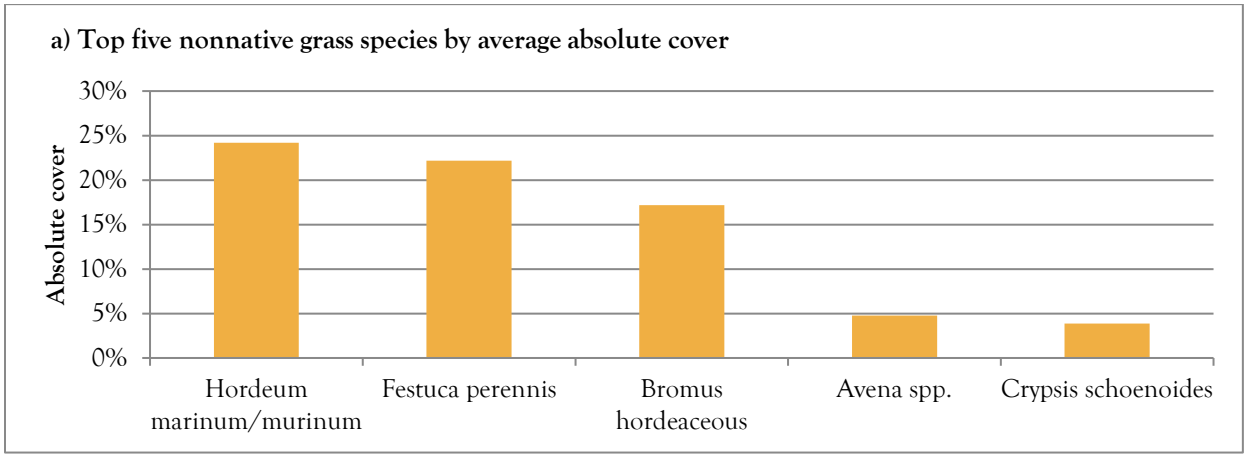
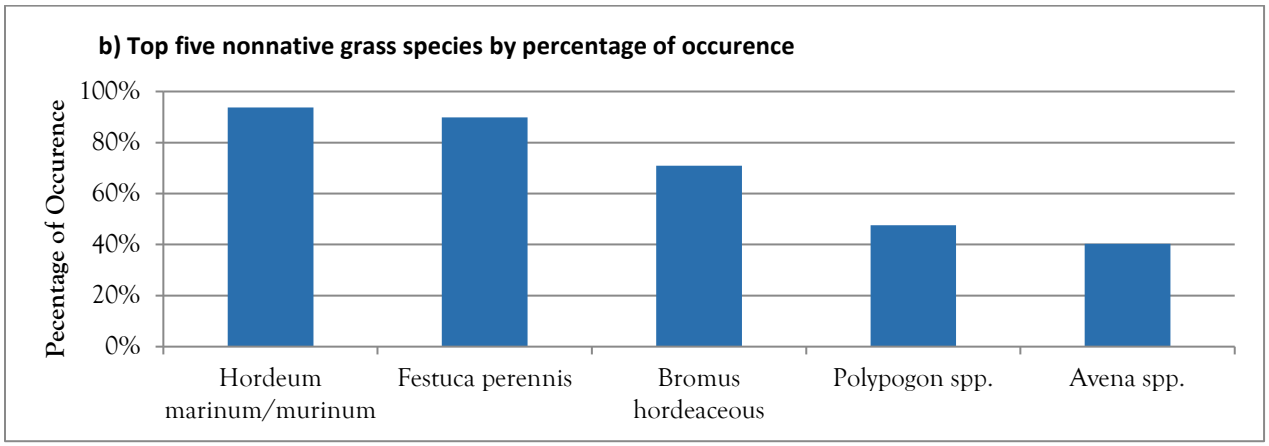


Figure 33. Nonnative grass species metrics from the Summer Vegetation Survey in 2018





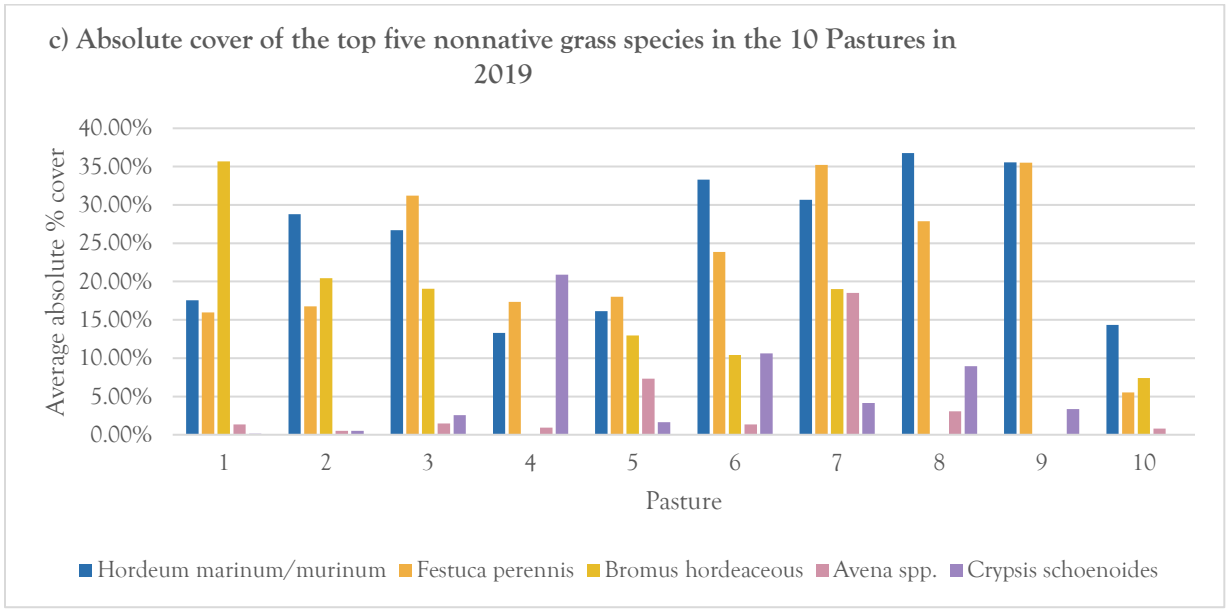
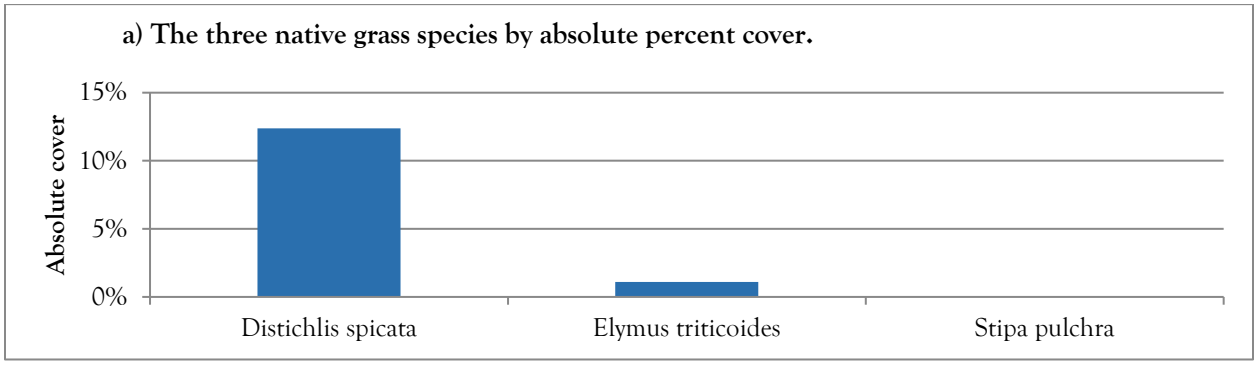
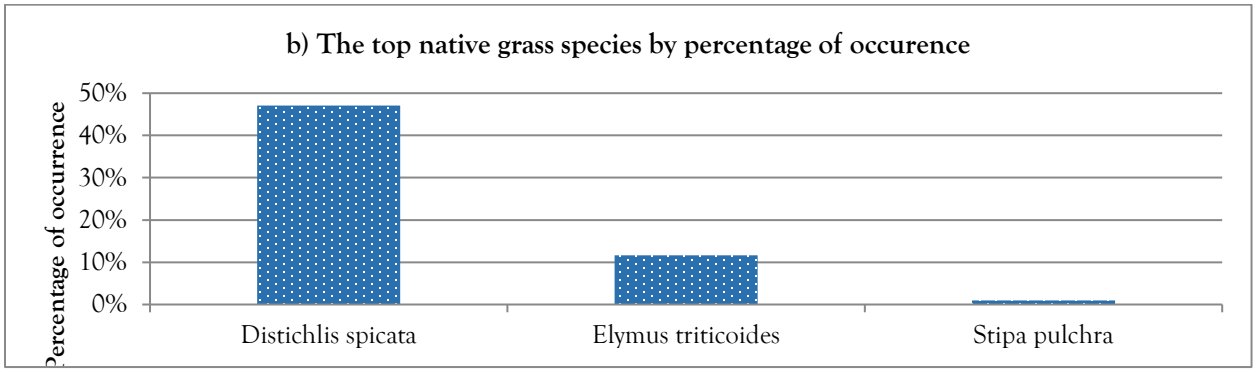


Figure 34. Native grass species metrics derived from the Summer Vegetation Survey in 2019.





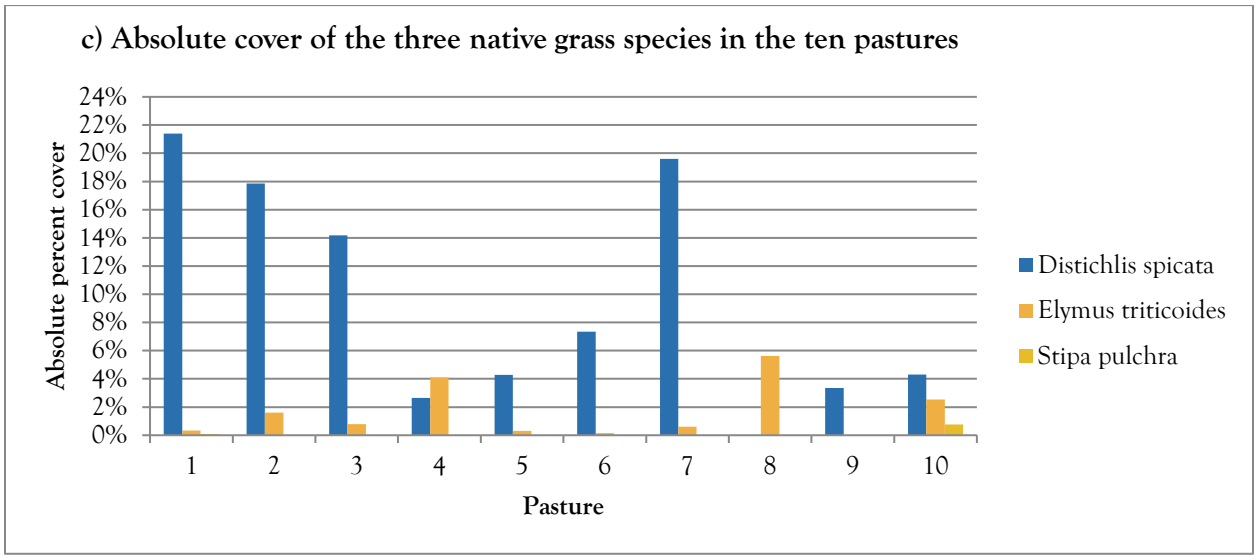


Figure 35. The top five forb species by absolute cover in 2019.

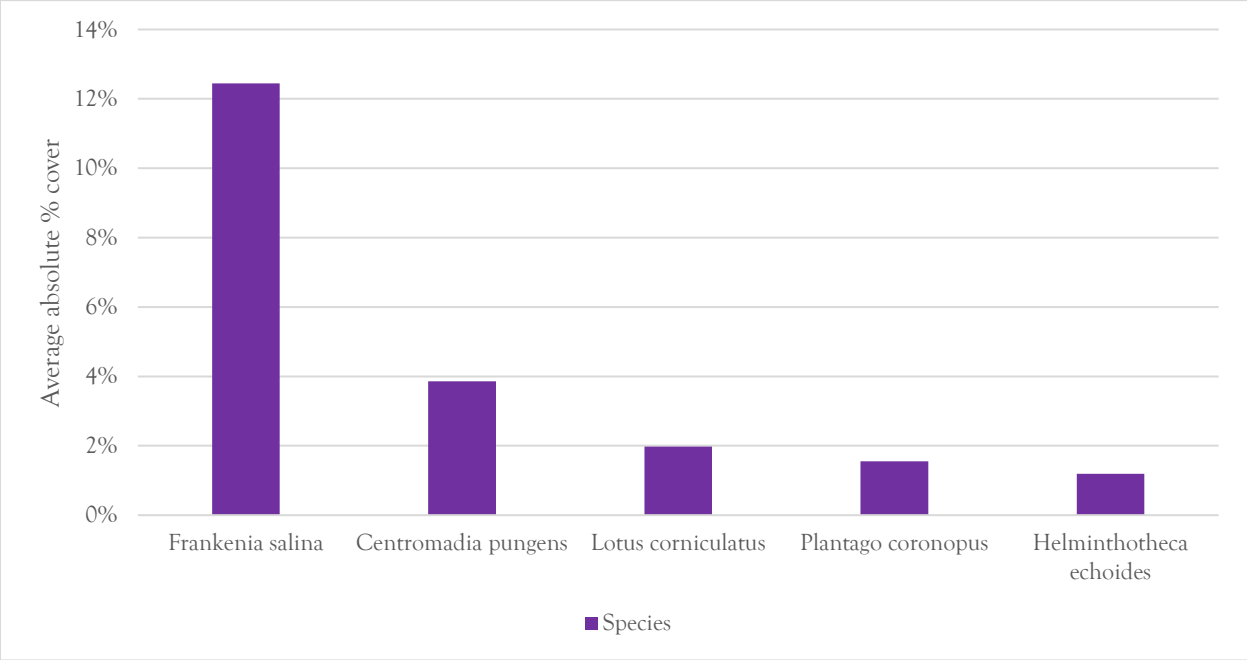


Figure 36. Top five forb species by distribution in 2019

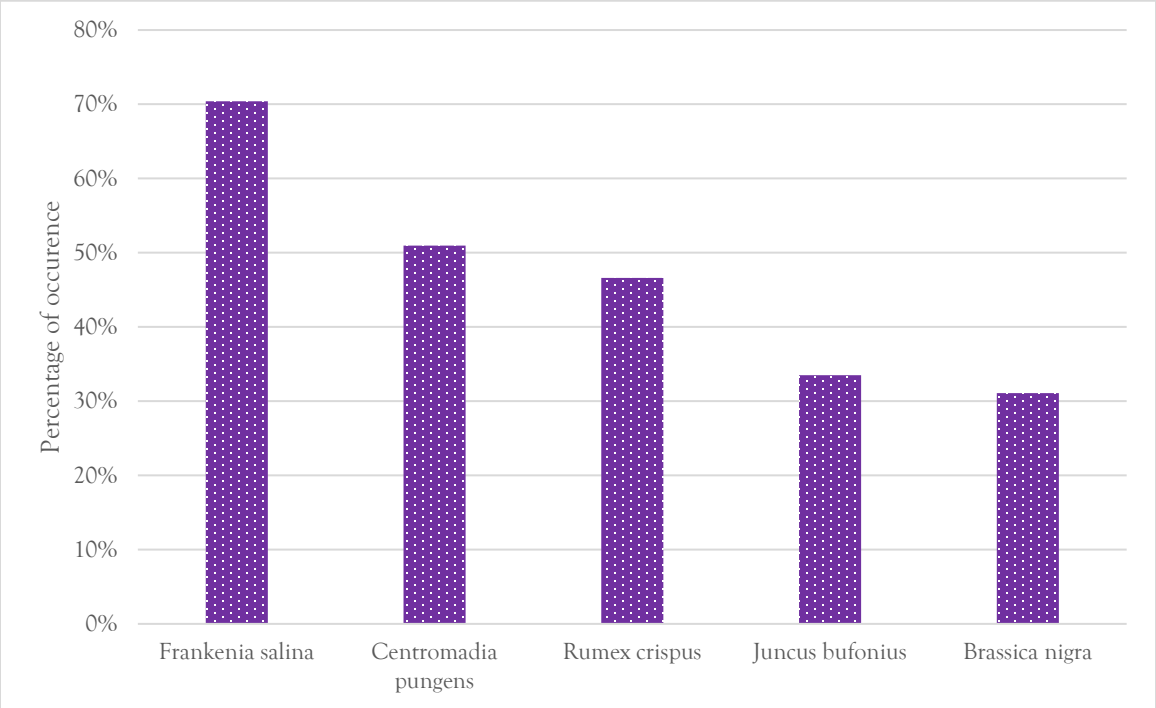
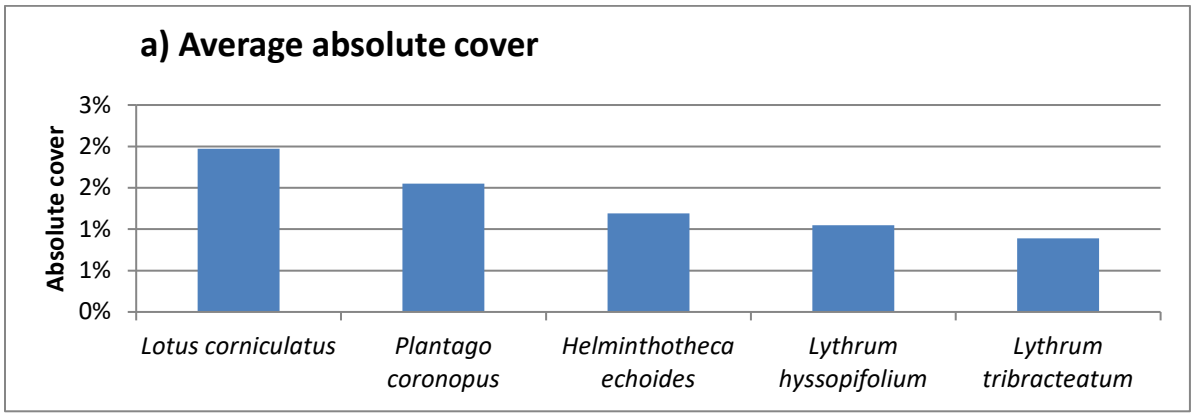
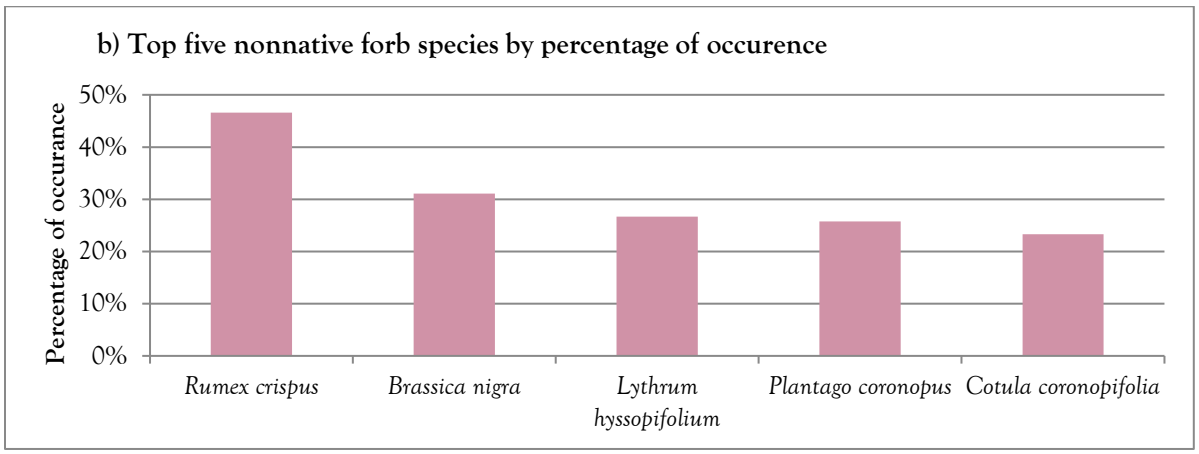


Figure 37. Nonnative forb species metrics derived from the Summer Vegetation Survey in 2019





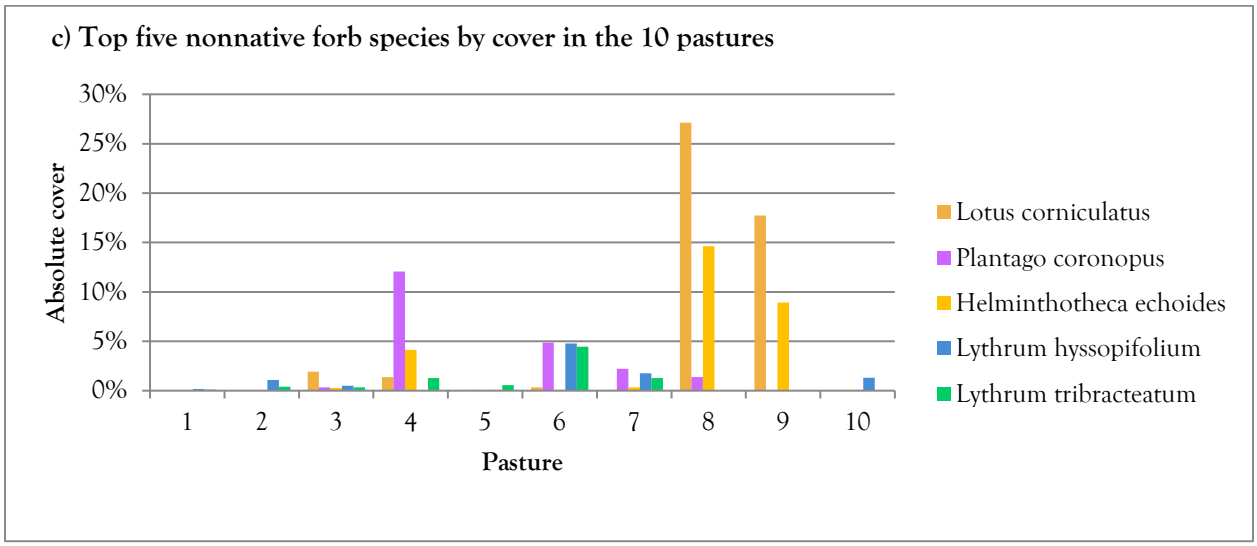


Figure 38. Native forb species metrics derived from the Summer Vegetation Survey in 2019

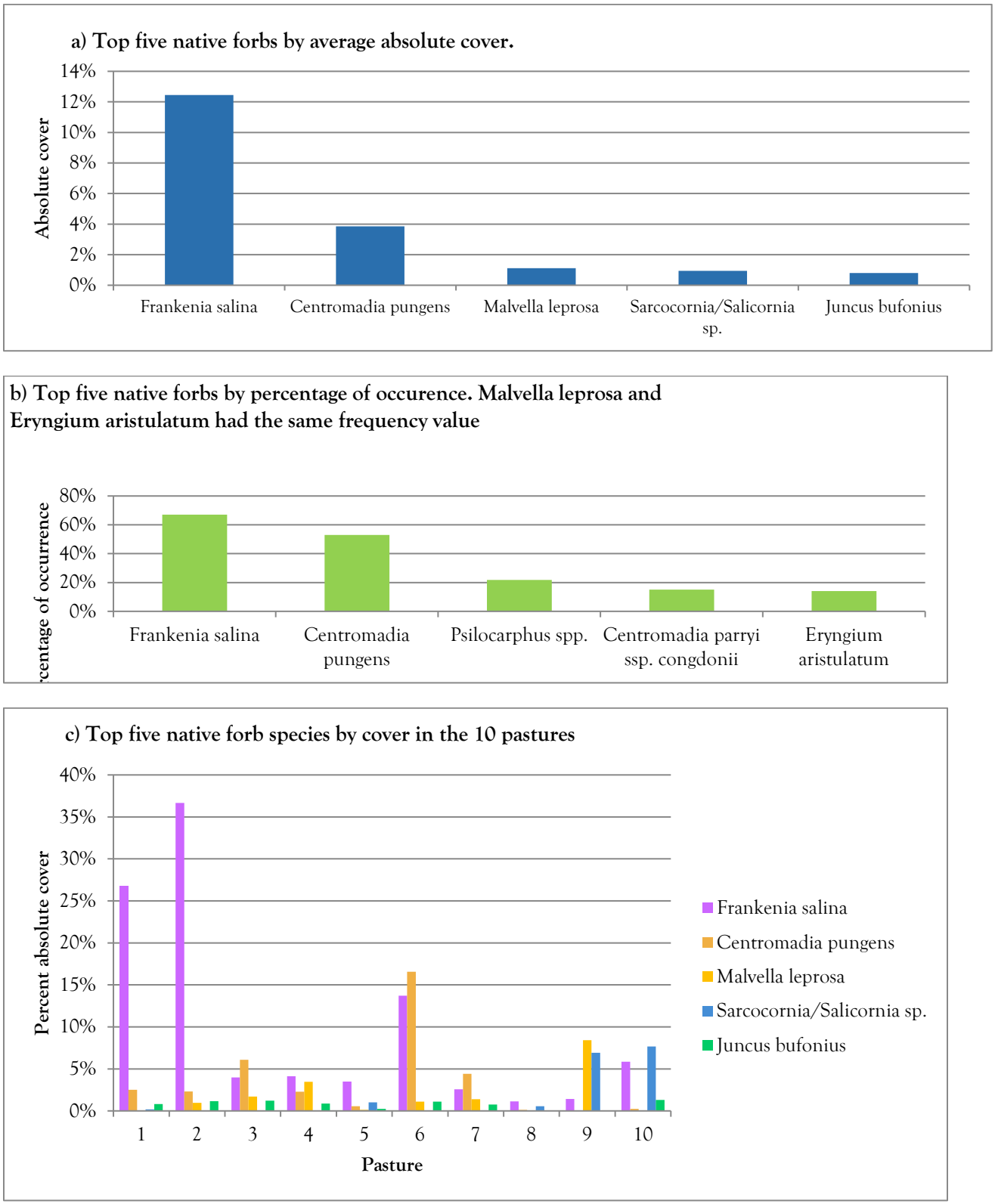
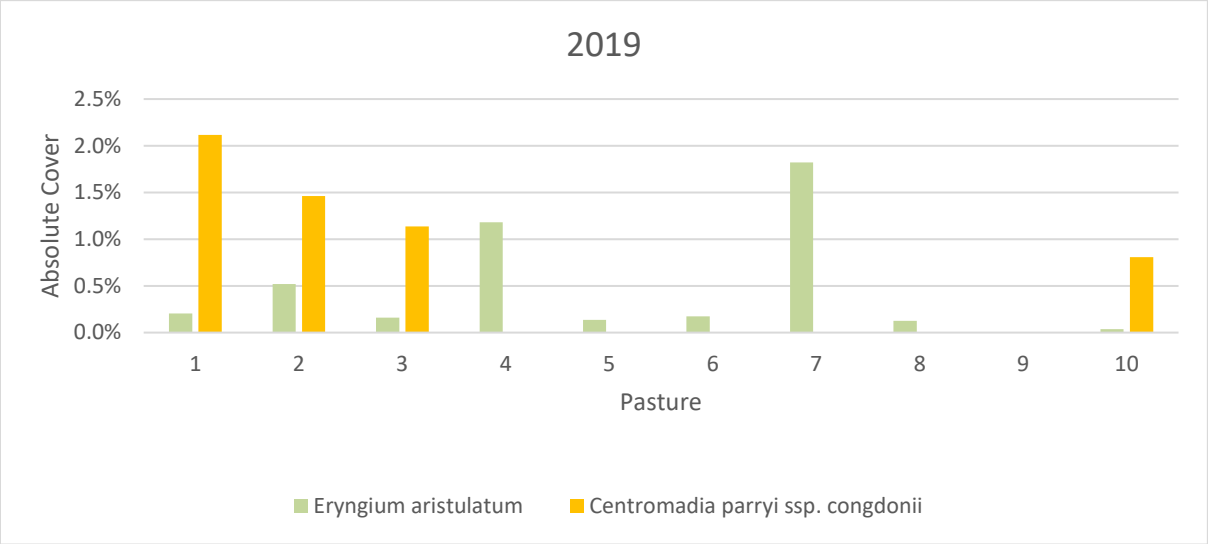


Figure 39. Absolute cover of two rare species across the ten pastures in 2019



The most abundant of the target weed species in both absolute cover value and distribution was black mustard (*Brassica nigra*) (Figures 40 and 41), although it was less widespread than last year. It had an absolute cover value of 0.80% and was found in 31% of the plots. Pastures 3, 5, 7 and 9 contributed the most to this wide distribution pattern (Figure 42). Stinkwort (*Dittrichia graveolens*) was found in 22% of the plots, a 5% increase from last year, and had a 0.42% absolute cover site wide (Figures 40 and 41). Italian thistle (*Carduus pycnocephalus*) was found in fewer plots than last year (Figure 41), but it was still one of the more abundant target weed species (Figure 40). Perennial pepperweed (*Lepidium latifolium*), which was found in 16% of the plots, had a 3% increase from last year in frequency of occurrence. Pastures 4 and 6 had a high frequency of occurrence. *Salsola soda* had a small but noticeable increase in the frequency of occurrence. The distribution was higher in Pastures 9, 10, and 5 (Figure 40). Another weed that we have recently found spreading rapidly is *Bassia hyssopifolia*, primarily in Pasture 5 South. It was found in 4.30% for the plots side wide versus 1.46% last year. Purple star thistle (*Centaurea calcitrapa*) had a slight decrease in its distribution this year (2.3% of occurrence compared to 2.9% in 2018). Yellow star thistle (*Centaurea solstitialis*) was not found in any plots during the survey but this year, we located some patches in the north end of Pasture 7 in an area this species was present and controlled in past years. Hoary cress (*Lepidium draba*) had a very limited distribution and was not found in any plots in Pasture 3, where it had previously been found. Russian Knapweed (*Acroptilon repens*) also showed a decrease and was found in only two plots in Pasture 7. Figure 41 shows the seven year trend in the frequency of occurrence for six selected target weed species. Figure 43 shows the map with their presence in the plots.

Figure 40. Contribution of target weed absolute percent cover. In 2019, target weed absolute cover totaled 2.138%.

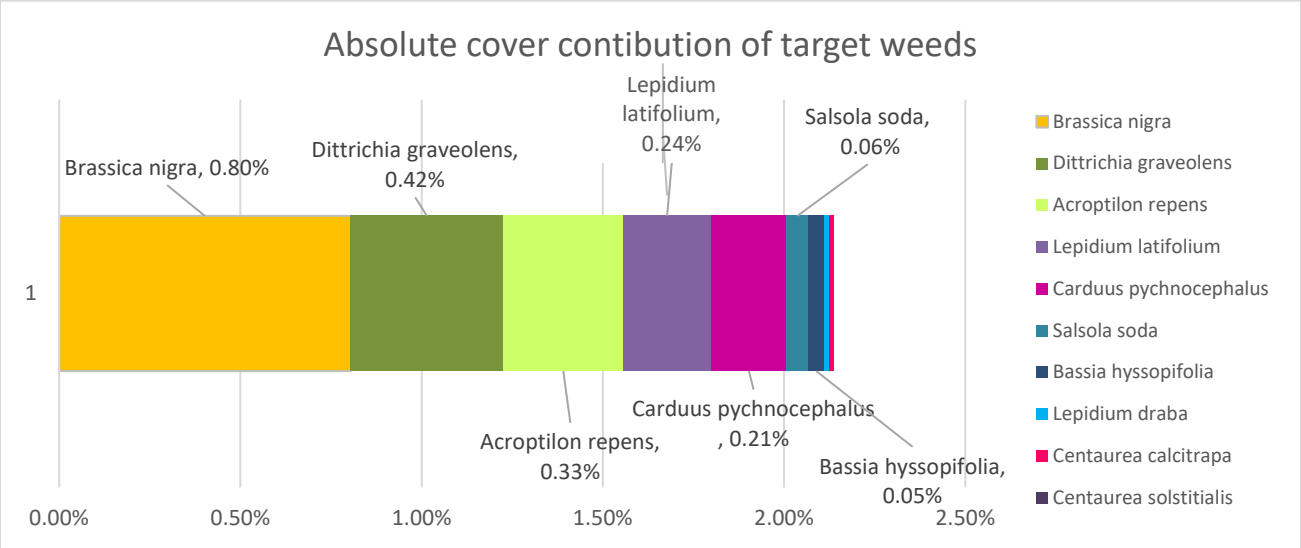


Figure 41. Seven- year percentage of occurrence trends for 5 target weeds. Percentage of occurrence does not show cover value but indicates how widespread a species is.

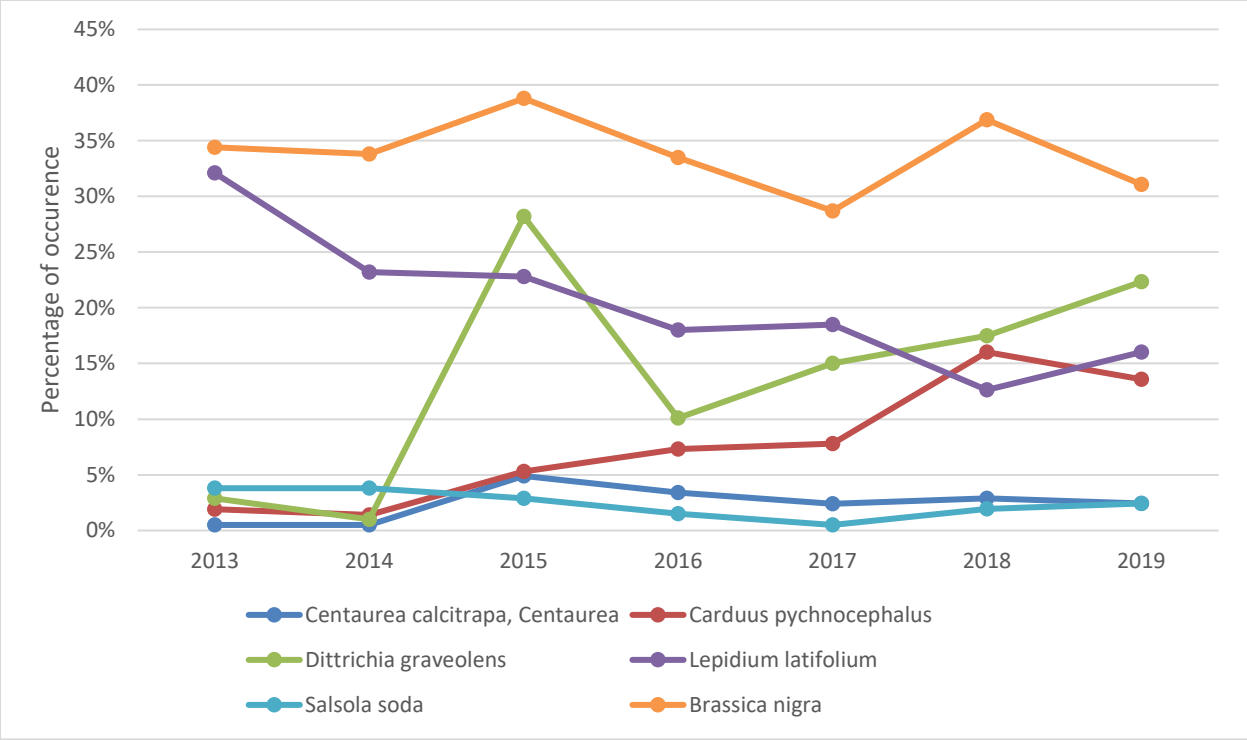


Figure 42. Frequency distribution for selected target weeds in the ten Pastures.

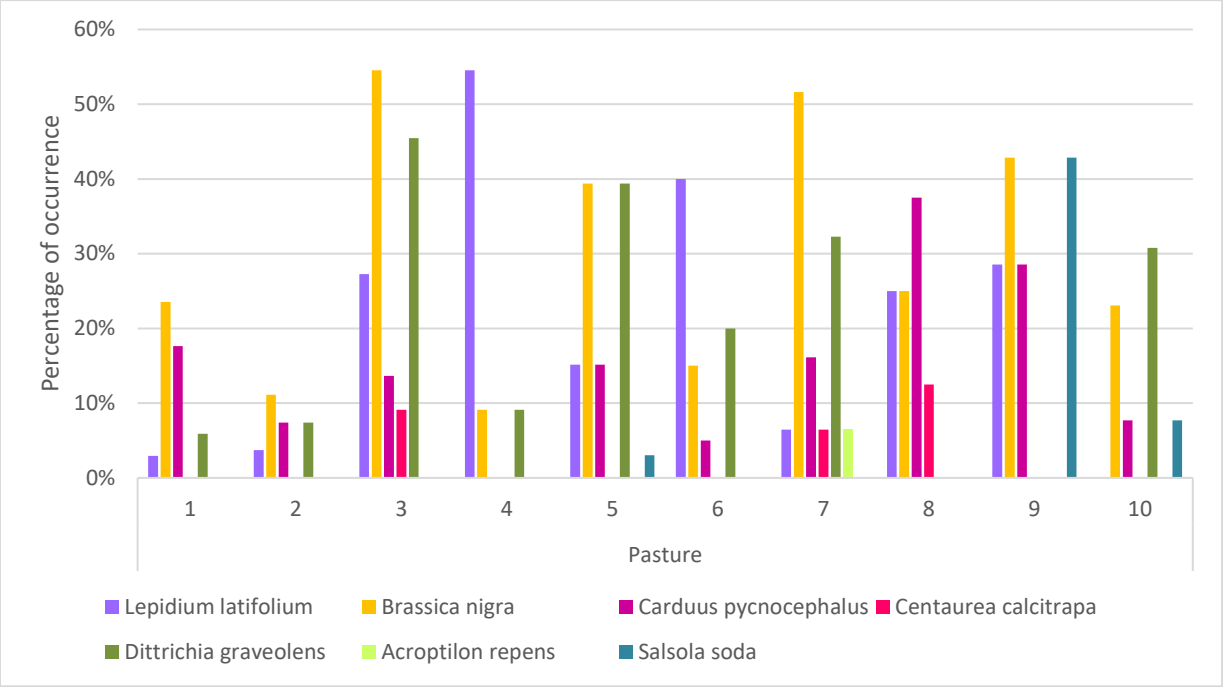
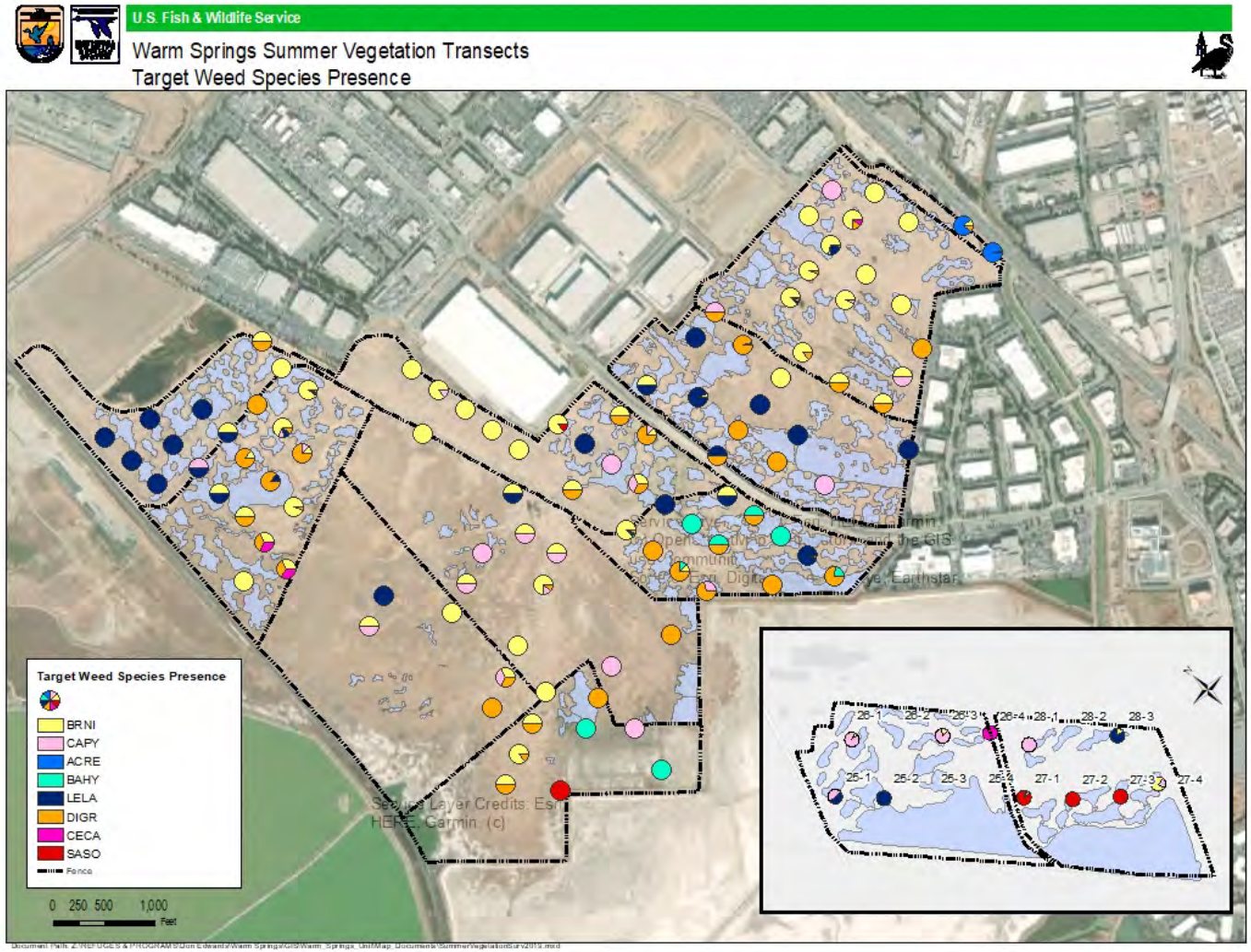


Figure 43. Presence of targeted invasive species in the summer vegetation survey plots at Warm Springs in 2019. (BRNI: Brassica nigra, CAPY: Carduus pychnocephalus, ACRE: Acroptilon repens, BAHY: Bassia hyssopifolia, LELA: Lepidium latifolium, DIGR: Dittrichia graveolens, CECA: Centaurea calcitrapa, SASO: Salsola soda.)



4.2.3 DISCUSSION

The Summer Vegetation Survey is our most comprehensive vegetation survey that aims to paint a picture of the plant community at Warm Springs. It is performed in mid-June in order to record both plants with peak growth in spring and those with peak growth in summer. The Summer Vegetation Survey in 2019 shows that Warm Springs Unit vegetation cover was dominated by nonnative annual grass species mixed with primarily native forbs but also nonnative forb species and a sizeable proportion of bare ground. Site wide, native perennial grasses covered a smaller proportion of the land than native forbs but they are found in great proportions in some pastures.

Grasslands are very responsive to annual weather patterns (Knapp et al. 2002) and for this reason annual variations in the vegetation structure and composition depend heavily on weather. While differences in cover values are more easily detected at a species level, differences may also be detected at the level of vegetative groups and bare ground. The big difference we see in 2019 compared to 2018 is a significant reduction in bare ground and an uneven increase in all vegetative groups. The biggest increase observed was in the annual grasses. This increase can be easily interpreted from the precipitation patterns this year. A lot more precipitation was received in 2019 than in 2018 (Table 4), the latter being the second driest year in the last decade, and therefore allowed for larger vegetative cover. The timing of precipitation better explains the disproportional increase in annual grass cover. Most of rain this year was received from February through May (Figure 4), shifting the wet season towards spring when photoperiod length is long, and temperatures are warm, and metabolic rates of most annual grasses are high. This weather pattern greatly benefitted growth of annual grasses between May and June: by the time large precipitation events occurred, annual grasses were developing at a high rate absorbing readily the available moisture before it percolated in deeper layers. Perennials benefitted by the precipitation as well, but as they have a competitive advantage when more water is available in deeper ground layers, their cover increase was more modest compared to the increase in annual grasses cover.

Although annual grasses dominate in most of the pastures, our data exhibit how different vegetation is in each pasture either for vegetative group patterns (for example see Figure 24 and Appendix IV with flora).

In the NRMP, we defined vegetation composition and structure as one of the key ecological attributes (KEAs) for the health of the vernal pool grassland ecosystem. We identified absolute native cover as one of the indicators for this KEA and created ranks to measure health status. We further established a management goal that aims to attain a good ranking in at least four pastures and a minimum of a fair ranking for at least four more pastures by 2023. Summer vegetation survey data is used to assess the status in each pasture. We clearly did not meet the goal we set so far (the goal is set for 2032), but this year we achieved a good rating in Pastures 1 and 2, a fair rating in 6 other pastures, and a poor rating in Pastures 5 and 8 (Figure 25). The ranking system

we established to assess ecosystem health through indicators adds clarity to the data analysis and guides our management. However the indicator value as it is set refers to a single year. Figure 27 for example shows the indicator values for the last three years for each pasture. It is obvious that native species cover will fluctuate each year and sometimes very widely. For this reason, it is best not to rely on a single year's ranking to determine ecosystem health, but to look for multi-year trends.

In the last three years, native cover in the ten pastures have exhibited some interesting patterns (Figure 27). For example, for the pastures with a "poor" ranking in native cover, namely Pastures 5 and 8, there has been a gradual decline in native cover. For all other pastures, there was an increase in native cover between 2018 and 2019. If native cover varied based primarily on weather conditions then we would expect to see the same trend for all pastures in each year. So what caused this discrepancy? It could be an effect of the different disturbance regimes each pasture had, varying competition with nonnatives, weed control efforts, different grazing management, or a combination of those. Let's compare a pasture with low native cover, Pasture 5, to a pasture with good native cover, Pasture 1. Figure 24 and the graphs of the floristic composition of the ten most dominant species in each pasture (Appendix IV) show that Pasture 5, like all the other pastures, is dominated by annual grasses. In addition, the nonnative grasses absolute covers are similar to the values in Pasture 1, a pasture with a "good" rating this year. Bare ground is higher in pasture 5 with a difference of 8% from the value in Pasture 1. Still this difference does not explain the extremely low values of native cover in Pasture 5. Pasture 5 land use legacy includes a period when the land was used for hay production while Pasture 1 was used mostly as a duck club. Hay cultivation methods most likely have disturbed and destroyed perennial native species, soil structure and hydrological regimes. Field 5 has seen large infestations of weeds since the beginning of its restoration. It used to be dominated by pepperweed and now *Bassia* and *Dittrichia,* and we have been actively controlling weeds in this pasture. Still, native species cover has declined, albeit slowly, in the last 3 years. Noticeably, nonnative forb cover is very low too, at least during the summer vegetation survey. However, Pasture 5 has great infestations of mustard and nonnative thistles in the months prior to the survey, and later in the summer and fall has some of our largest *Ditrichia* infestations. Because we have been actively controlling weeds in Pasture 5 and yet still have low non-native cover, active revegetation may be needed. Goals of weed abatement must be synced with restoration goals. Otherwise it seems that we will not be able to attain our goals for a sustainable plant community characterized by a strong presence of native plants which in turn will support wildlife.

Of course, there could be other potential explanations for the downward trend in native cover. For example it could be an interaction between weather conditions and the grazing regime. Weather was completely different among 2017 (an extremely wet year), 2018 (a very dry year), and 2019 (a dry fall and early winter and a late wet season). Therefore, its impact may be completely

different and makes it hard to discern the impact of management such as grazing or weed control. As it was explained above, every pasture seems to have its own unique set of characteristics. For example, in Pasture 8, which received a "poor" status rating, we again observed a declining trend in the native cover. There we did not direct any weed control in the last few years but it is the pasture with the highest nonnative forbs cover. In this case, the reason for the very low native species cover it is most likely competition with nonnative weeds.

Looking forward to improve conditions and increase native species cover in other pastures, we can examine the vegetation traits in pastures that have a "good" status rating. Pasture 2 holds a good ranking for at least three years in a row. Pasture 1 ranked as good in 2019. The graphs in figures 24, 33c, 34c, 37c, and 38c and the graphs and species lists of each Pasture in Appendix IV, tell us that salt grass (*Distichlis spicata*) and especially alkali heath (*Frankenia salina*) have high values in both Pasture 2 and Pasture 1. It looks like these two species are the "bones" of the native species community. In Pasture 2 and less commonly in Pasture 1, we see patches of the native perennial beardless wild rye (*Elymus triticoides*) and the perennial low growing native forb alkali weed (*Cressa truxilensis*). The annual natives *Centomadia parryi ssp. condgonii* and *Centromadia pungens* are commonly found in both pastures. Alkali mallow (*Malvella leprosa*), heliotrope (*Heliotropium curassavicum*), and Bush seepweed (Suaeda nigra) are found in areas with sparse grass cover. In saltier areas we find, *Arthrocnemum subterminale*, *Spergularia marina* and *Salicornia pacifica*. The salinity gradient greatly influences the spread of species even if most of the natives at Warm Springs have some type of salinity tolerance. Because 2019 had a late wet season extended until mid-May, presence of several annual vernal pool species was still evident even if plants were dry or at the last stage of their cycle. The tiny toad rush (*Juncus bufonius*) was very common this year. Wooly marbles were still completing their cycle. *Eryngium aristulatum*, a perennial vernal pool species was found at its top growth.

Site-wide dominant species in the top five list remain the same this year. *Hordeum marinum/murinum*, *Festuca perennis*, *Bromus hordeaceus*, *Distichlis spicata*, and *Frankenia salina* are consistently in the top five ranks over the years. Alkali heath (*Frankenia salina*) was by far, for another year, the most dominant native species. Alkali heath and salt grass (*Distichlis spicata*) are the two perennial native species that have high cover even in pastures of poor quality (in several spots). These two are characteristic of the plant community associations found in the transitional zone connecting the Bay with the foothills. These species are dominant in the native plant community at Warm Springs and should be included in vegetation enhancement projects.

The annual native species that is in the top five list of forbs for absolute cover and distribution is common tarweed (*Centromadia pungens*). It is a warm season annual, a pioneer species, which prefers disturbed soil and/or bare ground. It germinates in late winter/early spring, keeps growing in size until September, and provides nectar for many pollinators. In 2019, it had a very expansive

spread in Pasture 6 with an absolute cover value of 17%. This species was also abundant in Pasture 3. Common tarweed was present in almost all the pastures. Its cover values shift from year to year depending on seedbank and whether bare ground is present.

All of the top five nonnative forbs are species growing in the pools (*Lotus corniculatus*, the two *Lythrum* species and *Plantago coronopus*) with the exception of *Helminthotheca echioides*, which occupies the uplands. It has to be noted here that *Lotus corniculatus* values are greatly influenced by its abundance in Pastures 8 and 9, the two Stevenson parcels. The five most wide spread nonnative forbs were again very similar with last year. *Rumex crispus* and *Brassica nigra* are in the top five for several years in a row. However, distribution of *Brassica nigra* appears reduced from last year. On the down side, *Dittrichia graveolense* distribution expanded and holds sixth place in the list of most widespread forbs. We are putting so much effort to control both these target species and especially *Dittrichia* in the last few years. It looks though that the seedbank is getting replenished by surrounding lands such as the landfill, the railroad and the highway, as well as plants that survive control measures. Finally, extra control should be taken for *Lepidium latifolium* which has an increase in distribution, albeit small.

Year 2019 was the seventh year that the previously used invasive species survey and the currently used summer vegetation survey took place in the whole Unit. We compiled the list of species found in these years (Appendix II) to create a baseline and ensure in the future that we will not lose any native species.

Perhaps the strongest quality of the summer vegetation survey dataset is that it enables the detection of multiyear trends and comparisons among years because the survey sampling design minimizes variance due to site effects. In other words, the same plots are sampled every year and therefore any difference in the values of the species cover is not affected by soil conditions, topography etc. Because the sampling plots are spread along transects spaced almost regularly, it seeks to cover the whole expanse of the site and pick up its diverse features. In fact, this sampling design was chosen because in the past the survey primarily aimed to scan the whole site in a methodical way and detect invasive species in the plots and in surrounding areas. To make it possible to use this survey to describe vegetation composition and structure with higher precision and at the same time compare data collected before 2018, the year the Summer Vegetation Survey was adopted, we modified the previously used methodology of the Invasive Species Survey (see the Introduction section of the current chapter). However, the methodology of the current survey version carries with it several biases stemming primarily from the systematic sampling design and the lack of randomness. Therefore care should be taken when analyzing and interpreting the data, especially because the current sampling design may over or under represent certain systematically occurring landscape features.

An example of bias and error using the systematic sampling design employed by the Summer Vegetation Survey is the case of Pasture 5. In Pasture 5, transects are running parallel but do not hit an old drainage channel that was covered and reseeded with native species. This area, which now is dominated by Elymus triticoides, a native perennial grass, and constitutes about a tenth of Pasture 5, is not sampled. As it is discussed above, native cover value is very low in this pasture. Perhaps a more randomized sampling design would paint another picture. Another example is the case of Pasture 8 and 9. Transects there run only in the uplands and omit almost half of the total pasture acreage, an area with long inundation which is dominated by *Salicornia*, *Spergularia*, *Distichlis*, *Cressa* and other salinity tolerant species. In this case, transects were purposefully placed in the uplands because the main goal of the Invasive Species Survey was to track target weed species.. Last example of the sampling system's weaknesses is the case of Pasture 4 (for a detailed explanation see the 2018 Warm Springs Annual Monitoring Report). This pasture is one of the smallest in the Unit and includes only 10 sampling plots. While the number of plots in each pasture is more or less proportional to pasture acreage, the landscape heterogeneity in Pasture 4, which includes a road, a slope gradient and part of the filled and reseeded old drainage channel, may require a larger number of sampling plots, especially since the current ones overwhelmingly sample the same zone due to their systematic placement.

The three examples above show that inherent bias in the survey sampling design may reduce the ability of the dataset to reliably answer our monitoring questions associated with the Complex NRMP and indicate the need to reconsider or adjust the methodology. The purpose of the Summer Vegetation Survey is to thoroughly sample vegetation attributes to assess the health of the whole ecosystem. Detecting the attributes of the invasive plant community is still an important focus of the survey but most importantly all other plants and cover types are identified to determine indicator values. The native species indicators used in our management goals describe desired conditions we want to establish and therefore we have to ensure that our sampling scheme allows their accurate depiction with certain confidence. At this stage for our data analysis and interpretation to be meaningful we need to acknowledge the current limitations of the dataset. Going forward, we should consider adjusting the currently used sample and/or methodology to increase accuracy and reliability into estimating indicator values.

In 2019, the Complex worked with the Regional Inventory and Monitoring Program (I&M) to prepare a complete protocol for the summer vegetation survey. The protocol seeks to follow the National Wildlife Refuge System Protocol Guide (U.S. Fish and Wildlife Service 2013) which is a comprehensive set of instructions for conducting a survey. The purpose of developing a full protocol under these guidelines is to adhere with the U.S. Fish and Wildlife Service policy *Inventory and Monitoring in the National Wildlife Refuge System* (701 FW 2) which aims to provide consistency in how U. S. Fish and Wildlife Service conducts monitoring and enhance credibility of monitoring results. The product of this process is in a draft stage at this point primarily because we

identified several issues with the sampling design as they are discussed in the previous two paragraphs that we need to address. In addition, we identified the need to improve data management to avoid potential errors and perhaps adopt a more standardized method of reporting. Currently, we use Excel worksheet to enter the data. Analysis relies on special formulas drawing data from several worksheets to create data summaries and analytical graphs. The system is prone to errors and a person not familiar with the structure of the document may end up accepting erroneous results. The botanist has created an Access relational database. This structure allows for quick retrieval of data to look into trends over years however it does not offer good graphing capabilities. For the reason all these issues involve a lot of technical, practical and theoretical considerations, special group meetings with Refuge as well as I&M staff will be required to update and complete the protocol for the summer vegetation survey.

On the whole, based on the indicators we have set in the NRMP, the Summer Vegetation Survey datas shows improved vegetation conditions in 2019 compared to last year. However, the path to achieve our management goal looks long, especially with regards to increasing native species abundance in pastures that currently have lower native cover. Our current approach of using management tools such as grazing and weed control has a limited potential to enhance the native species community in areas with a small seedbank of the desired species; more active restoration activities are needed. Adjustments and improvements in the sampling design of the survey seem necessary to improve accuracy and reliability of data. This is very important not only for short but also long term management. Warm Springs Unit is the last vernal pool grassland and the only sizeable transitional zone habitat in the South Bay. It encompasses a variety of transitional microhabitats ranging from saline ecotone in lower areas close to the Bay to the uplands. A representative sample that grasps the whole gradient and range of microhabitats will provide a dataset that not only assess the ecosystem health at Warm Springs but can be used as a reference in setting goals and objectives for ongoing ecotone and transitional zone restoration projects in the Refuge.

4.3 INVASIVE SPECIES CONTROL

Invasive plants have become a major concern in the conservation and management of natural ecosystems. Invasive plants at Warm Springs generally fall into two categories: grasses and forbs. Invasive annual grasses are the primary invasive species at Warm Springs. These species were introduced in the mid-19th Century and have since largely displaced the native California grassland flora. The rapid invasion of European annual grasses has substantially altered the species composition of California grasslands, and they have become “naturalized” in most of California. Annual European grasses have a direct impact not only by altering native plant community composition but also by changing the carbon cycle and hydrology. Invasive forbs include

herbaceous species from around the world that can spread rapidly and aggressively while impacting natural habitats by altering ecosystem structure and function. For example, in Warm Springs, a lot of the invasive forbs we target for control alter the short grassland physiognomy which very much negatively affects the habitat quality for many grassland animals. Some others alter the soil chemistry and if left uncontrolled they can form monotypic stands that displace native plants, reduce diversity and therefore diminish the value of habitat.

4.3.1 APPLIED METHODS

Controlling invasive plants at Warm Springs is an ongoing management priority, as these species compete with native species and generally have a negative impact on existing habitats. Management techniques seek to prevent the colonization or spread of invading species, while reducing the prevalence of species that are already well-established. We use grazing as the primary method of control for nonnative annual grasses while selective application of herbicides and other methods such us manual removal and weed whacking are employed as needed for nonnative forbs.

In general, the approach we took for weed control in 2019 followed basic principles of integrated weed management. When individual plants of target species were found moderately dispersed or present in very sensitive habitats and/or co-occurring with focal native species, we preferred the manual removal by staff or volunteer groups. Volunteer groups are especially effective when the target species have distinct phenology and can be easily identified but not confused with beneficial species. For example, this year we manually removed Italian thistle (*Carduus pycnocephalous*) in spring from vernal pools in Pastures 6 and 7, especially those close to vernal pools where spraying with herbicide is not an option. Using volunteers to combat species that may cause allergic reaction when handled, should be considered with care. For example, to pull stinkwort (*Dittrichia graveolense*), a species that can cause severe dermatitis, we often use volunteers at Warm Springs but we make sure we emphasize the importance of wearing long sleeves and pants and we also provide them with disposable nitrile gloves as liners under the thick work gloves to avoid contact with the allergen.

Another weed control technique that we apply is to cut the above ground stems either using weed whackers or more rarely with clippers. In 2019, SFBBO used weed whacking to control tall vegetation in burrow areas. They used weed-whacking on days when spraying could not take place due to circumstances such as recent rainfall, high winds, weeds located less than 25 feet from surface water/vernal pools, and other unforeseen conflicts. While weed-whacking delays invasive plants from seeding, areas treated using this technique required a follow-up round of weed whacking or herbicide application. This second treatment is due to the re-sprouting of these weeds

after having been cut down. On the other hand, weed-whacking instantly controls vegetation height, unlike spraying that may take days or weeks to kill the weeds.
For some species such as *Lepidium latifolium*, which has a very specific phenology window for the treatment to be effective, we used a two-step approach. Chemical treatment on this species is the only effective method and only when it is applied when the plants are budding and/or just starting blooming. We observed that some individual plants bolted and bloomed early (asynchronous flowering) especially in Pastures 6 and 3. In that case, volunteers and staff cut the flowering stalks of the early individuals and then staff applied herbicide when all plants were budding. Cattle grazing was used in a similar fashion for late blooming mustard. While cattle are not attracted to mustard in spring when fresh green grass is available, they will graze on it during summer when grasses are dry.

When target weed infestations were mixed with natives a truck mounted hose sprayer was used to spot treat target weeds. This method, is the most effective when done systematically. Timing is also important. Applying this treatment when most of the targeted plants have the appropriate phenology adds to the effectiveness and minimizes the need for another future treatment. If it is done too early there must be follow up treatments since many new sprouts may appear after the treatment.

We generally do not use herbicides with pre-emergent qualities, however, in 2019 SFBBO conducted back pack spraying on some mounds with Polaris (which contains the active ingredient Imazapyr) in order to control weeds on mounds with a lot of burrows and create some bare ground that could attract burrowing owls. This is the second year we used this treatment, although in 2018 the use of this treatment was even more limited. Backpack spraying is used when there are numerous solitary dispersed target weeds or when spraying is focused in small areas often dispersed widely. SFBBO, through partnership with SCVHA and Talon, used this method widely this year to control tall weedy vegetation on potential nesting habitat of burrowing owls. Qualified Refuge staff prescribed the herbicide mixes.

We directed the cooperative rancher to apply selected herbicides with a boom sprayer (attached to an ATV) on large infestations of target weeds in areas with no or low presence of natives. To avoid spraying areas with sensitive native species with this method and to avoid missing target species with low stature, we provided maps with target weed presence. The botanist created these maps during routine surveillance visits either by drawing on paper maps or using Collector for ArcGIS. The latter is technology we recently adopted widely in the Service and gives tremendous opportunities for more efficient weed control treatments. We note here that these maps do not include information of cover density; regardless it is assumed that the infested mapped areas had patches with dense cover of weeds. We plan to include some rough density measures in the future. In 2019 we treated mustard, thistles, perennial pepperweed, and stinkwort using a boom sprayer.

This method can be very effective and with low impact when there is good coordination and timely response of the Refuge staff and the rancher. For example, if treatment is not administered during the right time, then weeds may bolt and drop seeds. Unfortunately, equipment failure and other logistics may make instant response impossible. As a measure to reduce this type of incidents, we have arranged with the Rancher that for 2020, we will give a very early notice for spraying requirements based on our experience but then we will fine tune the date according to plant phenology. For example, in February, we let the rancher know that we will need spraying in May and June for mustard and thistles, and then in August/September for Dittrichia. This way, he can include this activities into his work schedule in advance and specify dates as the month approaches.

In 2019, we spent a lot of effort in the control of *Bassia hyssopifolia* in Pasture 5 south. We spotted the first indication of a serious infestation from this species in 2018. In the past the presence of this species was extremely limited. However, we noticed a significant increase in this species presence in 2017, a very wet year when water from the nearby water control channel along the salt pond A22, entered the system of the pools in Pasture 5 South. The distribution of *Bassia* that year in Pasture 5 and the fact that *Bassia* formed monotypic stands along the channel, indicates that seeds were transferred via flooding. This is very unfortunate because Bassia is highly invasive and thrives in grazed areas, vernal pools, and bare areas. The seed structure has 5 tiny hooks that stick easily on wildlife and livestock and this way can spread very fast in other areas. Control efforts in 2017 via pulling and in 2018 with spraying were not successful. In 2018 we attributed the results to the advanced growth stage of the plants. In 2019, we used a new herbicide recipe which included Telar, Vastlan, and Capstone (the latter because we were also treating Dittrichia which co-occurs with Bassia), created maps of its spread and meticulously sprayed. Plants showed initial stress but did not die. To avoid spread in other pastures through cattle, for both years, 2018 and 2019, we did not graze this pasture once seeds started maturing.

Italian thistle had another prolific year. It seems that this species appears every year in the same areas. It is impressive that even with aggressive control and combined methods we do not seem to have sustainable control. Italian thistle is a very prolific seeder and even one plant can produce a large amount of seeds. However, we should see a noticeable reduction. In the last few years, the botanist has noticed that a lot of smaller plants can be seen blooming after the treatment on the most obvious and expanded patches has been administered. Perhaps then, we miss these smaller plants hiding in grasses.

For another year we continued tackling purple star thistle. Its numbers were not so great as last year but in some small areas in Pasture 3 and 7 there were small patches that we kept treating from spring till fall. We used both, herbicide and pulling to control this species. Keeping this species in

check at this point when its distribution is still limited, is very important for its control or even eradication.

Dittrichia was once again one of the most widespread weeds, especially in Pasture 5 North and 5 South, but also in 3, 4, and 7 and 10. Even Pasture 2 had some dense patches, particularly in the berm area at north. For herbicide treatment, we typically use Capstone for this species but this year we also used Vastlan with excellent results. However, this species' window of germination is more than eight months and we had to revisit areas to pull or spray. The first flowers this year were recorded on September 19th. *Dittrichia* control is very challenging because of the wide germination window, the extreme drought tolerance of this species, and the limited success of herbicide when plants are fully mature and/or in bloom. While this year we used every method available to control for it, an approach we have followed for more than 6 years, it looks like the problem is linked with the strong presence of these species on neighboring lands.

Table 12 shows a summary of methods used in 2019 for weed control per month. Staff notes related to weed control are also presented in Appendix V. Table 13 presents the hours spent for weed control in the 2019 fiscal year.

A total of 5.08 gallons of Garlon4, 26.49 gallons of Vastlan, 181.68 onces of Telar, 2.625 gallons of Polaris, and 121.5 gallons of Capstone were sprayed in 2019. We used much less Garlon4 (49.83 gallons in 2018). Vastlan, a form of triclopyr that is also the active ingredient in Garlon4, was a new herbicide we used in 2019. Even considering the Vastlan quantity we used this year in addition to Garlon4, the total was less than the amount of Garlon 4 used in 2018. We used more Telar (120 ounces were used in 2018). Finally, we used more Capstone (101.02 gallons in 2018) which is used primarily for *Dittrichia* control. Dittrichia control has been increasing in the last few years.

Table 12. Weed control activities in 2019 per pasture (Boom= Rancher sprayed with a Boom sprayer, Cut= cut the stem aboveground using clippers or weed whacker, G: USFWS staff sprayed with hinge sprayer, Hose= USFWS staff sprayed with hose sprayer, Spot=Spraying with Backpacks usually on specific spots, Pull: Manual pulling of weeds)

Fiscal Year 2019		Oct.	Feb.	March	April	May	June	July	Aug.	Sept.
Pasture	Target Weed									
1	Thistles			Spot, Cut	Spot, Cut		Spot			
	Mustard			Spot, Cut	Spot, Cut		Spot	Spot		
	Nettle			Spot, Cut	Spot, Cut					
	General						Spot			Spot
2	Thistles			Cut	Spot, Cut	Spot, Cut	Pull, Cut	Cut	Pull	Pull
	Dittrichia	Pull					Pull		Hose, Pull	Pull
	Sonchus						Pull			
	Mustard				Cut		Pull, Cut	Spot	Pull	
	Nettle				Cut					
	Purple star thistle	Pull								
	General				Spot					
3	Thistles					Spot, Cut				
	Dittrichia						Boom	Spot	Hose	Spot, Pull
	Mustard					Spot	Spot, Boom	Spot		Spot, Pull
	Pepperweed								Hose	
	Purple star thistle	Pull			Pull	Spot, Pull	Pull		Pull	Pull
	General						Spot		Pull	Spot
4	Thistles					Cut				
	Dittrichia	Pull							Boom	Pull
	Pepperweed								Boom	
5 North	Thistles									
	Dittrichia	Pull					Hinge, Hose		Boom	
	Bassia						Hinge, Hose			
	Pepperweed								Boom	
	General		Spot							
5 South	Thistles					Cut				
	Dittrichia	Pull					Spot, Hose, Boom, Hinge		Spot, Boom	
	Bassia						Spot, Hose, Hinge			
	Mustard						Boom	Spot		
	Pepperweed								Boom	
	General							Spot		

6	Thistles					Cut				
	Dittrichia								Spot	
	Pepperweed								Spot	
	General								Boom	
7	Thistles					Spot, Cut		Pull		
	Dittrichia						Boom			
	Mustard						Boom			
	Purple star thistle					Spot	Pull			
	Yellow star thistle					Spot	Pull	Pull		
8 & 9	Dittrichia						Hose*		Hose*	
10	Thistles									
	Dittrichia						Boom			
	Mustard						Boom			

* We performed the triple rinsing of the spraying tank at pasture 8.

Table 13. Estimated time spent for weed management activities. These hours do not include weed control coordination activities or the hours spend for the summer vegetation survey, which among others is used to assess status of weeds.

	Method	Oct	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total Hours	Grand Total
USFWS staff and intern	Pull	8	3		18		50	10	8	11	108	
	Hose & hinge spray						51		34		85	
	Mapping/weed assessment	10			6	10	22	9	10	13	80	
	Coordination	2			8	4	14	10	12	5	55	**328**
USFWS lead volunteers					90				6	16	112	**112**
Cooperative Rancher	Spot					12					12	
	Boom spraying						8		32		40	
	Weed-whacking					15					15	**67**
SFBBO through SCVHA partnership	Habitat Assessment		2		0.75		0.5	4	1		8.25	
	Spraying		21	23	19	30	49.5	24.5	16	21	204	
	Weed-whacking			17	11		4.25	8.5			40.75	
	Hand pulling								10		10	
	Planning and Prep		8.25	7.5	5.75	4.75	7.25	9	4.25	5	51.75	**314.75**
	TOTAL	20	34.25	47.5	158.5	75.75	206.5	75	133.25	71		821.75

4.4 NON-LISTED RARE PLANTS

This chapter discusses plant species known to be present at Warm Springs which are considered rare by the California Native Plant Society, but which are not listed under the State or Federal Endangered Species Acts. Federal endangered Contra Costa Goldfields are discussed in Section 4.1.

Five non-listed rare plant species are known to be present at Warm Springs, including San Joaquin spearscale (SJSS; *Extriplex joaquiniana*, CNPS List 1B.2), Congdon's tarplant [CTP; *Centromadia (formerly Hemizonia) parryi ssp. congdonii*, CNPS List 1B.2], alkali milk-vetch (AMV; *Astragalus tener var. tener*, CNPS List 1B.2), prostrate navarretia (*Navarretia prostrata*, CNPS List 1B.1), and Hoover's button celery (*Eryngium aristulatum var. hooveri*, CNPS List 1B.1).

This is the second year we do not conduct the rare plant surveys we were doing since 2012 for SJSS, CTP, and AMV. During the complex-wide conservation prioritization process we identified that due to resource and personnel time shortage, surveys that do not directly relate to management have to be discontinued. While the rare plant surveys added to our knowledge of the plant community they were not informing our management in a direct way. For CTP, we should have a good sense of its presence at Warm Springs since it appears in several quadrats of the summer vegetation survey. Occurrence data for prostrate navarretia and Hoover's button celery generally appears in wetland vegetation data (Section 4.1) and in the Summer Vegetation Survey for the Hoover's button celery, a perennial species. Site-wide trends can be inferred from these data. For the AMV and SJSS we will no longer survey, but the staff will report these two species occurrences they spot during field visits associated with other tasks. In the future, we may partner with a non-profit organization or academic institution to perform more systematic surveys.

We spotted AMV in Pasture 3. A single individual of this species was located by the Botanist in Pasture 2.

A patch of at least 80 SJSS plants was found in mid-July, in Pasture 3, between pools 3-11 and 3-12. Some other patches were found on the artificial burrows mounts in the same Pasture, south east of pool 3-21. The total number of these plants was counted 85.

5.0 GRAZING MONITORING

Grazing is one of the primary management tools for the biological resources within Warm Springs. Maintaining a rotation schedule and annual monitoring of residual dry matter (RDM) are necessary to provide data sufficient to inform the grazing management. The following sections report the results of RDM monitoring and stocking numbers for grazing year 2019, and provide recommendations for future grazing management.

5.1 MONITORING METHODOLOGY

5.1.1 CATTLE ROTATION

At the beginning of each grazing season at Warm Springs (October 1st through September 30th), a generalized grazing rotation schedule is discussed with the rancher. This schedule is a recommended outline for the timing and intensity of grazing in each pasture. Reducing the biomass of non-native grasses, particularly in the winter season and the fast growth period in the spring season, allows for increased rooting space, soil fertility, and sunlight for native annual forbs. Additionally, grazing reduces thatch accumulated in the dry season, thereby providing favorable microhabitat conditions (e.g. bare ground) for seed germination of native annual forbs, particularly vernal pool species such as CCG, as discussed in a study report for work done at Warm Springs (WRA 2011). This study demonstrated a positive correlation between high-intensity grazing from October through February and CCG counts (R-value: 0.47). These findings reinforce the assumption that high-intensity grazing prior to CCG bolting and blooming, immediately followed by a steep reduction in grazing intensity, increases the number of CCG blooms (WRA 2011).

To monitor the stocking rate during each grazing year throughout the pastures, an Excel table is used to calculate the animal unit equivalents (AU) for each herd type (e.g. heifer, bull) based on an average dry forage consumption of 900 pounds per month. Information on specific types and numbers of cattle are acquired from the cooperative rancher and entered into the table. Sums are then updated, and cattle can be rotated when a pasture appears close to target RDM levels based on observations of the fields.

The cattle rotation schedule (i.e. daily calculations of herd location) is a useful tool for the refuge manager and cooperative rancher to track cattle numbers and specific pasture needs and utilization throughout the year. Although this table tracks stocking rates per field, the Refuge is no longer setting a "target stocking number" at the onset of the grazing season as it has in the past. The reasoning for this is discussed further in section 5.2.4. However, we will have a general idea of grazing need for each field based on the previous grazing season's utilization as well as weather and forage conditions throughout the year. The cooperative rancher also utilizes direct experience with the cattle and forage in cattle rotation decisions. Close coordination with the rancher, timely

updates to the table, and frequent (at least monthly) visual assessments can ensure that cattle are rotated when and where they are most effective for management of the resources at Warm Springs.

5.1.2 RESIDUAL DRY MATTER MONITORING

RDM measurements for Warm Springs utilize the clip plot method (below). RDM samples are taken at the end of the growing season and prior to the first rains, typically around the last week of September through the first week of October. A total of 57 clip plot samples are taken annually at fixed locations (Figure 44). These locations are distributed across Warm Springs, with each sample location representing 10-20 acres of grassland.

The clip plot method is a standard RDM monitoring procedure. It involves clipping, drying, and weighing all vegetation within a 0.96-foot^2 circular hoop placed in a grassland area. All of the above-ground vegetation within the hoop is clipped to approximately ¼ inch in height, and the clippings are placed in a paper bag. Woody vegetation is not included. All bagged samples are retained and air dried in a warm location, such as the Refuge greenhouse, for a period of 7-14 days. The contents of the samples are then weighed to the nearest tenth of a gram using a digital analytical scale. Weights are multiplied by 100 to arrive at an estimate of pounds/acre RDM[1]. Results of the RDM analysis will be used to adjust grazing rates and target stocking rates as needed.

Photo points are also utilized for continued monitoring of Warm Springs, using 17 pre-established points located at water troughs (Figure 45). Photo points are a valuable method of recording change over time in relation to a continual management regime such as grazing. Repeated photos taken in the same location over time provide visual data on the long-term effects of cattle grazing. The orientation of each photo point is described in Table 14. Photographs are taken at these points once per year, at the end of the growing season, during RDM monitoring (Section 5.2.3).

[1] The use of a 0.96-foot^2 hoop allows the use of a standard empirical range science formula for RDM that utilizes material weight in grams multiplied by a factor of 100 to calculate pounds per acre RDM (RDM in pounds per acre = dried clip plot weight in grams x 100).

Figure 44. Residual Dry Matter (RDM) Collection Points at Warm Springs.

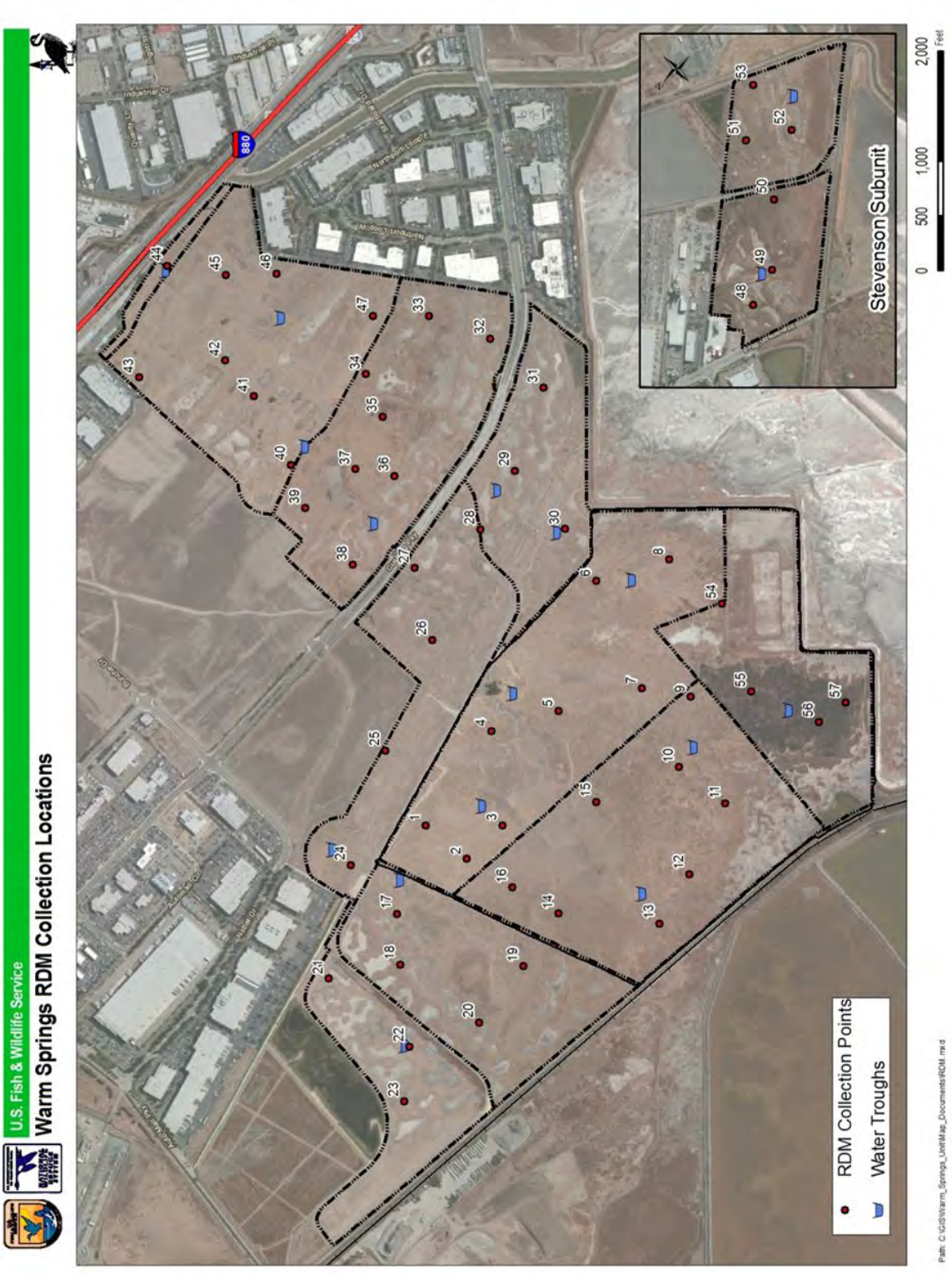


Figure 45. Location and Direction of Photo Points at Warm Springs.

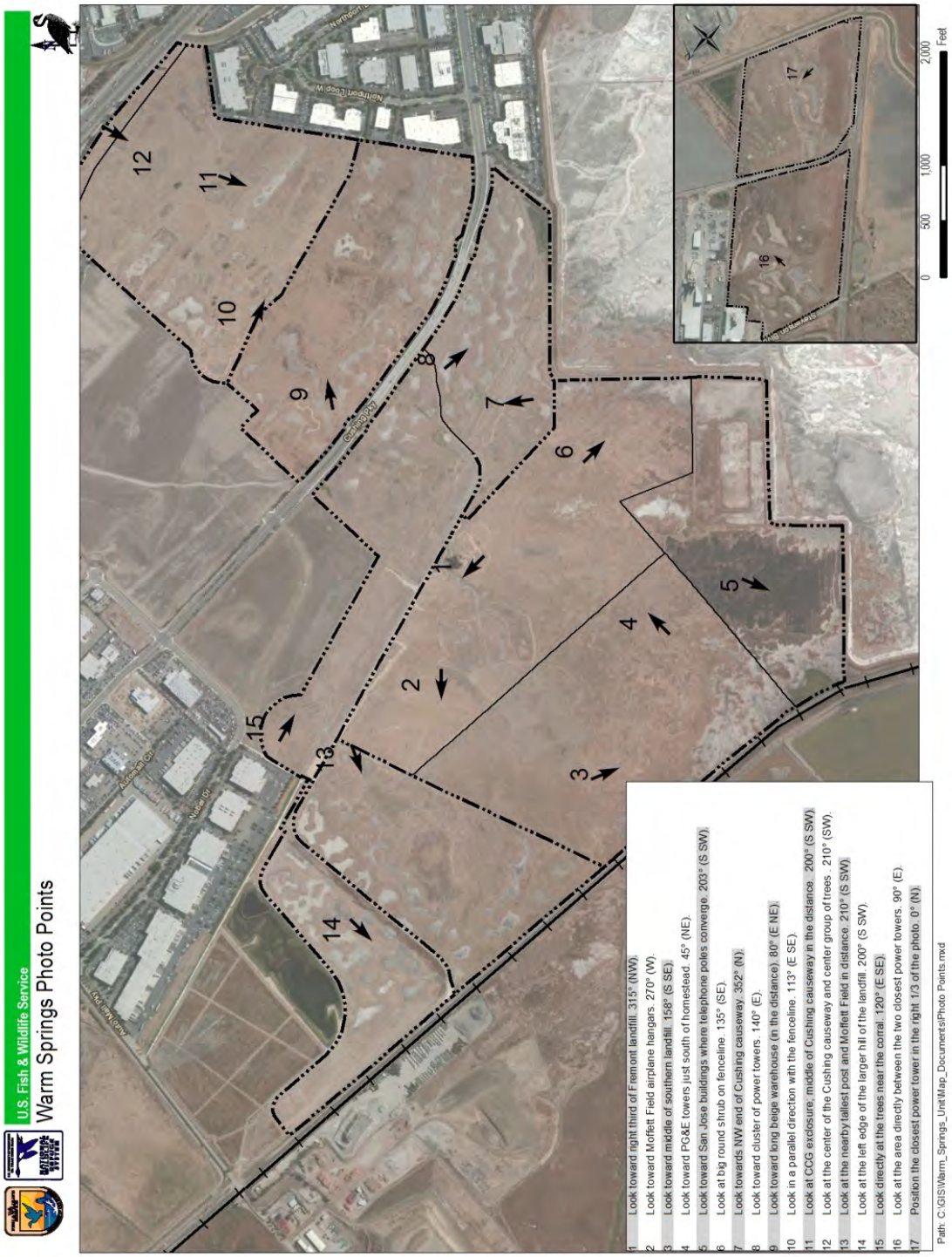


Table 14. Orientation of Warm Springs photo points.

Photo Point	Pasture	Orientation
1	1	315° (NW). Look toward right third of Fremont landfill.
2	1	270° (W). Look toward Moffett Field airplane hangars.
3	2	158° (S SE). Look toward middle of southern landfill.
4	2	45° (NE). Look toward PG&E towers just south of homestead.
5	10	203° (S SW). Look toward San Jose buildings where telephone poles converge.
6	1	135° (SE). Look at big round shrub on fence line.
7	5	352° (N). Look towards NW end of Cushing causeway.
8	5	140° (E). Look toward cluster of power towers.
9	6	80° (E NE). Look toward long beige warehouse (in the distance).
10	7	113° (E SE). Look in a parallel direction with the fence line.
11	7	200° (S SW). Look at CCG exclosure; middle of Cushing causeway in the distance.
12	7	210° (SW). Look at the center of the Cushing causeway and center group of trees.
13	3	210° (S SW). Look at the nearby tallest post and Moffett Field in the distance.
14	4	200° (S SW). Look at the left edge of the larger hill of the landfill.
15	5	120° (E SE). Look directly at the trees near the corral.
16	8	90° (E). Look at the area directly between the two closest power towers.
17	9	0° (N). Position the closest power tower in the right 1/3 of the photo.

5.2 2019 MONITORING RESULTS

5.2.1 CATTLE ROTATION RESULTS

Table 15 summarizes the field carrying capacity, actual stocking rate, and the rotation schedule for Warm Springs in the 2019 grazing season. The grazing schedule is intended to vary rotation between pastures annually to allow a different set of pastures to receive the beneficial effects of grazing during the slow growth and fast growth seasons at least once every few years.

At the end of the 2018 grazing year (using averages from 2007-2018), a grazing target was developed based on the carrying capacity, adjusted by observed RDM and available forage estimates from Warm Springs. However, in 2019, the actual herd size was 88, which was a 10% decrease from the 98 animal units in 2018 and much lower than our target stocking rate going into the season. Although we had planned to increase the herd size in 2019, forage conditions on the ground led to a slight decrease instead. In 2019, there was above average rainfall for the year as a whole, but the beginning of the rainy year (October through January) was below average rainfall and affected grass production for the year (Becchetti, 2016). Because the year started out dry, the herd size was not increased and it was appropriate in the end as the carrying capacity was low in 2019.

Refuge staff noticed that over the last few years, target stocking rates (based on averaging carrying capacity through the years) have tended to be higher than what is needed to achieve target RDM levels. Target stocking rates have been used as guidelines, but in practice the Warm Springs manager works with the cooperative rancher to make adjustments mid-season to adapt to field conditions. Nevertheless, this observation led staff to initiate discussions with an NRCS grazing expert, Ling He (personal communication 2020), and to conduct further literature review on forage production. Ling He advised us that using average carrying capacity to set target stocking rates is not appropriate due to the high variability in forage production. Forage production and thus carrying capacity in California grasslands exhibit high annual variation due to annual weather conditions (Becchetti et al 2016). As a result of these conversations and research, Refuge staff will no longer be setting "target stocking rates" at the beginning of the season. We will, however, continue to calculate actual annual carrying capacity in order to interpret RDM and grazing data.

Table 15 has been modified to replace "target stocking rate" with actual calculated carrying capacity of the field for grazing year 2019. "Percent of target stocking rate" has been replaced with "Percent of Field Carrying Capacity." This provides a more accurate measure of whether each field obtained the appropriate level of grazing in 2019. Biomass left on the ground from the previous season (RDM) must also be taken into account in interpreting the results. In 2019, fields 4 and 5 appeared to have received too much grazing. Both fields were within target RDM range at

the beginning of the season, so they did not have additional biomass available. Most of the rest of the fields were grazed in the 80-150% range except Field 9 which was only grazed at 68%.

Adaptive grazing management allows for the refuge manager and cooperative rancher to reduce or rotate animals in-season as needed based on visual observations of the fields. This will allow us to protect the natural resources from over-grazing (e.g. trampling, soil compaction), or to increase the size of the herd to meet desired ecological parameter values. There are always constraints to scheduling based on logistics (cows need to be near the corral when calving), herd groupings (number and size of herds), as well as annual variation in forage production. Priority will be given to ensuring that Pastures 2 and/or 7 receive optimally timed grazing for CCG (grazing in winter; light or no grazing in early spring), and that several pasture are grazed in the late winter/early spring for BUOW nesting habitat (Pastures 1, 2, and 3, were the focus for 2019.

Table 15. Grazing in Warm Springs during the 2019 grazing season.

Pasture	2019 Field Carrying Capacity (AUM)	Grazing Season: October to September Actual Stocking Number 2019: 88 AU												2019 Actual Stocking Rate (AUM)	% of Carrying Capacity
		OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP		
1	183	0.0	2.3	17.0	13.6	14.0	14.0	13.0	13.0	13.0	13.0	13.9	20.0	148.7	81
2	112	14.6	10.2	0.0	24.9	38.6	22.9	8.7	0.0	0.0	0.0	1.7	11.7	132.9	119
3	65	13.0	11.3	0.0	0.0	5.4	9.8	7.5	9.0	1.5	5.9	6.8	6.8	78	120
4	14	0.0	1.7	13.0	1.3	5.9	7.4	6.8	6.8	6.8	0.9	0.0	1.3	52.3	373
5	53	0.0	0.0	0.0	6.0	3.6	11.3	24.0	20.0	20.0	20.0	17.4	0.0	124.6	237
6	82	23.3	22.5	21.1	14.0	2.5	4.8	14.2	0.0	0.0	0.0	0.0	15.3	119.5	146
7	208	24.3	23.5	23.0	14.8	13.4	14.3	0.0	18.7	30.5	30.5	30.5	15.3	243.0	117
8	119	0.0	7.2	12.0	12.0	12.0	12.0	12.0	8.3	6.0	6.0	6.0	6.0	100.6	84
9	69	8.8	8.8	8.8	8.8	2.9	1.3	1.3	1.3	1.3	1.3	1.3	1.3	47.5	68
10	20	3.8	4.5	0.0	0.0	0.0	0.6	3.8	2.2	1.3	1.3	1.3	1.1	20.1	100
Total AU	76	87.7	92.0	94.8	95.4	98.3	98.4	91.1	79.2	80.3	78.8	78.8	78.6	1067.1	115

Flower schedule for protected and target weed species	
Contra Costa goldfields	**********
broadleaf pepperweed	**********
black mustard	**********
stinkwort	********** **********

5.2.2 RESIDUAL DRY MATTER MONITORING RESULTS

Figure 46 presents the average residual dry matter (RDM) measurements by pasture for 2019. Figure 47 presents the RDM indicator scale that Refuge staff developed as part of the Natural Resource Management Plan. The RDM bar graph colors in Figure 46 are displayed based on the indicator scale value for each pasture. Five fields were within target range and therefore "very good" on the scale, one field was close to target and was "good", three fields were "fair", and two fields were overgrazed and scored "poor". The overall goal for RDM is to achieve a "Very good" in 7 out of 10 fields and a minimum of "fair" in the rest. We did not achieve this goal in 2019.

Table 16 and Figure 48 summarize the overall RDM measurements for Warm Springs in the grazing seasons between 2010 and 2019. Warms Springs experienced a decrease in RDM between 2018 and 2019, from an average of 1747 pounds per acre to an average of 1264 pounds per acre.

Some pastures had similar RDM as last year (Pastures 1, 3, and 7), most had much lower RDM, and only one had a higher RDM value (Pasture 10). Five pastures were at or near target RDM levels in 2019. Pastures 4 and 5 were overgrazed and Pastures 8 and 9 were higher than target levels. Pastures 8 and 9 form the Stevenson Unit and together these fields are managed as lower priority for grazing due to the relative lack of native vernal pool vegetation and no California tiger salamander or burrowing owl use.

Overall, RDM is at target levels and has declined over the last few years. During the drought period of 2012-2014, the herd size was reduced by over 40% to a low of 76 Animal Units in 2015, and RDM levels were low due to the lack of rainfall. Normal to wet rainfall patterns resumed in 2015, consequently grass production increased, and the Refuge worked with the rancher to increase the herd size to keep up. It takes time to increase numbers to catch up so RDM was relatively high in 2015-2017. RDM began approaching target levels in 2018 despite not achieving target stocking rates because it was a dry year. In 2019, we did not achieve "target" stocking rates, but RDM is generally on target or low. 2019 was an above average rainfall year but it was below average during our typically wettest months of December and January. We had planned to further increase the herd size in 2019 but instead numbers went down by 10% due to conditions on the ground. The negative consequences of over-grazing are considered worse than under-grazing, so our bias will be toward being conservative with stocking rates and grazing management. Given that there was low to moderate RDM left on the ground at the end of 2019, we will be conservative in increasing herd size in 2020 if at all. In reviewing the last 15 years of data from Warm Springs and further researching carrying capacity while writing this report, we found that there is very high annual variability of grass production in California grasslands leading to high variability in annual carrying capacity. This variation is primarily influenced by timing and

amounts of rainfall as well as temperatures during the fall and winter (Becchetti et al. 2016, He 2020). This will be discussed further in Section 5.2.4.

The target RDM range is between 1,000 and 1,500 pounds per acre. The range allows for annual variation in rainfall and greater logistic flexibility to rotate several herds of cows among ten pastures without overgrazing any particular pasture.

Figure 46. Average RDM by Pasture in 2019.

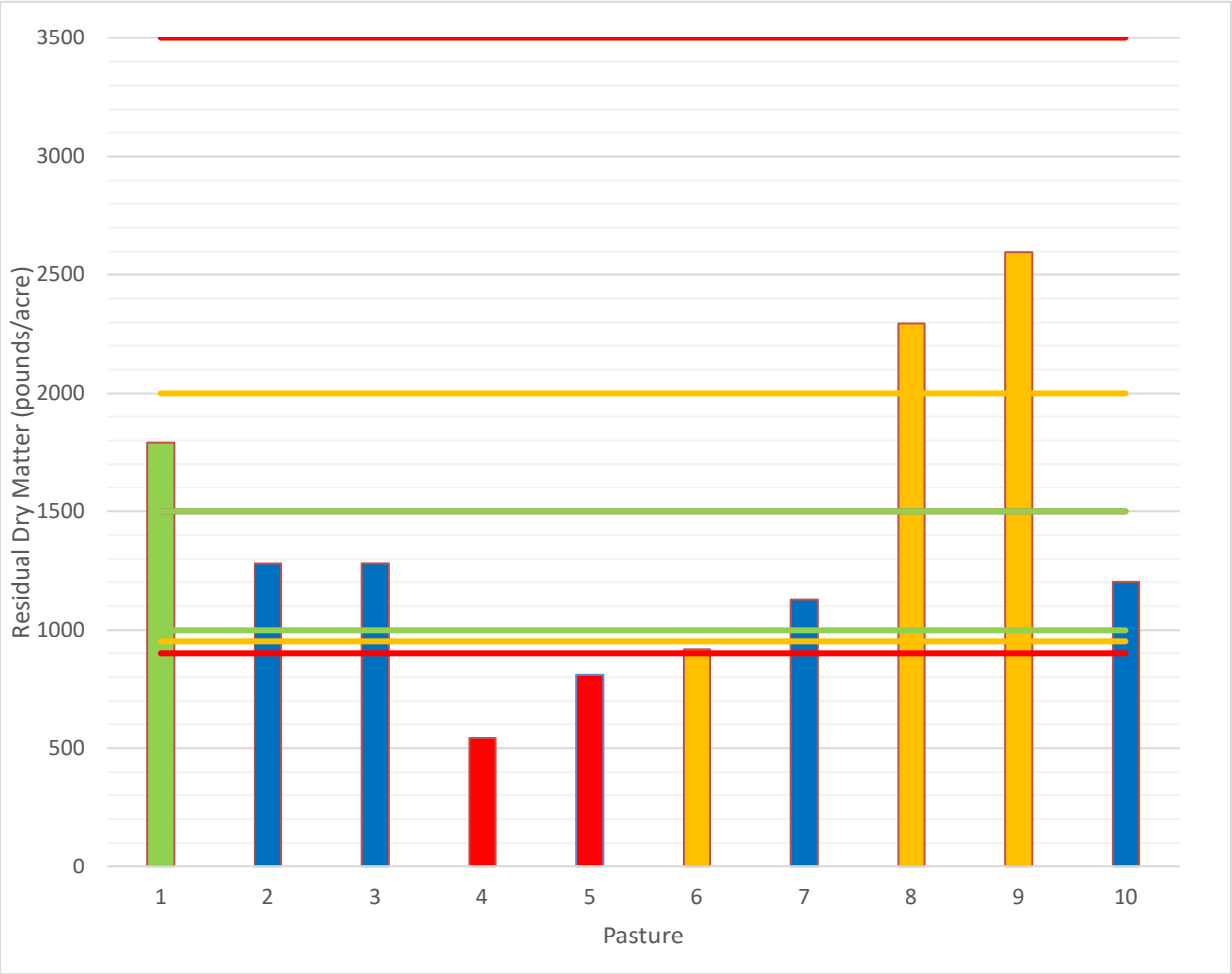


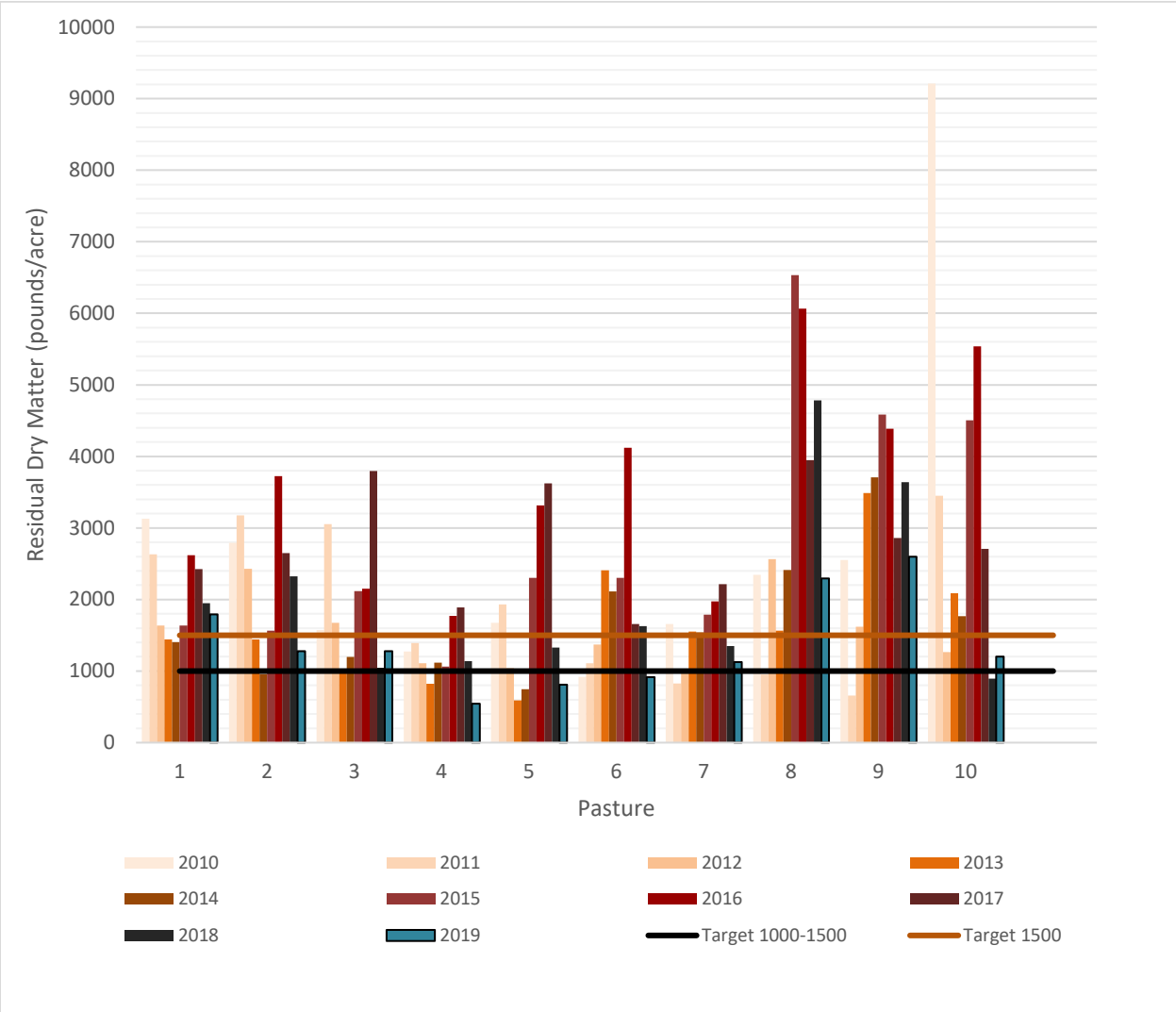
Figure 47. Grassland vegetation structure and composition indicator scale for RDM

Indicator	Poor	Fair	Good	Very Good
Residual dry matter (lb./acre) at the end of the growing season	>3500	2001-3500	1501-2000	1000-1500 lb./acre
	or	or	or	
	<900 lb./acre	900-949 lb./acre	950-999 lb./acre	

Table 16. Residual dry matter data, 2010-2019. Target range is between 1000-1500 pounds per acre. Average RDM is weighted by pasture acreage.

Pasture	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
1	3131	2634	1638	1444	1405	1635	2618	2426	1950	1791
2	2794	3178	2428	1444	957	1566	3726	2651	2325	1279
3	1574	3053	1675	1003	1199	2118	2151	3797	1045	1279
4	1274	1391	1109	824	1116	1064	1771	1889	1139	543
5	1672	1934	1040	590	746	2303	3315	3622	1328	810
6	921	1107	1370	2410	2113	2301	4120	1657	1626	917
7	1656	828	1016	1551	1541	1787	1975	2216	1350	1128
8	2343	954	2565	1563	2412	6533	6064	3947	4782	2296
9	2553	657	1619	3490	3707	4583	4385	2860	3640	2597
10	9212	3449	1265	2087	1769	4506	5539	2708	893	1202
Average	**2852**	**2253**	**1528**	**1491**	**1453**	**2382**	**3327**	**2720**	**1747**	**1264**

Figure 48. Average Residual Dry Matter by Pasture 2010-2019.



5.2.3 PHOTO POINT RESULTS

Figure 49 contains photos that are representative of grazing observations at the end of the growing season. The photos were taken between October 2-3, 2019.

Figure 49. 2019 Grazing Photo Point Photographs. Photographs are organized by pasture.



Photo Point 1 (Pasture 1)



Photo Point 2 (Pasture 1)



Photo Point 6 (Pasture 1)



Photo Point 3 (Pasture 2)



Photo Point 4 (Pasture 2)



Photo Point 13 (Pasture 3)



Photo Point 14 (Pasture 4)



Photo Point 7 (Pasture 5)



Photo Point 8 (Pasture 5)



Photo Point 15 (Pasture 5)



Photo Point 9 (Pasture 6)



Photo Point 10 (Pasture 7 on left, 6 on right)



Photo Point 11 (Pasture 7)



Photo Point 12 (Pasture 7)



Photo Point 16 (Pasture 8)



Photo Point 17 (Pasture 9)



Photo Point 5 (Pasture 10)

5.2.4 CATTLE ROTATION, RDM, AND PHOTO POINT DISCUSSION

In analyzing the grazing data this year, questions arose about carrying capacity calculations and this led staff to initiate discussions with an NRCS grazing expert Ling He (personal communication 2020) and to conduct further literature review on forage production. Ling He advised us that target stocking rates are usually calculated to determine how many animals to initially put on a site and to plan for the initial few years. Estimates of forage production based on NRCS models can be used to set initial stocking numbers. After the first few years, typically, animal units are adjusted up or down based on the previous year's RDM, weather patterns in the fall, and visual assessments throughout the year. Landowners work with the rancher to look at how the last year's stocking rate went and whether RDM at the end of the season was within targets, then plan to adjust up or down, while continuing to adjust based on annual forage production. In the long run it is not appropriate to use an average carrying capacity to calculate target stocking numbers due to the substantial annual variation in forage production. Therefore, our approach will be to no longer calculate a fixed target stocking range. Instead we will continue to be flexible and rely on conditions on the ground in addition to the previous year's RDM values to guide planning. In practice, the Refuge has always worked with the cooperative rancher to make decisions based on assessing conditions on the ground, regardless of the target we had set. We will continue to calculate the annual carrying capacity in order to interpret the grazing management actions and the resulting RDM values each year.

Table 19 summarizes precipitation, RDM, and stocking rates at Warm Springs from 2007 to 2019. Data from 2005 and 2006 have not been included because those were the first years of full grazing and inclusion of these data would skew the averages. The values of actual stocking rate and carrying capacity (AUM/acre) were adjusted slightly this year to more accurately reflect acreage of fields available for grazing. Acreage from pool centers and salt pannes was removed from acreage totals. Carrying capacity calculations are included in Appendix VI.

Table 19 illustrates that annual calculated carrying capacity at varies dramatically. At Warm Springs, carrying capacity has shown dramatic variation over the last 12 years, from a low of 1.57 AUM/acre to a high of 3.80 AUM/acre, which represents more than a doubling of the stocking rate. A substantial amount of variation in forage production is based on annual climatic patterns, including seasonal rainfall totals, fall rainfall amounts, temperatures, and date of "break of season." Break of season is a measure of when the grass starts growing in the fall and is defined as the first fall rains that exceed 0.5 inches during a one-week period. (Becchetti et al. 2016).

In 2019, the calculated carrying capacity of 1.57 AUMs per acre was the lowest number ever recorded at Warm Springs which means that forage production was very low this year. The low

carrying capacity in 2019 explains why RDM was generally at or below target levels even though the stocking rate was fairly low. Several factors may have caused low forage production in 2019, despite the above average precipitation. First, there was a late break of season in 2019. The timing of the break of season dramatically affects forage production (Becchetti et al. 2016). Generally, an early break in season means that grass has a longer opportunity to grow during the warmer and longer fall days before the winter comes and forage production will be relatively high (Becchetti et al. 2016). In 2019, the break of season was the latest on record (2007-2019), occurring on November 21, 2018. In addition, although precipitation was above average, it was below average during December and January, typically our rainiest months. Then in February and March, when rain resumed, temperatures were below average. March is generally the month of most rapid grass growth at Warm Springs. All of these climatic factors led to low forage production in 2019. By understanding these variables, we could have predicted in January that 2019 would have low productivity due to the late break of season and the below average rainfall in the early season. Indeed, the cooperative rancher understands forage production patterns and advised against increasing herd size in 2019.

As before, we will manage toward a higher RDM target to avoid the potentially deleterious effects that may occur if RDM drops below the lower end of the target range. At Warm Springs, this can be accomplished by setting an RDM target of 1,000-1,500 pounds per acre. This allows the refuge manager and the cooperative rancher with the flexibility to leave animals on the range in dry years as it is often difficult and economically undesirable to reduce a herd in mid-season. It is also important to note that overgrazing in dry years is more detrimental to range quality and natural resources than undergrazing in wet years. The overall goal for RDM is to achieve a "Very good" in 7 out of 10 fields and a minimum of "fair" in the rest. We did not achieve this goal in 2019, as only four fields were in the “very good” category and two fields were slightly overgrazed and in the “poor” category. Low forage production led to fairly low RDM numbers in some fields, although on average RDM was on target.

Table 19. Summary of precipitation, RDM, and stocking rates at Warm Springs from 2007-2019. Actual stocking rate and carrying capacity column values were adjusted this year to remove pool centers and salt pannes from acreage totals.

Year	Rainfall		Break of Season (First 0.5 inch rain within 1 week period)	RDM (lbs./acre)	Stocking Rates (AUM/acre)	
	inches	% of average			Actual	Calculated Carrying Capacity
2007	8.7	53%	8-Nov	2231	2.33	2.46
2008	10.4	63%	8-Oct	2010	2.28	2.26
2009	11.0	67%	31-Oct	1422	2.58	1.81
2010	15.5	94%	13-Oct	2858	2.56	3.19
2011	15.0	91%	20-Nov	2253	2.47	3.02
2012	13.1	80%	4-Oct	1528	2.46	2.49
2013	11.6	71%	22-Oct	1491	1.78	1.72
2014	7.8	48%	22-Sep	1453	1.64	1.54
2015	13.9	108%	19-Nov	2382	1.57	2.41
2016	12.9	100%	2-Nov	3327	1.91	3.80
2017	17.9	139%	15-Oct	2720	2.24	3.59
2018	9.6	75%	14-Nov	1747	2.02	2.29
2019	14.17	110%	21-Nov	1264	1.81	1.57
Average				**2052**	**2.13**	**2.47**

Table 20 presents recommended windows and intensity on a per pasture basis for grazing season 2020. For in-season pasture adjustments, it is especially important that moderate to high intensity grazing be achieved in the germination and slow-growth seasons (approximately September through February) in pastures containing CCG (2 and 7), followed by low intensity or no grazing in these areas in April and May during the peak blooming season. Regression analyses performed in previous years suggest that a strong correlation exists between this grazing regime and high CCG counts (WRA 2011). For this reason, Pasture 2 and 7, which have the largest CCG populations should be grazed in the winter of the 2020. In addition, only Pastures 8 and 9 (Stevenson) had high RDM, and these fields are typically used for heifers/steers or bulls as the fields are not contiguous with the rest of Warm Springs. Stevenson can be grazed more heavily in 2020 if needed, but this field is not used for cows and pairs, so usually does not get heavily grazed. Pasture 1 had a good amount of biomass left on the ground and can be grazed early in 2020.

Photo points taken in 2019 (Figure 49) give a visual interpretation of RDM, as they were taken at the same time as RDM measurements, although not at the same locations within the pastures. Photo points are biased toward lower than average RDM, since photos are taken while standing on the water troughs, and these are heavily grazed areas within the pastures. Photo points in 2019 generally agree with measured RDM. Pasture 1 (Photo Points 1, 2, and 6) photos show a good target range of RDM throughout the pasture although RDM measured slightly higher than target. Pasture 2 photos (Photo Points 3 and 4) show some patchiness in RDM but look generally close to target. Pasture 3 (Photo Point 13) displays low RDM in the foreground, but the background looks on target. The foreground also shows a salt lick which likely led to the lower RDM in that area. Measurements were on target. Pasture 4 (Photo Point 14) shows fairly low levels of RDM throughout the pasture, confirming the measurements. Pasture 5 (Photo Points 7, 8, and 15) also shows low RDM, with patchy unpalatable shrubs (*Bassia* and *Dittrichia*) showing. Pasture 6 (Photo Point 9 and 10) and Pasture 7 (Photo Points 10, 11 and 12) show at or near target levels of RDM which is how they measured as well. Pasture 8 (Photo Point 16) and Pasture 9 (Photo Point 17) show patchy slightly high RDM although they measured moderately high. Pasture 10 (Photo Point 5) appear to have moderately high RDM even though it measured on target. Overall, most pastures appeared to have RDM levels near target levels or below.

Table 20. Proposed grazing windows for grazing year 2020.

Pasture	Grazing Season: October 2018 to September 2019 Target Stocking Number (based on 2007-2018 average for 1,500 lbs./acre): 101-134 AU											
	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1												
2												
3												
4												
5												
6												
7												
8												
9												
10												

Legend:	
Low Intensity	
Moderate Intensity	
Moderate to High Intensity	

5.3 SERVICES-IN-KIND EXCHANGED FOR GRAZING

In 2012, a Cooperative Land Management Agreement (CLMA) (USFWS 2012) was completed between the Refuge and the cooperative grazer, Frank Imhof. The 2012 CLMA includes management of the Pacific Commons subunit (Pastures 3-9), which the Refuge began to manage in June 2012. The CLMA specifies grazing fees based on AUMs and services-in-kind that will be exchanged for grazing fees.

5.3.1 COOPERATIVE LAND MANAGEMENT AGREEMENT STRUCTURE FOR FEES AND WORK VALUES

The following information is taken from the 2012 CLMA for the Warm Springs Seasonal Wetland Unit (USFWS 2012).

Rental Rates (For Alameda County; Assessed December 2011)

Grazing	$15.00/AUM

Work Values

General maintenance work (fence repair, debris removal, weed control etc.) will be valued at $53.00/hour.

Heavy equipment use (mowing, seeding, firebreaks, tractor spray rig) will be valued at $95/hour.

Special maintenance work (labor for fence construction) will be valued at $7,550/mile.

In addition, we use an equipment rate of $12/hour for ATV use based on FEMA's schedule of equipment rates.

5.3.2 2019 ACCOUNTING OF SERVICES-IN-KIND EXCHANGED FOR GRAZING

A total of 1067 AUMs were grazed at Warm Springs in 2019.

1067 AUMs x $15/AUM = $16,005

Based on these calculations, Frank Imhof should have completed approximately $16,005 worth of Services-In-Kind as outlined in the Cooperative Land Management Agreement in exchange for the 2019 grazing period. In-kind services and reimbursements in 2019 totaled $18,796.16 (Table 21). This is higher than the amount required. There was a large project conducted in October and November 2018 to remove and replace grazing exclosure plots, so there were a lot of hours and heavy equipment work associated with that project.

Table21. Services-in-kind completed by cooperative grazer Frank Imhof from Oct. 2018 through September 2019.

Project	**Hours and Rate**	**Total**
October and November: Demolish and remove 4 existing grazing exclosures Haul away and dispose of materials Contruct 4 new grazing exclosures	 184 hours at $53/hour 40 hours at $95/hour	 $9752 $3800
Materials: 16 steel fence posts		$100.16
Spray thistles, mustard, pepperweed in June	8 hours at $53/hour	$424
Spray Dittrichia in August	32 hours at $53/hour	$1696
Garbage pickup throughout the year	48 hours at $53/hour	$2544
Equipment Rates ATV	40 hours at $12/hour	$480
Total		**$18,796.16**

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Avian Protection Plan
For External Distribution

PG&E's Program to Address Avian Electrocutions, Collisions, and Nesting Birds

Updated April 2018

Avian Protection Plan
For External Distribution

PG&E's Program to Address Avian Electrocutions, Collisions, and Nesting Birds

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Updated April 2018

Pacific Gas & Electric Company. 2017. *Avian Protection Plan for Public Distribution: PG&E's Program to Address Avian Electrocutions, Collisions, and Nesting Birds.* Public Version. Updated April 2018. Victor, CA.

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Acronyms and Abbreviations

AMM	Avoidance and Minimization Measures
APLIC	Avian Power Line Interaction Committee
APP	Avian Protection Plan
BGEPA	Bald and Golden Eagle Protection Act
CCS	California Condor Conservation Strategy
CDFW	California Department of Fish and Wildlife
ECP	Eagle Conservation Plan
GPS	Global Positioning System
HCP	Habitat Conservation Plan
kV	kilovolt
MBTA	Migratory Bird Treaty Act
MOU	Memorandum of Understanding
NBMP	Nesting Bird Management Plan
PG&E	Pacific Gas and Electric Company
RCZ	Raptor Concentration Zone
USFWS	U.S. Fish and Wildlife Service

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Chapter 1
Introduction

1.1 Introduction and Corporate Policy

PG&E is committed to being an environmental leader. Our environmental policy reflects our environmental commitment and challenges us to find ways to produce, deliver, and use energy as safely and sustainably as possible. It is our policy to:

- Comply fully with the letter and spirit of all applicable environmental laws and regulations;
- Maintain an environmental management system that (1) fosters environmental excellence and innovation, (2) ensures that regular independent reviews of all environmental aspects of our business are conducted through a risk-informed process, (3) train all employees on applicable environmental requirements and the importance of environmental leadership to achieving our vision, and (4) strives for continuous improvement;
- Lead by example and reduce our impact on the environment by delivering clean energy, building more sustainable and climate-resilient facilities, and serving as responsible stewards of land, wildlife and cultural resources;
- Proactively engage with our customers to help them use less energy and better manage their energy footprint;
- Advocate for public policies that create greater environmental benefits while balancing the needs of our customers, communities and shareholders;
- Partner with our stakeholders as we strive to meet our environmental commitment; and
- Publicly communicate our progress and performance.

As one component of PG&E's environmental commitment, PG&E has developed this Avian Protection Plan (APP) to address key issues surrounding impact avoidance, management, and conservation of avian species as related to PG&E's operations and maintenance activities.

1.2 Document Organization

This Avian Protection Plan (APP) is organized as follows:

- Chapter 1, *Introduction*, provides background information for the development, implementation, and the goals of the APP.
- Chapter 2, *Risk Assessment and Risk Reduction*, provides an overview of the risk assessment approach, as well as a summary of the proactive and reactive steps taken to prevent avian electrocutions and collisions. It also provides an overview of PG&E's approach to nesting bird management plan.
- Chapter 3, *Training, Permits, Quality Control and Reporting*, provides an overview of the training conducted for PG&E employees and contractors, permits held by PG&E, the quality control process to ensure that the APP is effective, and a summary of reporting requirements.

- Chapter 4, *Avian Enhancement, Outreach, and Research Programs*, provides an overview of the programs and partnerships PG&E engages in and funds to support habitat restoration or other enhancements for birds. It also describes efforts to promote avian protection and conservation, including support of bird research.
- Chapter 5, *References Cited*, provides a list of sources used in preparing this plan.
- Appendix A, *Public Awareness Program*, contains a publicly distributed brochure explaining PG&E's *Avian Protection Plan* and links to information on PG&E's website.
- Appendix B, *Avian Protection Plan Field Guide*, contains a quick reference guide about PG&E's APP for employees who work in the field.

1.3 Background and Purpose

Birds may be affected by a variety of activities, including activities associated with the construction, operation, and maintenance of electric, natural gas, and power generation infrastructure. PG&E's service territory stretches from Eureka in the north to Bakersfield in the south and from the Pacific Ocean in the west to the Sierra Nevada in the east, in addition to gas transmission pipelines in the Mojave Desert. The service area spans more than 74,000 square miles in 48 of California's 58 counties and is home to many wildlife species and important natural communities. The service area contains habitat for more than 300 species of migratory birds that live in northern and central California either permanently or seasonally, and for the numerous waterfowl that migrate in the Pacific Flyway corridor.

Birds often use utility poles, transmission towers, and power lines for perching, hunting, and nesting because these features are often the highest and most prominent points in the landscape. Birds that come in direct contact with electric current while also touching a grounded element of a facility may be electrocuted, resulting in injuries or death (Figure 1). These electrocutions, in turn, may result in electric outages and fires. Bird collisions with facilities include strikes with wires (transmission and distribution lines), with most collisions occurring with the smallest diameter wires and typically mid-span of the line (i.e. these wires are typically the shield wire located above the phase conductors on transmission lines or the phase conductor and neutral wires on distribution lines). If issues arise, the APP program manager, in conjunction with company biologists, investigates the situation, assesses the methods to deter and prevent future occurrences, and prescribes the measures needed to avoid and minimize impacts. Ongoing PG&E maintenance activities, including vegetation management activities, may also affect birds. Nest abandonment can result directly or indirectly from nearby disturbances, depending on the timing, duration, and extent of the work performed.

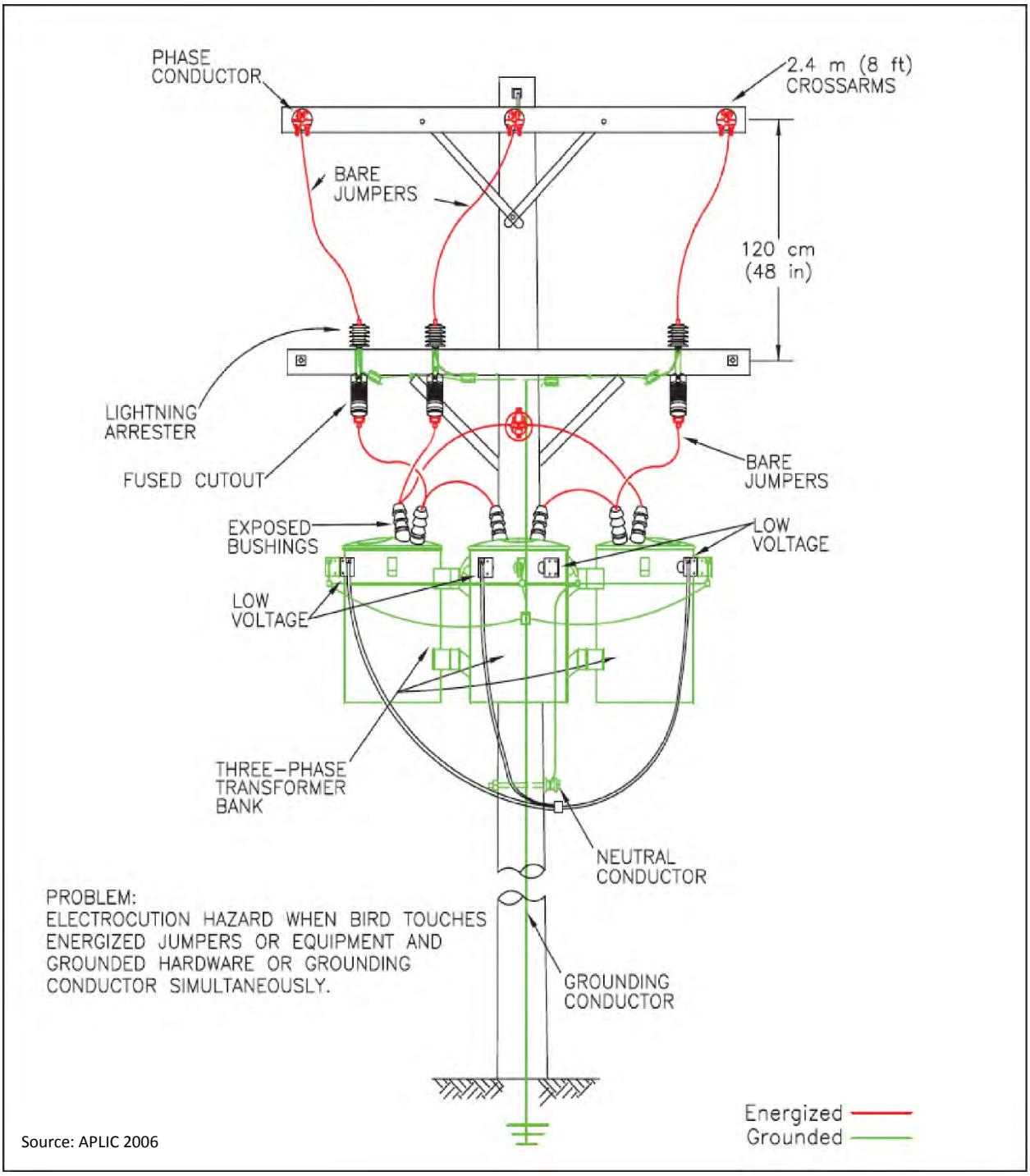


Figure 1. High-risk pole showing the locations where perching birds are vulnerable to electrocutions.

This plan is intended to describe PG&E's efforts to avoid and reduce electrocutions and collisions of birds with electric facilities, and to avoid and minimize impacts on nesting birds from PG&E's maintenance activities. PG&E's APP has evolved over many years and some of the key dates related to the program are described in Table 1.

Table 1. Summary of Key Events Related to Avian Protection Plan Development and Implementation

Year	Key Event
1989	Avian Power Line Interaction Committee (APLIC) established; PG&E is a cofounder.
1994	PG&E and U.S Fish and Wildlife Service (USFWS) enter into a settlement agreement regarding raptor fatalities and pole retrofitting.
1995	PG&E responds to requirements of 1994 settlement agreement.
2002	PG&E develops Raptor Concentration Zone (RCZ) maps and begins implementing pole retrofit program.
2003-2004	PG&E works with APLIC to develop APP guidelines.
2005	APLIC and USFWS provide guidelines to all utilities on APP development.
2006	APLIC issues *Suggested Practices for Avian Protection on Power Lines: The State of the Art in 2006*.
2007	PG&E adopts comprehensive APP as a *Utility Standard*. Settlement agreement with USFWS expires and PG&E continues implementation of retrofitting program. Bald eagle delisted.
2008	PG&E revises and expands RCZ maps. PG&E initiates condor conservation strategy.
2012	USFWS releases *2012 Final Land Based Wind Energy Guidelines* and proposed Eagle Rule. PG&E begins developing Eagle Conservation Plan (ECP). PG&E develops its *Nesting Bird Management Plan*. APLIC issues *Reducing Avian Collisions with Power Lines: State of the Art in 2012*.
2013	PG&E updates standards and procedures including its *Raptor Safe and Wildlife Protection* standards. Eagle Rule revised.
2015	PG&E updates its APP.
2016	Eagle Rule revisions.
2018	PG&E updates its APP.

PG&E finalized its APP in 2007 to better protect migratory, threatened, and endangered birds while improving safety and reliability for its customers. As policies and science evolve, and as PG&E monitors the plan's effectiveness, PG&E will continue to improve the plan to address current issues and trends.

In conjunction with the electric transmission standards team, the APP program manager is responsible for providing oversight, implementing an effective quality assurance program to assess compliance with the APP, establishing the overall program approach and annual work plan, procuring necessary funding, identifying training needs, establishing reporting criteria and

structure, and serving as the central point of contact with resource agencies involved in avian protection.

The primary objective of this APP is to provide a description of all approaches, based on accepted practices of wildlife management to 1) reduce avian electrocutions and collisions with electric facilities and 2) to avoid and minimize impacts of PG&E activities on nesting birds. Implementation of this plan allows for consistent application of avoidance and minimization measures (AMMs) for birds across PG&E's service area and for compliance with state and federal laws and regulations protecting birds.

According to the Avian Power Line Interaction Committee (APLIC), an APP is a utility-specific program designed to reduce the operational and avian risks that result from avian interactions with electric utility facilities. Although each utility's APP may vary, the overall goal of any APP should be to reduce avian mortality. In 2005, APLIC and the U.S. Fish and Wildlife Service (USFWS) jointly released Avian Protection Plan Guidelines. The guidelines provide a framework along with principles and examples to aid utilities in APP development. Although not all APP elements may be included in every APP because of specific utility circumstances or geographical area, these guidelines represent an overview of elements that should be considered for inclusion in an APP. PG&E's APP follows these guidelines. An APP should be a "living document" that is evaluated and modified over time to improve its effectiveness.

Avian Power Line Interaction Committee

The Avian Power Line Interaction Committee (APLIC) leads the electric utility industry in protecting avian resources while enhancing reliable energy delivery. APLIC works in partnership with utilities, resources agencies and the public to:

- Develop and provide educational resources
- Identify and fund research
- Develop and provide cost-effective management options, and
- Serve as the focal point for avian interaction utility issues

The following components are encouraged by APLIC to be included in an APP, all of which are included in PG&E's APP:

- **Corporate Policy** identifying the company's commitment to work cooperatively toward the protection of migratory birds.
- **Training** for all appropriate utility personnel on company APP policies and procedures.
- **Permits**, both federal and state, that may be required for nest management, incidental take, or listed species recovery or management.
- **Construction Design Standards** for avian protection that meet or exceed APLIC recommendations.
- **Nest Management Procedures** for nests that may pose fire or safety risks, as well as methods for installing nest platforms.
- **Avian Reporting System** to track bird mortalities, remedial actions, and nest management.
- **Risk Assessment Methodologies** to aid in the identification of avian mortality risk areas.
- **Mortality Reduction Measures** that can be implemented to minimize bird electrocution and collision risks.
- **Avian Enhancement Options** to benefit bird populations or habitat.

- **Quality Control Methods** to monitor and improve APP effectiveness and efficiency.
- **Public Awareness Efforts** to educate the public about avian/power line issues and solutions.
- **Key Resources**, both internal and external, that are integral to successful APP implementation.

1.4 Objectives of the APP

The APP is intended to ensure compliance with legal and regulatory requirements while improving system reliability and reducing overall avian mortality. PG&E employees are responsible for managing bird interactions with power lines and are committed to reducing the detrimental effects of these interactions. To fulfill this commitment, the APP is designed to do the following:

1. Ensure that company operations comply with applicable laws, regulations, permits, and PG&E procedures.
2. Ensure that company operations follow APLIC recommendations and guidance.
3. Work cooperatively and collaboratively with state and federal wildlife agencies.
4. Provide annual training to targeted staff and contractors on how to implement the APP.
5. Document avian mortalities, high-risk poles and lines, and nests with risk to nesting pairs or infrastructure operations.
6. Construct all new or rebuilt facilities in Raptor Concentration Zones to current avian-safe standards.
7. Retrofit or modify power poles reactively where a raptor or other large bird has been injured or killed.
8. Participate with public and private organizations in programs and research to reduce the detrimental effects of avian interactions with power lines.
9. Prepare an annual plan summarizing the yearly strategy to fulfill the key APP components.
10. Ensure that procedures describing a proactive retrofit program for utility poles are implemented with the goal of reducing avian electrocutions and collisions. This retrofit program includes annual evaluations and retrofits of high-risk poles throughout the service area using multiple variables described in Chapter 2, *Risk Assessment and Risk Reduction*.
11. Ensure that nest protection measures, including seasonal restrictions (i.e., limited operating periods) or exclusion buffers, are implemented in areas where PG&E undertakes projects and other maintenance activities near bird nests.

1.5 Avian Task Force

1.5.1 Overview

PG&E has an avian task force to coordinate the protection, mitigation, and conservation of birds in relation to PG&E's facilities, activities and lands. A primary goal of the task force is to oversee and guide implementation of the APP. Other goals include prioritizing future management actions, addressing other areas of risk, and supporting regional avian conservation efforts. The task force includes the APP program manager, management and staff from environmental management (i.e., principals and wildlife biologists that represent multiple lines of business), Law, and engineers from transmission and distribution departments. This diverse team helps ensure that biological, legal, and governance issues are addressed when implementing the APP. This task force is responsible for reviewing the APP and ensuring the governance structure is in place and that budget is secured to implement the APP.



Ferruginous Hawk

1.5.2 Program Manager

The APP program manager is responsible for implementation of the APP.

In addition, the program manager oversees and ensures that PG&E adheres to the guidelines and conditions of the U.S. Fish and Wildlife Special Purpose Utility Permit MB057942-0, administered by the USFWS Office of Migratory Birds. The APP program manager is responsible for reporting, as required by the Special Purpose Utility Permit, to the USFWS Office of Law Enforcement and Migratory Bird Permit Office. As part of the APP, the program manager is responsible for the following programs:

- **Training and Education.** The APP requires that the appropriate identified employees are trained on the permit conditions and other key elements of the program. Online training is provided for approximately 5,500 employees and contractors annually.
- **Avian Reporting System and Corrective Actions**. All birds found killed or injured because of electrocutions or collisions with PG&E facilities are required to be reported via a web-based reporting system. In the case of raptors, the incident pole and adjacent pole(s) will be retrofitted within 90 days. Other poles are also retrofitted for reliability and for concerns with high-profile species. The program manager is responsible for securing the necessary budget and ensures that work is completed in compliance with the APP. Managing budget includes establishing unit cost, geographic area division targets, and determining which area divisions will participate in the annual retrofit plans.
- **Avian-Safe Construction Design Standards.** The program manager works closely with the engineering and standards group to design facilities that meet industry guidelines for avian protection. This also includes development of new standards as necessary. In addition, any new ancillary equipment or facilities attached to power poles are evaluated for potential risks.

- **Risk Assessment Methodology and Retrofit Program.** The program manager is responsible for identifying, planning, and working with the area divisions and reliability group to proactively retrofit approximately 2,000 poles annually. As required for reliability and/or threatened or endangered species, annual retrofit work also targets high-risk transmission structures and substations.
- **Nest Management and Permit Compliance.** The program manager, in conjunction with PG&E biologists, is involved in developing project-specific measures to address nesting bird issues for various types of projects (gas, electric, facility, renewable). The program manager also takes the lead in discussions with the California Department of Fish and Wildlife (CDFW) and USFWS to discuss nesting bird issues.
- **Quality Control.** The program manager performs periodic division audits to assess compliance with the related standards, work procedures, and overhead construction techniques. Quality control audits also ensure that all bird incidents are reported to the regulatory agencies as required. This audit is completed by verifying electrical distribution and transmission outage data and correlating with bird incident reports on a monthly basis.
- **Avian Enhancement.** Certain species of birds may benefit from using utility structures. The program manager works closely with USFWS on protection projects to reduce bird mortality. This can be accomplished by installing bird flight diverters, or more commonly through installing bird nesting structures. The program manager also works to partner with environmental and conservation organizations as well as identify charitable contribution opportunities to nonprofit groups.

The APP program manager also responds to unusual situations that arise regarding birds. For example, the APP program manager maintains partnerships with not-for-profit wildlife rehabilitation groups that may care for injured birds or wildlife that are affected by electric facilities. PG&E works with the following groups to provide care for injured and orphaned wildlife resulting from encounters with PG&E facilities: Injured and Orphaned Wildlife, International Bird Rescue, WildCare, Lindsey Wildlife, U.C. Davis Raptor Center, and Wildlife Center of Silicon Valley.

1.5.3 Environmental Staff

As part of the avian task force, environmental management staff provides direction to the program based on state and federal laws, regulations, or policies, and direction from senior management. Environmental management staff participates in strategy and program development for the APP. Environmental management staff also participates in APLIC meetings and works to share the latest information with PG&E staff.



Killdeer

1.5.4 Biological Staff

Biological staff provides technical biological input for non-routine avian issues, such as study design, proposal development and review, data analysis and interpretation. Biological staff advises on technical biological issues affecting bird species, and participates in agency consultations as needed.

1.5.5 Line of Business Staff

The avian task force includes staff members from engineering within PG&E's transmission and distribution lines of business. Engineering staff provides input on the effectiveness of the APP as it relates to asset engineering design, maintenance, and operations. Assigned staff updates engineering documents, work procedures, and other materials to support avian program implementation. They also approve new methods and materials for use on electric transmission or distribution systems. Transmission and distribution representatives support implementation of the APP and provide guidance on what is working in the field.

1.5.6 Legal Staff

PG&E Law Department staff provides legal advice and counsel to the avian task force on various legal and regulatory matters. Law reviews implementation of the APP and regulations affecting bird species, including compliance with state and federal laws and PG&E's special purpose utility permit.

1.6 Avian Reporting System

PG&E trains field staff to identify and report avian mortalities and any other relevant avian concerns. Staff is directed to contact the APP program manager when there is a nesting bird, electrocution, collision, or other avian issue. The APP program manager maintains a comprehensive database of reported bird incidents and uses this information to help direct PG&E's avian risk reduction efforts. When a dead or injured bird is found, PG&E collects information on the date, location, type of bird, type of injury, where the bird was found in relation to PG&E facilities, photos (if possible), the equipment involved, and need for repairs. This information is used to plan retrofits and to identify and evaluate facility risk over time.



Swainson's Hawk

The APP program manager responds to incidents from the public when calls are received directly or through PG&E's general service hotline. PG&E has developed systems to standardize the reporting of avian fatalities including a detailed phone log, a script outlining responses and procedures based on the type of incident or issue experienced by the public, and an automatic notification process to ensure the APP program manager is aware of pressing issues related to avian management as reported by the public.

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Chapter 2
Risk Assessment and Risk Reduction

The APP is intended to ensure compliance with legal and regulatory requirements while improving system reliability and reducing overall avian mortality. Its primary components are risk assessment and risk reduction.

2.1 Retrofits

Avian-safe power pole retrofits reduce the potential for mortality from electrocution by reducing or eliminating the risk when raptors and other birds encounter energized components when landing on power poles. PG&E's Raptor-Safe Construction and Wildlife Protection guidelines specify construction methods and special materials used by PG&E to ensure retrofits are safe for birds and other wildlife. For example, protective coverings or guards are constructed such that birds, squirrels, and other wildlife are deterred or protected from contacting energized conductors. In addition, all power pole retrofits are completed using APLIC guidance (Avian Power Line Interaction Committee 2006).

As part of the proactive retrofitting process, careful attention is paid to high-risk poles, lines, and structures, including the following:

- Older and non-retrofitted equipment
- Riser, tap, and corner poles
- Locations where raptors are known to perch or nest
- Lines that traverse open fields, farmlands, orchards, or rolling hills with signs of ground squirrels (i.e., a high prey base) or that are near a body of water
- Poles or structures that are higher than the surrounding terrain, providing a vantage point from which raptors may perch

Reactive retrofits are made to poles or equipment that has electrocuted a raptor or other migratory bird. Avian electrocution also triggers a risk assessment of the five adjacent poles (or 1,000 feet of power line for 60- or 70-kilovolt [kV] wood transmission poles) in all directions away from the incident pole. Adjacent pole evaluations assess bird use, pole type, and habitat near the incident pole. On average, about five adjacent poles are retrofitted for every incident pole. Repairs to facilities with high risk to raptors and other birds are generally completed within 90 days of an electrocution on distribution facilities.

2.2 Risk Assessment – Proactive Retrofits

PG&E is committed to reducing avian mortality in a cost-effective manner by focusing efforts on the areas that pose the greatest risk to birds. PG&E considers areas with the highest avian use, established flyways, adjacent wetlands, and other information (e.g. electric equipment type, configuration, perceived risk of electrocution for larger birds) when assessing risk. Biological

assessments, outage investigations, and anecdotal evidence are also helpful in determining where potential incidents are most likely to occur.

PG&E's risk assessment for prioritizing proactive retrofits considers historical mortality data, facility nesting data, wildfire risk, and effectiveness of existing risk reduction efforts. To aid in visualizing where at-risk facilities are located, PG&E developed a detailed Raptor Concentration Zone (RCZ) map (Figure 2) that identifies areas where raptors are most likely to occur. The RCZ map is based on raptor mortality data, presence of poles as preferred perch locations, proximity to water and wetlands, and the history of outages resulting from raptor collisions. The RCZ map is used as a planning tool to prioritize proactive retrofit efforts throughout the service territory. When old poles in the RCZs reach their maximum service life, they are replaced with poles that are automatically built to raptor-safe standards. The RCZ is reviewed periodically to assess if it needs to be modified based on bird-caused outages and reported mortalities.

The risk assessment process requires consistent reporting, analyzing, and tracking of corrective work. These duties are performed by the APP program manager and the local area compliance employees. Unusual situations regarding birds may arise, including nesting birds in parking areas, powerhouses, and service garages. These issues are brought to the attention of the APP program manager, who then investigates these issues and works with local staff and other experts to develop solutions to prevent reoccurrence.

2.2.1 Existing Facility Repairs

When existing facilities are repaired, PG&E will often make other avian-safe repairs, including relocating exposed jumper wires, reconductoring with insulated conductors, or adding other bird protection devices. PG&E makes hundreds to thousands of repairs each year that reduce risk to raptors and other bird species.

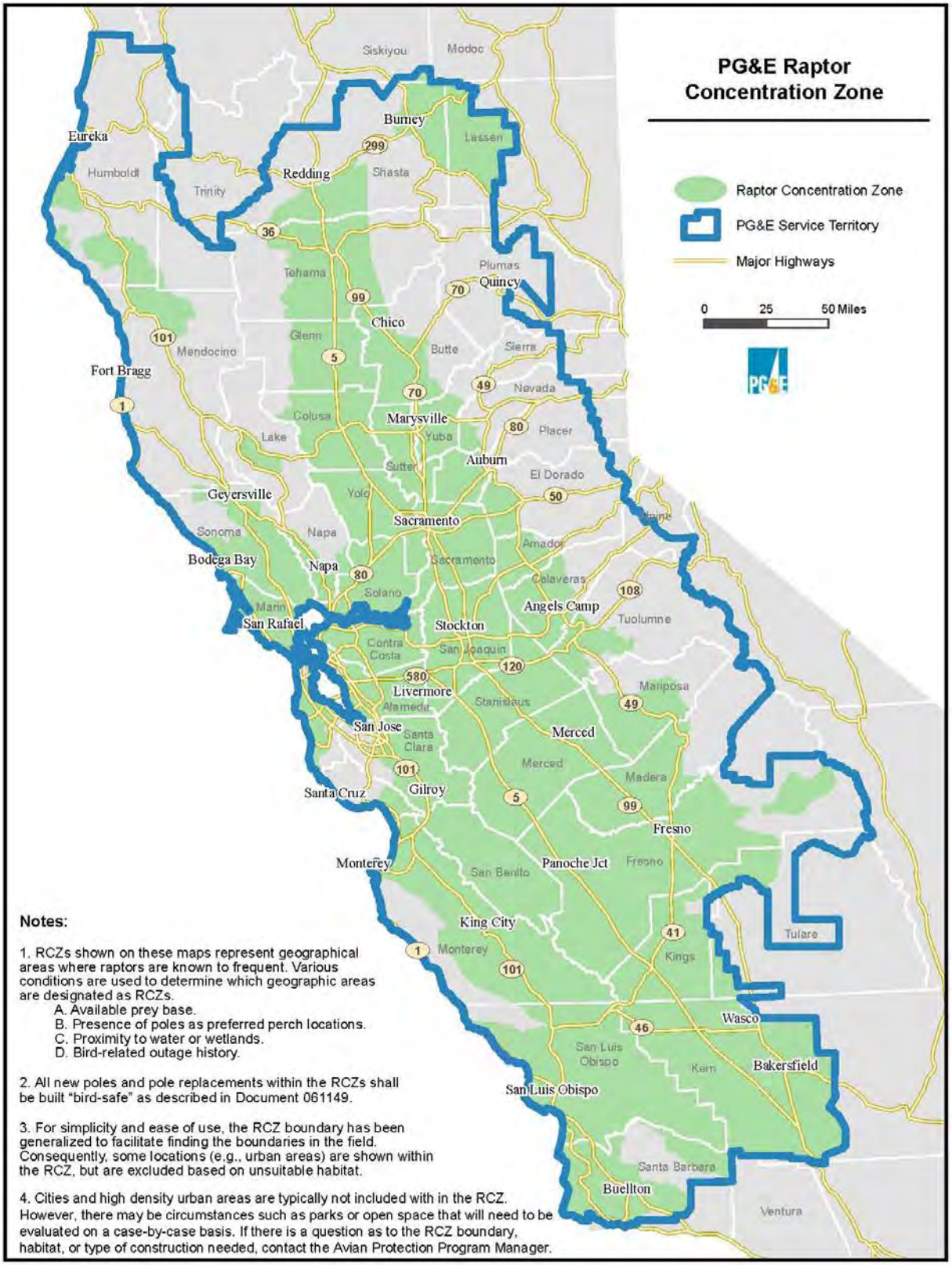


Figure 2. Raptor Concentration Zone

2.3 Risk Reduction

Risk reduction is achieved by constructing new facilities to the current avian-safe standards, assessing existing facilities that pose the greatest risks, repairing facilities, and retrofitting facilities. PG&E also implements risk reduction techniques for nesting birds, California condor, bald and golden eagles, and other birds as described below.

2.3.1 New Construction

PG&E's construction design standards are state-of-the-art and are based on APLIC's *Suggested Practices for Avian Protection on Power Lines: The State of the Art in 2006* (Avian Power Line Interaction Committee 2006).[1] PG&E has developed additional avian-safe construction details, clearance distance requirements for new construction, equipment prescriptions, and construction methods based on the APLIC practices. Avian-safe construction is based on two principles:



Peregrine falcon

- Provide birds with a safe place to land
- Prevent incidental contact with energized conductors

Avian-safe construction in a RCZ is typically implemented by leaving 60 inches of separation (phase to phase) between energized components, and leaving 60 inches of separation (phase to ground) between an energized component and a grounded component. Where separation is not practical, PG&E insulates equipment and conductors to guard against bird electrocutions. Avian-safe construction includes the following measures, depending on pole and equipment configurations:

- Installation of bushing covers
- Interruption of ground links (floating grounds)
- Increased phase separation (reframing)
- Installation of perch deterrents and conductor covers
- Installation of bird flight diverters
- Siting and routing of new facilities away from high-risk areas to minimize impacts (e.g., waterways, wildlife refuges, and foraging habitat).

Examples of some of these retrofits are illustrated in Figure 3. PG&E maintains a catalogue of bird protection devices, material, and equipment approved for use in PG&E operations, maintenance, and construction. Durability and effectiveness of these items are continually monitored as part of facility inspections and maintenance. Whenever new bird protection equipment, devices or materials are introduced by any manufacturer, PG&E must rigorously test this equipment to ensure it does not pose a safety or other risks to facilities and the public before deploying it in the field.

[1] APLIC has 2012 standards for guidance on collisions; the 2006 standards are the latest standards for electric distribution infrastructure.



Figure 3. Important Avian Protection Hardware on Electric Facilities

2.3.2 Nesting Bird Management

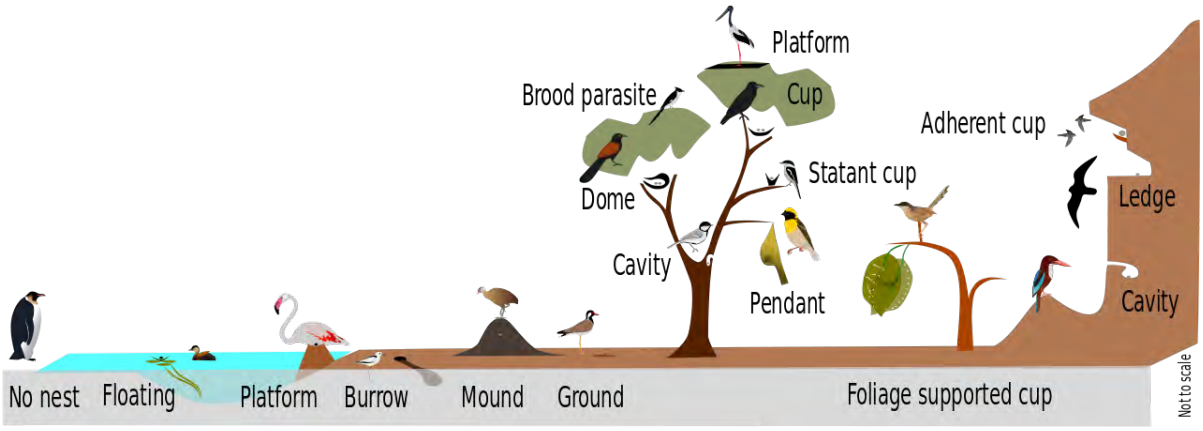
PG&E is focused on reducing potential impacts from its operations and maintenance activities on nesting birds. To address these impacts, and to maintain compliance with the MBTA and state statute, PG&E has developed a comprehensive plan to avoid and minimize impacts on nesting birds: PG&E's *Nesting Bird Management Plan* (NBMP). The NBMP is intended to do the following:



Hummingbird nest

- Maintain compliance with applicable federal and state bird protection regulations.
- Avoid and minimize disturbance to nesting birds within PG&E's service area.
- Standardize PG&E's approach to managing nesting bird conflicts using accepted wildlife management practices.

The NBMP is implemented by biologists working on PG&E activities and projects near active bird nests. The NBMP defines an active nest as one containing eggs or young. PG&E is required to comply with federal and state laws and regulations that prohibit take of birds, including eggs or young, in active nests or for special-status protected species.



Nest Forms and Locations

Implementation of the NBMP allows for consistent application of avoidance and minimization measures for nesting birds across PG&E activities, provides structured and standardized decision making, and allows PG&E to comply with federal and state regulations applicable to nesting birds.

A step-wise compliance approach guides implementation of the NBMP:

- **Step 1: Conduct desktop review** as part of the environmental review and planning process prior to initiating activities in locations that provide suitable habitat for nesting birds. A qualified biologist determines if there is potential for the activity to impact nesting birds.
- **Step 2: Conduct preconstruction nesting bird surveys,** if there is potential to impact active nests in or near construction areas. Pre-construction surveys can detect recent or established nests and identify the need to implement or adjust standard exclusion buffers.
- **Step 3: Assign nest exclusion buffers** or other applicable AMMs around active nests. The NBMP provides standard species-specific nest exclusion buffers; assigned buffers may be standard or reduced and may include periodic nest monitoring.
- **Step 4: Confer** with the USFWS and/or CDFW as necessary. PG&E may confer with USFWS and/or CDFW when the standard buffer cannot be observed for a nesting threatened, endangered or fully protected species.

PG&E also created EarlyBird, a mobile application and website, to improve data collection and tracking for nesting bird surveys and species detections. Every year, nesting season surveys locate active nests for many bird species across California. Communicating the results of these survey efforts is a critical aspect of managing work near nests and retaining survey information is an important part of PG&E's Nesting Bird Management Plan. EarlyBird offers PG&E biologists a way to standardize the information they collect, streamline reporting, and save data for future projects and research. As an example, PG&E can use EarlyBird to support the management and protection of burrowing owls located at or near PG&E facilities.

2.3.3 California Condor Risk Reduction

Portions of PG&E's electric service area fall within the current and historic range of the California condor (*Gymnogyps californianus*), one of the rarest avian species worldwide. PG&E works with condor managers to identify potential areas of electrocution and collision risk for condors in California. As areas of risk are identified and refined, PG&E develops action plans to reduce these risks by making power lines more visible to condors (reduce collisions), covering the wire with insulation (reduce electrocutions), and, in special cases, undergrounding the power line altogether (reduce collisions and electrocutions). In addition, company biologists are working with condor partners to develop a predictive risk model to identify and prioritize future areas for additional proactive work as condors continue to expand their territory.

PG&E is in the process of developing a long-term California Condor Strategy (CCS) for the express purpose of providing a clear and predictable program for avoiding and minimizing hazards to California condors that may be associated with the design, construction, operation, and maintenance of electric facilities. The CCS achieves the following objectives:

- Reviews and summarizes the status of California condors in relation to utility facilities, including movement patterns and range, general ecology and status, management practices, recovery efforts, and power line interactions.
- Maps and evaluates California condor movements to determine condor density zones based on available satellite or cellular GPS (Global Positioning System) tracking data through partnerships with agencies and condor management teams.
- Overlays available satellite telemetry data with PG&E electric facilities to establish a repeatable process for evaluating tracking data for periodic assessment within the range of PG&E facilities.
- Defines risk through assessment of condor telemetry data to provide new tools for evaluating California populations to better understand and define areas of risk.
- Develops a long-term strategy to identify, plan, and prioritize retrofits for facilities that have the greatest potential to reduce the risk of California condor electrocutions or collisions.

As described in Chapter 4, *Avian Enhancement, Outreach, and Research Programs*, PG&E also contributes to the Ventana Wildlife Society to help with the condor release program including training young condors to avoid perching on electric poles (also known as aversion training).

2.3.4 Bald and Golden Eagle Risk Reduction

For years PG&E has worked closely with USFWS and other federal land managers to address bald and golden eagle management issues on its hydroelectric power facilities and throughout its service area. In 2013, PG&E developed an Eagle Conservation Plan (ECP) to address bald and golden eagle mortalities, both of which are protected under the Bald and Golden Eagle Protection Act (BGEPA). The ECP evaluates effects at the landscape level, estimates mortalities on a yearly basis, and identifies minimization and mitigation measures. PG&E



Bald Eagle

submitted the ECP to the USFWS to obtain a long-term incidental take permit for bald and golden eagles. PG&E is working closely with the USFWS on the ECP. Issuance of this permit is anticipated in 2019. The ECP addresses the take of bald and golden eagles associated with above-ground transmission and distribution lines and facilities and emergency eagle nest disturbance.

The incidental take of eagles is the result of infrastructure that has, in most cases, existed for many decades, and, consequently, is part of the baseline mortality for eagles in the ECP area. Issuance of the requested permit would not increase mortality in the ECP area. Rather, PG&E's avoidance and mitigation measures, including annual pole and line retrofits, will continue to significantly reduce take relative to baseline levels, resulting in a net benefit to bald and golden eagles. For example, avian-safe power pole retrofits will continue to reduce the potential for eagle mortality from electrocution by eliminating the risk that eagles and other raptors would encounter energized components when landing on power poles.

Pole Retrofits for Wind Developers

USFWS's Eagle Conservation Plan Guidance for wind developers details current guidelines regarding minimizing impacts on eagles. Eagle take permits issued by the USFWS require compensatory mitigation to offset eagle take. Actions to retrofit, reframe, or rebuild power poles to avian-safe designs have been identified by USFWS as an option for offsetting eagle take occurring at wind facilities. PG&E is working with USFWS, the National Fish and Wildlife Foundation, and specific wind developers to facilitate retrofits on PG&E facilities to meet compensatory mitigation requirements for these third-party entities. To provide mitigation options to third party wind developers, PG&E identifies areas with suitable poles for modification, provides the USFWS and the third-party entity with a cost estimate and schedule to conduct the appropriate retrofits, and, once an agreement is reached between the parties, PG&E executes the work plan. This work is in addition to PG&E's reactive and proactive power pole retrofitting work.

2.3.5 Other Bird Species Risk Reduction

As needed, the APP program manager assists PG&E staff with other risk reduction issues. This includes consulting with staff on the timing of work activities, the installation of materials and equipment to avoid and minimize the potential impact on birds of work activities, and the rescue and relocation of birds. The APP program manager has assisted with wild turkeys, nesting cormorants, nesting sparrows, among other species.

Chapter 3
Training, Permits, Quality Control and Reporting

3.1 Training

PG&E delivers biannual training on the APP to more than 5,000 operations and management staff to ensure employees and contractors are aware of their obligations to report incidents and protect active nests or special-status species. Managers, supervisors, line crews, engineers, dispatch, and design personnel receive biannual training as well. The training covers the need for an APP, the methods by which employees should report an avian mortality or injury, and protocols to follow to avoid and minimize impacts on nests. Three APP trainings are offered: APP Overview, APP Comprehensive Review, and APP for Vegetation Management. All trainings are available for delivery to staff in-person or via the web. Descriptions and target audience of each training course are as follows:

Code: ENVR-0400
Name: Avian Protection Plan Overview
Type: Mandated
Description: This course provides an overview of PG&E's APP

Objectives: Overview level of the following subjects: The twelve components of the APP – Employees' roles and responsibilities to comply with the APP – How birds interact with electric distribution and transmission facilities – Laws that protect migratory birds and threatened and endangered birds and their nests – Reporting procedure for bird incidents – Selection of incident and adjacent poles – Pole risk assessment and retrofit program – Raptor Concentration Zone (RCZ) – Avian safe construction – Nest management – Avian enhancement – Public awareness – Working safely – How to obtain additional information about the program.

Target Audience: Senior Management, Control Center Ops, etc.
Duration: 15 minutes plus discussion
Repeat Interval: 24 months

Code: ENVR-0401
Name: Avian Protection Plan Comprehensive Review
Type: Mandated
Description: This course provides a comprehensive presentation of PG&E's APP.

Objectives: Overview and detailed information for the following subjects: The twelve components of the APP – Employees' roles and responsibilities to comply with the APP – How birds interact with electric distribution and transmission facilities – Laws that protect migratory birds and threatened and endangered birds and their nests – Reporting procedure for bird incidents – Selection of incident and adjacent poles – Pole risk assessment and retrofit program – Raptor Concentration Zone – Avian safe construction – Nest management – Avian enhancement – Public awareness – Working safely – How to obtain additional information about the program.

Target audience: M&C Field Employees, Supervisors, Quality Assurance, etc.

Duration: 40 minutes plus discussion
Repeat Interval: 24 months

Code: ENVR-0402
Name: Avian Protection Plan for Vegetation Management
Type: Mandated
Description: This course provides an overview of PG&E's APP as well as detailed information about managing nests encountered by Vegetation Management activities.

Objectives: Overview information for the following subjects: The twelve components of the APP – Employees' and responsibilities to comply with the APP – How birds interact with electric distribution and transmission facilities – Laws that protect migratory birds and threatened and endangered birds and their nests – Reporting procedure for bird incidents – Selection of incident and adjacent poles – Pole risk assessment and retrofit program – Raptor Concentration Zone – Avian safe construction – Nest management – Avian enhancement – Public Awareness – Working safely – How to obtain additional information about the program – Details information is provided about managing nests encountered by Vegetation Management activities.

Target Audience: Foresters, Vegetation Management Program Managers, VM Specialists, etc.
Duration: 20 minutes plus discussion
Repeat Interval: 24 months

PG&E distributes educational materials to the public. Appendix A, *Public Awareness Program*, provides an example of these materials.

PG&E has developed the *Avian Protection Plan Field Guide* (Appendix B), a quick reference tool used by field crews to understand their responsibilities to the APP. The field guide contains information on how to report bird incidents, identifies additional actions required for raptors, contains photos and brief descriptions of some of the common bird species typically encountered in the field, specifies methods for managing nests, and provides common examples of raptor-safe construction techniques.

3.2 Permits

PG&E maintains a Special Purpose Utility Permit with the USFWS. The permit authorizes PG&E to collect, transport, and temporarily possess migratory birds found injured or deceased on electric facilities including property, structures, and rights-of-way for avian mortality monitoring or disposal purposes; in certain emergency situations, the permit also allows PG&E to remove active nests. The permit requires that PG&E maintain records of mortalities and injuries, and that the results be reported annually to the USFWS. This permit enhances PG&E's ability to accurately monitor migratory bird mortalities and enables PG&E to retain specimens to confirm identification. Collecting and reporting data to the USFWS contributes to collective knowledge and understanding of the impacts of utilities on migratory birds. PG&E also obtains other project-specific permits as needed. This has included permits for moving and removing raptor nests. PG&E's San Joaquin Valley operation and maintenance (O&M) Habitat Conservation Plan (HCP) and the Bay Area O&M HCP also serve as a special purpose permit for non-ESA listed birds covered in the HCP.

3.3 Quality Control

PG&E evaluates the progress and effectiveness of the APP annually. The APP program manager ensures that project engineers use the guidance required to design facilities, and that crews know how to respond when deceased birds or active nests are discovered in the field. The APP program manager is involved in all major decisions affecting birds or their nests, reviews key incidents, and evaluates and plans for PG&E's annual avian protection needs. Where information on incident forms is incomplete or illegible, the APP program manager contacts staff to complete and clarify the information reported. Based on the annual review of the program, PG&E's avian task force discusses, modifies, expands, and provides recommendations to improve the APP to address issues that arise.

3.4 Reporting

PG&E maintains detailed records of each year's avian incidents. PG&E reports this information, consistent with its Special Purpose Utility Permit, to USFWS. The annual report provides an opportunity for PG&E to review the previous year's data, summarize incidents, and evaluate further needs.



Common Raven and Nest

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Chapter 4

Avian Enhancement, Outreach, and Research Programs

4.1 Avian Enhancement Programs and Partnerships

PG&E implements a series of efforts that are designed to enhance avian habitat and benefit migratory birds. These efforts include providing ongoing wildlife habitat grant funding, obtaining wildlife habitat certification at several of our properties, installing nesting platforms for osprey, and making habitat acquisitions to benefit many species. Wildlife Habitat Council certifies submitted PG&E properties that benefit wildlife species and natural habitats. PG&E has developed partnerships for over 15 years with Audubon California, local Audubon chapters, Ducks Unlimited, San Francisco Bay and Central Valley Joint Ventures, Santa Cruz Predatory Bird Research Group, Migratory Bird Partnership (Audubon California, The Nature Conservancy, and Point Blue Conservation Science), Ventana Wildlife Society, WildCare, and other organizations whose mission is to promote the protection of avian species and further the conservation of birds. PG&E will continue to support and fund avian enhancement programs to advance the protection and conservation of avian species.

4.1.1.1 Migratory Bird Conservation Partnership

PG&E supports the Migratory Bird Conservation Partnership, a collaboration of Audubon California, Point Blue Conservation Science, and The Nature Conservancy that is addressing the loss of wetland habitat in California's Central Valley and its impact on bird populations. The projects PG&E has supported between 2015 and 2017 clear barriers to providing additional water on the landscape and are complementary in nature—building off previous work supported by PG&E and leveraging the expertise and engagement of each partnership organization. The projects complement each other by creating additional tools and data for land managers to use in their efforts to most effectively and efficiently manage wetlands for migratory birds, flooding protection, and other wildlife.

4.1.1.2 Migratory Bird Joint Ventures

PG&E has been an active member of the Management Boards for both the San Francisco Bay Joint Venture and the Central Valley Joint Venture—part of the National Migratory Bird Joint Ventures across the country that work collaboratively with federal, state and local regulatory agencies, environmental nonprofit organizations, businesses, and landowners to conserve and restore habitat for migratory birds. PG&E works with partners to develop restoration plans and ensure that electric utility infrastructure is integrated into final designs.

Migratory Bird JOINT VENTURES

Migratory Bird Joint Ventures are cooperative, regional partnerships that work to conserve habitat for the benefit of birds, other wildlife, and people. There are twenty-two habitat-based Joint Ventures, each addressing the bird habitat conservation issues found within their geographic area.

4.1.1.3 Tricolored Blackbird Memorandum of Understanding

PG&E was an original signatory to the multi-agency and environmental stakeholder group Memorandum of Understanding (MOU) in 2007 that was developed to promote voluntary conservation measures to save this species. PG&E continues to be an active member of the Tricolored Blackbird Working Group to encourage and support actions by all stakeholders to

safeguard the long-term welfare of tricolored blackbirds (*Agelaius tricolor*) by supporting secure breeding, foraging, and wintering populations and their associated habitat in California. The Working Group has developed and is implementing a Conservation Plan and Research and Monitoring Programs. Signatories to the MOU include Audubon California, California Association of Resource Conservation Districts, California Farm Bureau, California Cattlemen's Association, CDFW, California Department of Food and Agriculture, Central Valley Bird Club, Central Valley Joint Venture, Natural Resources Conservation Service, PG&E, Point Blue Conservation Science, Sonoran Joint Venture, Sustainable Conservation, U.C. Berkeley Agriculture and Natural Resources, USFWS, and Western United Dairymen.

4.1.1.4 Peregrine Falcon Nest Box

Since the late 1980s, PG&E has partnered with U.C. Santa Cruz Predatory Bird Research Group to provide safe nesting habitat on the roof of the company's headquarters in downtown San Francisco. The scientists at U.C. Santa Cruz Predatory Bird Research Group knew that peregrine falcons (*Falco peregrinus*) were attempting to nest on the Bay Bridge and other bridges with poor results. They identified a good location to install a nest box on the roof of 77 Beale Street that would provide a safe location and one that could be easily monitored. A webcam was installed to allow interested employees and the public to view progressive peregrine pair nesting activities including egg incubation and fledging of nestlings. PG&E has also supported the U.C. Santa Cruz Predatory Bird Research Group education and outreach efforts in local schools.

4.1.1.5 Osprey Nest Platforms

Native osprey (*Pandion haliaetus carolinensis*) populations are expanding in Northern California and often favor building their large nests on PG&E's power poles. PG&E developed a program to install osprey nest platforms to move osprey nests out of harm's way and to prevent fires from nests initiated on live power poles. Hundreds of osprey nest platforms have been installed throughout PG&E's service area.



Installation of Osprey Nesting Platform

4.1.1.6 Barn Owl Nest Boxes

PG&E has partnered with Central Coast Vineyards and the Lodi Wine Grape Commission to aid grape growers in the Central Coast and Central Valley to maintain sustainable pest control and keep birds safe around power lines. PG&E's charitable grants funded the purchase of owl nest boxes for grape growers to install with the goal of attracting barn owls, a natural predator of rodents. The nest boxes are intended to provide a safe home for the owls and replace the boxes that growers often attach to power poles that can create unintended problems such as electrocution of the birds, outages, and potential fires.



Barn Owl Nest Boxes

4.1.1.7 California Condor Recovery Efforts

Since 2003, PG&E has continued to promote protection and recovery of California condor populations. PG&E helped form an external Condor Recovery Plan Powerline Subcommittee, comprising multiple California utilities, resource agencies, and other condor recovery stakeholders, to determine the risk of power structures to California condors in California and to develop and implement plans to minimize that risk. In 2016, PG&E signed an MOU with multiple condor recovery partners (USFWS, National Park Service, Yurok Tribe, CDFW, Bureau of Land Management, Redwood National Park, U.S. Forest Service, and Ventana Wildlife Society) focused on condor reintroduction efforts in Redwood National Park. In addition to providing insight on PG&E facilities that could pose a risk to the condors, PG&E donated $200,000 over a 3-year period to the National Parks Foundation for condor reintroduction and recovery, which directly supports the Redwood Condor Reintroduction Project.

PG&E continues to actively support the Ventana Wildlife Society to help with the reintroduction of condors on the Central Coast of California, including efforts such as developing joint educational displays, hosting fundraising events and technical meetings, developing risk mitigation strategies, and has served on the Board of Directors.

Since 2002, PG&E and the PG&E Corporate Foundation have contributed more than $7.5 million to programs that benefit migratory birds. Table 2 lists the organizations that have received PG&E contributions.

Table 2. Summary of Partner Organizations That Have Received Charitable Contributions

California Wine Education Foundation
Center for Land-Based Learning
Central Coast Vineyard Team
Ducks Unlimited
Friends of the Swainson's Hawk, Inc.
Golden Gate Audubon Society
Injured & Orphaned Wildlife
Lodi Sandhill Crane Association
National Audubon Society
National Fish and Wildlife Foundation
National Park Foundation (Washington office)
Redwood National Park
U.C. Santa Cruz Foundation
Ventana Wildlife Society

4.1.1.8 Supporting National, State and Local Chapters of the Audubon Society

PG&E has had a long-standing relationship with the National Audubon Society, California Audubon, and local Audubon chapters throughout our service area. PG&E employees volunteer, are members, have held leadership positions in these organizations.

4.1.1.9 Avian Power Line Interaction Committee

In the mid-1980s, PG&E was an original founder of APLIC, which was formed to address bird electrocutions and collisions with power lines. APLIC develops guidelines for utility companies to minimize risk to birds from infrastructure and develops education and outreach to others. PG&E has supported APLIC by serving as the Chair and on the Executive Committee, assisting with the development of utility standards and guidelines, supporting and attending educational workshops, supporting and developing research grant efforts, and implementing APLIC's recommendations.

4.2 Research

PG&E has contributed to multiple research efforts. Some of these key efforts are:

- Identifying Electric Distribution Poles for Priority Retrofitting to Reduce Bird Mortality. California Energy Commission. PIER Final Project Report. December 2007. P500-04-052.
- Testing the Effectiveness of an Avian Flight Diverter for Reducing Avian Collisions with Distribution Power Lines in the Sacramento Valley, California. PIER Final Project Report. January 2008. CEC-5000-2007-122.
- Evaluating Diverter Effectiveness in Reducing Avian Collision with Distribution Lines at San Luis National Wildlife Refuge Complex, Merced County, California. PIER Final Project Report. August 2009. CEC-500-2009-078.

This research has informed PG&E's maintenance and retrofitting practices.

Chapter 5
References Cited

5.1 Printed References

Avian Power Line Interaction Committee (APLIC). 2006. *Suggested Practices for Avian Protection on Power Lines: The State of the Art in 2006*. Edison Electric Institute, APLIC, and the California Energy Commission. Washington, D.C. and Sacramento, CA.

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Appendix A

Public Awareness Program

Going beyond compliance and building "best practices" for our industry.

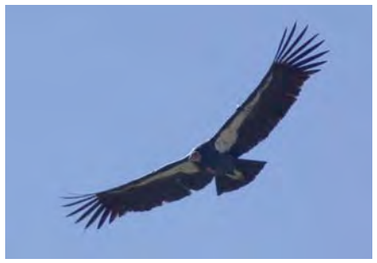
PG&E has a long history of protecting habitat and species, including bird populations. For example, we were a founding member of the Avian Power Line Interaction Committee, a collaboration between utilities and the U.S. Fish and Wildlife Service that began nearly 20 years ago.

In 2002, PG&E and the U.S. Fish and Wildlife Service entered into an agreement that required PG&E to implement various measures to protect migratory, threatened, and endangered birds. When this agreement expired in 2007, PG&E voluntarily adopted a proactive Avian Protection Plan that expands PG&E's commitments in public outreach, collaborative research, and "bird safe" technology demonstration projects. This plan has set the standard for our industry and is one of the most comprehensive in the nation.

BIRD PROTECTION PROGRAM (BIRD-SAFE RETROFITS)

	2002	2003	2004	2005	2006	2007
Poles Planned	2,000	2,011	2,000	2,050	2,075	2000
Poles Completed	1,930	2,089	2,023	2,073	2,117	2000
% Poles Completed	97%	103%	101%	101%	102%	100%

Since 2002, in compliance with the agreement, PG&E has retrofitted more than 12,230 existing utility poles and towers with "bird-safe" equipment (see chart above). We have also retrofitted more than 11,100 poles in high-risk areas where bird injuries or fatalities have occurred previously, or where there have been bird-related power outages. All new poles and replacement poles in "Raptor Concentration Zones" are also built "bird-safe."





Many bird species build nests on power poles and structures; unfortunately, this behavior increases risks for both the birds and our electric system. PG&E's Avian Protection Plan minimizes these risks by protecting birds and their nests, while improving safety and reliability for our customers.

SOME OF OUR PARTNERS:

Ventana Wildlife Society
Avian Power Line Interaction Committee (APLIC)
Wildcare
Audubon California
UC Santa Cruz Predatory Bird Research Group

Since 2003, PG&E has contributed over $500,000 to support bird conservation organizations.

In 2008, PG&E earned Audubon California's Corporate Achievement Award for protecting California's birds and important habitat.

For more information,
visit **www.pge.com/environment**

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AVIAN PROTECTION PLAN

Helping protect California's birds and keep customer service flying high.



AVIAN PROTECTION PLAN

Pacific Gas and Electric Company's (PG&E) service area spans over 70,000 square miles and is home to wildlife and other important natural resources. More than 300 species of migratory birds live in northern and central California either permanently or during migration along the "Pacific Flyway."

Since utility poles are often the highest and most prominent point in a landscape, birds often perch on the poles to hunt or rest. Also, it is often easier for birds to build nests on the flat surfaces of electric equipment than in trees.

When birds seek out power lines for perching and various other uses, they can come into direct contact with live electric wires and become electrocuted, which, in turn, can cause electric outages and fires. Birds can also collide with power lines while in flight. PG&E's Avian Protection Plan seeks to protect migratory, threatened, and endangered birds, while improving safety and reliability for our customers.



Breeding bald eagles in California have increased from a low of only about 30 pairs in the early 1980s to more than 200 pairs today due to a variety of federal, state, and private protection efforts.

A plan designed to take wing.

PG&E's Avian Protection Plan consists of several key components:

- **Employee training and compliance:** We educate our employees to ensure we comply with all federal and state bird protection laws. PG&E has developed training in "bird-safe" construction practices and in the proper reporting and tracking of all avian electrocutions or collisions.
- **Making our poles "bird-safe":** Since 2002, we have proactively retrofitted a growing number of our utility poles. Each year, we identify high-risk poles based on the type of electric equipment, risk of electrocution, local biology, geography, and regional conservation initiatives. When needed, we also install platforms above or near our equipment to give birds a safe place to build a nest.
- **Public education and partnerships:** We promote the need for migratory bird and habitat conservation in cooperation with federal and state agencies and non-profit organizations. We also partner with a variety of bird conservation organizations to raise awareness about sensitive bird species, such as the Purple Martin in Lake County or the Tricolored Blackbird in Tulare County.



A PG&E crew installs a nest platform near Clear Lake. Nest platforms reduce outages and are preferred by large birds, such as ospreys.

Together, we can make a difference to Californians on the ground—and in the air.

Targeted species enhancement programs: For the past 25 years, PG&E has led various bird species conservation initiatives.

- **Bald Eagle:** PG&E has put in place tailored plans to protect bald eagles at our facilities as part of a long-term, statewide effort to monitor our national symbol. PG&E has surveyed more than 50 bald eagle nesting territories and provided scientific research and data to the U.S. Fish and Wildlife Service. Today, PG&E's hydroelectric watershed lands support about one-quarter of the state's entire breeding population of bald eagles.

"PG&E's avian protection efforts give us hope for the California Condor's recovery in Big Sur and elsewhere," said Kelly Sorenson, executive director of the Ventana Wildlife Society.

- **California Condor:** Endangered California Condors have a risk of colliding with PG&E's power lines in remote Big Sur locations. Inadequate scientific data on Condors makes it difficult to resolve this challenge. Yet, PG&E has taken a number of steps, including developing a cutting-edge long-lining helicopter technique to install special "bird flight diverters" along these area power lines. In 2007, PG&E partnered with Monterey County, the Ventana Wildlife Society, California State Parks, the U.S. Forest Service, and the U.S. Fish and Wildlife Service on one of the largest installations of these innovative devices.
- **Peregrine Falcon:** PG&E's support of peregrine falcon conservation efforts reached new heights in 2005 by funding the UC Santa Cruz Predatory Bird Research Group (SCPBRG) "nest cam" to broadcast the daily routine of a pair of peregrines and their young perched high on the company's headquarters building in San Francisco. In 2007, the famous peregrines laid new eggs on the central anchorage of the San Francisco-Bay Bridge, requiring a dramatic rescue by the SCPBRG scientists with financial support from PG&E. Our continued financial support also funds the group's educational outreach to hundreds of high schools and middle schools throughout California.



A golden eagle soars above a PG&E transmission tower near San Juan Bautista. Innovative new products, such as the red transmission line covers pictured (at left), protect eagles and greatly increase service reliability.

"Voluntary industry cooperation has long been essential to our conservation efforts, and many electric power companies have already taken steps to protect migratory birds," said former U.S. Fish and Wildlife Service Director Matt Hogan. "The new [industry] guidelines build on and strengthen that tradition."



In 2007, PG&E crews rescued a barn owl, entangled in a kite string, in Anderson, California.

"Thank you PG&E for helping us save the owl. We definitely couldn't have done it without your help."

Karlene Stoker, PR Coordinator,
Shasta Wildlife Rescue & Rehabilitation, Inc.

Avian Protection Plan—Helping Protect California's Birds and Keep Customer Service Flying High

Avian Protection Plan
Field Guide



A Field Guide to PG&E's Avian Protection Plan. This Field Guide can be used as a quick reference to the Avian Protection Plan. This Field Guide contains information on how to report bird incidents, additional actions required for raptors, photos and brief description of some of the common species of birds typically encountered in the field, guidelines for nests, and common examples of "raptor safe" construction techniques.

For additional information on the Avian Protection Plan please refer to documents S2321, WP2321, 061149, and 068181 located in the Technical Information Library.

cover photo:

Golden Eagle:

WINGSPAN: 79 inches

Golden eagles have a shiny, "golden" plumage on the nape of the neck. Adults are brown with some lighter feathers at the base of the underside of the tail and juveniles have a white patch on the underside of their wings. Golden eagles tend to be found in open areas.

Reporting Bird Incidents

An employee shall complete F2321-3, "Bird Incident Reporting Form" (type of information on form shown below), whether or not an outage occurred, for any of the following conditions:

1. The employee discovers and/or confirms a bird electrocution or collision.
2. The employee receives notification from the public or other source regarding a bird electrocution or collision.

The employee shall hand-deliver, email, or fax a copy of the completed form to the construction first line supervisor or the division compliance department.

The completed form, including the bird incident number, shall be entered into the "Bird Incident Reporting Web Site" at **http://dbird/HomePage.aspx** within 5 working days of the incident.

Bird Incident Reporting Form

Electric T&D Engg.
06/07
F2321-3

Email the completed form to Division Bird Coordinator. Enter completed form on "Bird Incident Reporting Site" within 5 working days of incident. For additional information or a copy of this form call: (415) 973-WILD or 223-9453.

Report Date: / / Incident # WorkType

Date Found: / / Time (FNL): : Outage? ☐No ☐Yes=Outage/Log#

Bird Found By: CorpID Cell ( ) -

Sender: CorpID Phone ( ) -

GPS coordinates of pole: Latitude N Longitude W

Address:

Cross Street: Nearest City:

Where is bird now and in whose possession?

Number of birds found = __ and type of bird(s) involved (use check boxes or enter the species below):

☐ Raptor: ☐ golden eagle ☐ bald eagle (Collect eagle, and call 24-hour line at 415-973-9453.)
☐ hawk ☐ owl ☐ vulture ☐ other bird with curved beak and sharp talons

☐ Waterfowl
☐ Perching bird
☐ Undetermined bird

Type/species, if known: _____

Condition of bird(s) ☐ dead OR ☐ injured (check below all that apply):
☐ burned ☐ broken appendage ☐ decayed ☐ maggots present ☐ other observation _____

Suspected cause of injury or death: ☐ electrocution ☐ collision ☐ unknown/other _____

Bird was found: ☐ base of pole ☐ on pole ☐ mid-span __ of incident pole _____ ☐ other location _____

Photos? ☐ bird ☐ pole (file locally with original form)

Additional Info. (e.g., band #, other persons) _____

Incident Pole Information (*PG&E Field Use*)

Division: Circuit name: Voltage: kV

Pole/Tower #: _____

Pole /Tower Design: ☐ tangent ☐ line/buck ☐ dead end ☐ slack span ☐ other_____

Conductor Spacing: ☐ <44" ☐ 44 – 59" ☐ ≥60" Number of Phases = __

Circuit Design:	Support:		Equipment: and Equip. ID#:	
☐ horizontal	☐ 9" brackets	☐ wood x-arm	☐ transformer	☐ capacitor
☐ vertical	☐ 20" brackets	☐ fiberglass bracket	☐ cutouts bushing mounted	☐ recloser
☐ triangular	☐ metal riser bracket		☐ cutouts on x-arm	☐ switch
	☐ metal x-arm		☐ riser	☐ other _____

Protection	None	Bushing covers	Insulated jumpers	Perch guard	Raptor framing	Other (Describe)
Existing:	☐	☐	☐	☐	☐	☐
Needed:	☐	☐	☐	☐	☐	☐

EC/EL# Construction Supervisor CorpID:

U.S. Fish and Wildlife Service (USFWS) will provide the information requested, if available, at the time the form is completed. Any use by USFWS of this form is not a final determination of the issues addressed. The form, or its use, does not constitute rulemaking by the USFWS and may not be relied upon to create a right or benefit, substantive or procedural, enforceable at law or equity by any person.

Raptor Incidents

Raptor Electrocution: **Distribution**

The incident investigator shall follow the protocol in, "Adjacent Pole Determination Form, and perform the following steps:

1. Identify other nearby structures posing a high risk of bird electrocution.
2. Enter the information from the "Adjacent Pole Determination Form" into the Bird Incident Reporting web site.
3. Create one Electric Corrective (EC) work form notification per pole.
4. Set the priority and completion date of each notification to 90 DAYS.
5. Enter the EC notification number on the Bird Incident Reporting web site.
6. Include the bird incident number on all forms and notifications.
7. File copies of the "Adjacent Pole Determination Form," including EC notification numbers, for auditing purposes.
8. Raptor-related EC notifications shall not be reassessed.

Raptor Electrocution: **Transmission Line**

The incident investigator shall perform the following steps:

1. Create an LC Work Management (WM) notification to schedule investigative work regarding the incident.
2. If the incident involved a raptor, the incident pole/tower shall be retrofit with avian-safe devices.
3. Create a Plant Maintenance (PM) order to retrofit the incident pole.
4. Set the priority and completion date of the order to 6 months.
5. If the incident pole/tower cannot be made avian-safe, provide the reason to avian program management.

continued on back

6. For 60 kilovolt (kV) and 70 kV wood pole lines, evaluate nearby adjacent poles within 1,000 feet of the incident pole. Only evaluations of the adjacent poles and data gathering are required. The information on adjacent poles should be included on the outage Event Report.
7. Schedule any retrofit work to be completed as soon as practical, based on material availability, facility accessibility, clearances, etc.
8. Provide any PM order number to avian program management, and include the bird incident number on all forms, notifications, or PM orders.
9. Enter the PM order number in the "Additional Data" field on the Bird Incident Reporting website.

Incidents Involving Non-Raptors

Bird electrocutions or mid-span incidents involving non-raptor or non-T&E bird species shall be monitored, addressed, and prioritized within the structured retrofit program or included in mitigation work recommended through the outage review process.

Reliability

Capital work performed to proactively improve reliability, as the result of an outage review team recommendation, shall be charged against MWC 08 using existing capital project review and approval processes.

Date: ____/____/____ **Name:** _____ **Corp ID:** _____ **Incident#** M M G d d m m y y n n n n

Notes: It is required to make the incident pole avian-safe. For mid-span raptor and T&E bird *electrocutions*, the nearest pole becomes the incident pole (IP).
Construction supervisor or delegate: Perform work verification on a representative sample of avian related work to ensure the work was completed correctly.

Pole Location Number	Equip Label	Bird Sign	Habitat (check one per row)				Existing Protection (Check all that apply)					Needed Protection (Check all that apply)					Lat/Long (or pole #)		EPCM /EL or PM								
			Res.	Com.	Ag.	Nat.	Bushing Cover	Jumper Insul.	Perch Guard	Other (Describe)		Bushing Cover	Jumper Insul.	Perch Guard	Other (Describe)													
IP																											

Comments: _____
Attach a copy of the distribution map or a sketch depicting the circuit(s) within the work area adjacent to the incident pole.

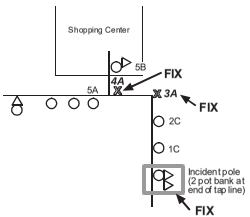
[a] Label key: Transformer (TF), Capacitor (CAP), Riser (RI), Fuse (FU), Recloser (RE), Line & Buck or Corner (L&B), Other (specify here) _____

[b] **For Audit Only:** Use this form to record the date when the audit was performed (in the rightmost column) following the job completion. If possible, take a digital picture labeled with the EPCM/EL number for reference.

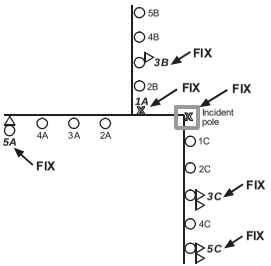
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Examples of Locating Adjacent Distribution Poles for Fixing

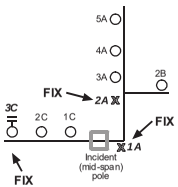
In the examples below, assume all the poles were found within Natural or Agricultural habitats, unless noted otherwise.



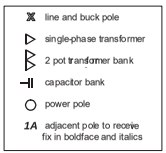
Example: Found line and buck poles (3A and 4A). Pole 5B in the shopping center is excluded because habitat is not suitable for raptors.



Example: Found two pot banks (3C and 5C), line and buck (1A) and single phase transformer poles (5A and 3B).



Example: Found two line and buck poles (1A and 2A) and capacitor bank (3C). Nearest pole (1A) becomes the incident pole.



For a complete copy of this report, go to www/techlib/default.asp



Bald Eagle

WINGSPAN: 80 inches

Prominent features of adults are a white head and tail as well as uniformly brown wings and breasts. Juveniles do not have white heads. Bald eagles are often found near bodies of water.



Osprey

WINGSPAN: 63 inches

An osprey's underside has white breasts and a white tail with many black bands. Ospreys nest in tall, dead trees and utility poles near water.



Swainson's Hawk

WINGSPAN: 51 inches

The Swainson's hawk has a reddish brown band across its breast and is otherwise brown with a light underside. The species lives in grassland and agricultural land.



Red-tailed Hawk

WINGSPAN: 49 inches

Adults of this species have a red tail and are otherwise brown with a pale underside. Red-tailed hawks have wide distributions and can be found year-round in fields, hunting from trees or utility poles.



Peregrine Falcon

WINGSPAN: 41 inches

Dark grey wings and head with a light underside streaked with black. Often found near marshes and tends to nest on cliff ledges or tall buildings.



Barn Owl

WINGSPAN: 42 inches

This owl has a distinct white, heart-shaped face and a mostly white underside. Barn owls sleep during the day in barns, caves, or dense trees, hunting at night in marshes, agricultural land, and brushy areas.



Great Horned Owl:

WINGSPAN: 44 inches

Perching individuals exhibit “ear tufts” of feathers. Overall plumage is mottled brown. A nocturnal owl that sleeps in trees and sheltered areas, the great horned owl hunts in forests and fields.



Turkey Vulture

WINGSPAN: 67 inches

Turkey vultures have featherless heads. The turkey vulture has a widespread distribution and can be seen in rural and suburban areas.



Great Blue Heron

WINGSPAN: 72 inches

A tall, slender bird, the great blue heron can easily be identified by its size and blue color. Usually found near water, but can forage in wet meadows or fields.



Great Egret

WINGSPAN: 51 inches

A crane-like, white bird with a yellow beak and black legs. Lives in marshes, but can also be found in wet agricultural fields.



Sandhill Crane

WINGSPAN: 77 inches

A distinct character of the sandhill crane is the red feathers on top of its head. This species can be found in open meadows, marshes, and farmland.



Tundra Swan

WINGSPAN: 66 inches

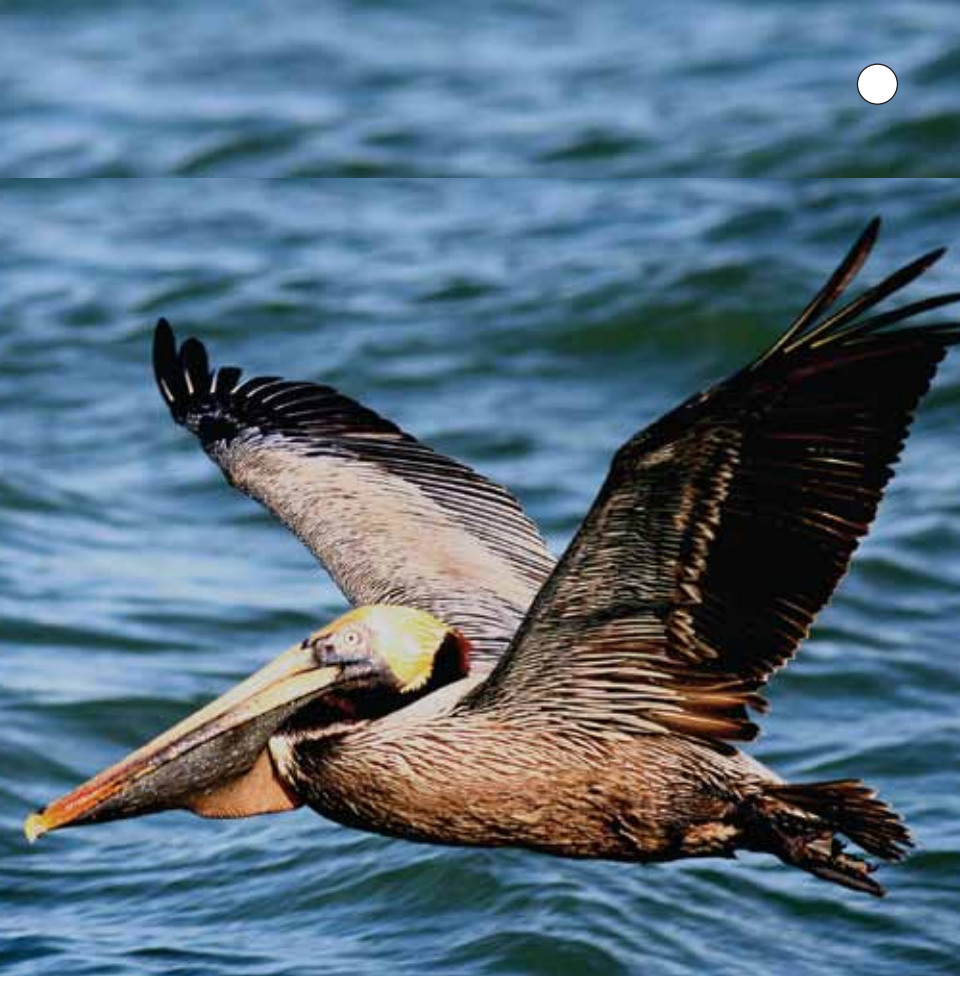
A white swan with a yellow patch between its eye and black beak. Can be found in California during the winter in ponds, marshes, and agricultural fields.



American White Pelican

WINGSPAN: 108 inches

White with yellow or orange legs and beak, the American white pelican is found in the calm waters of lakes and marshes.



Brown Pelican

WINGSPAN: 79 inches

A brown or grey colored bird that can often be observed flying low to the surface of the water. The brown pelican tends to be found in saltwater near or in the ocean.

Nests

Precautions

Be cautious when handling bird nests because they can carry disease. Use leather gloves and other personal protective equipment (PPE), as applicable.

Permit

Authorization for employees to remove nests, on an emergency basis, from transmission and distribution systems to prevent electrocution of birds and associated power outages is provided by Federal Fish and Wildlife Permit MB057942-0.



FEDERAL FISH AND WILDLIFE PERMIT

PACIFIC GAS & ELECTRIC CO
ELECTRIC ASSET LIFE CYCLE PLANNING
ATTN: MIKE BEST
4040 WEST LANE
STOCKTON, CA 95204
U.S.A.

MB057942-2 AMENDMENT

04/30/2010 03/31/2011

RONALD L. ORTOLIVA
BRIAN FRANTZ

SPECIAL PURPOSE - UTILITY

PG&E PROPERTY STATEWIDE (including rights-of-way and easements) - CALIFORNIA
RECORDS MUST BE MAINTAINED AT ADDRESS INDICATED ABOVE
CONTRA COSTA, COUNTY, CALIFORNIA

D. Authorized emergency removal of nests from electric transmission & distribution systems to prevent electrocution of birds and associated power outages (excludes eagles and endangered species). Notification to permit office is required in writing within 72 hours of such activity. (Note: No notification is required for species that are covered under Depredation Order 21.43 which do not require permits to take: crows, ravens, magpies, blackbirds (excluding Tri-colored and Brewer's Blackbirds which do require permit and must be reported), and cowbirds.

E. Removal and/or re[illegible]tion of active nests that could be affected by construction, reconstruction, modification or maintenance of PG&E [illegible]tten permission from USFWS permit office on a case-by-case basis. Nest manipulations required by

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1. The permit does not authorize removing eagles' nests or those of threatened or endangered bird species.
2. Active nests of any bird species, other than those listed below, "Exceptions Regarding Active Nests," below, that could be affected by construction, reconstruction, or maintenance activities shall not be removed or relocated without written permission from the USFWS permit office on a case-by-case basis.

- Brewer's blackbirds
- Red-winged blackbirds
- Pigeons
- Yellow-headed blackbirds
- Brown-headed cowbirds
- Crows
- Common grackles
- Magpies
- European starlings
- English sparrows

Discretion shall be used when applying these exceptions.

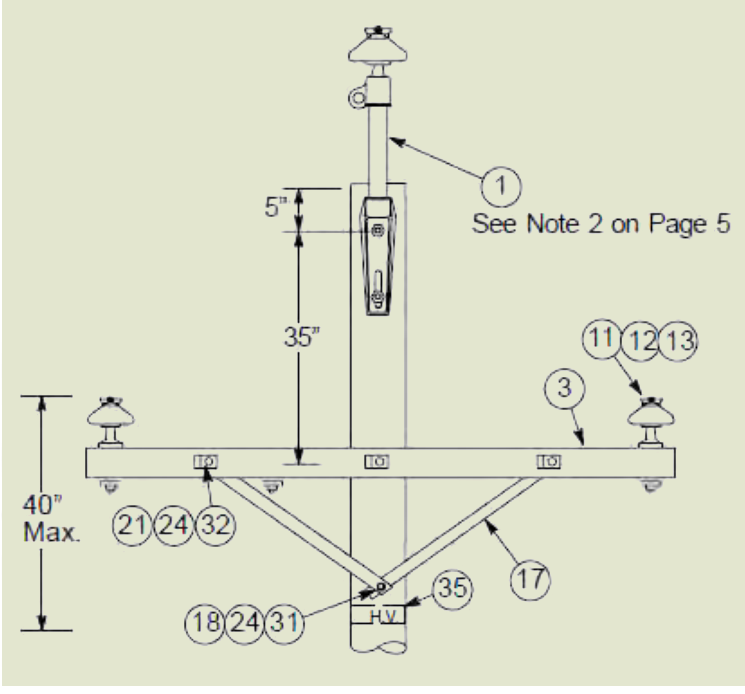
3. A copy of the permit shall be carried, ready for display, by employees who transport or move any bird, nest, or carcass.
4. A copy of the permit may also be printed from the Environmental Services site on the Company Intranet.

Nest Protection

1. Employees shall contact avian program management before working near any eagle's nest, because there may be work- or permit-related restrictions imposed during certain times of the year.
2. Nearly all bird nests are protected by the Federal Migratory Bird Treaty Act.
3. Golden eagle and bald eagle nests are protected by the Eagle Protection Act and cannot be disturbed or possessed without authorization from the USFWS.
4. Under no circumstance shall an employee take away any part of any bird carcass/nest or give away any part to others. To do so could lead to civil and/or criminal penalties. Refer to, "Bird Nest Process."

Construction Retrofits

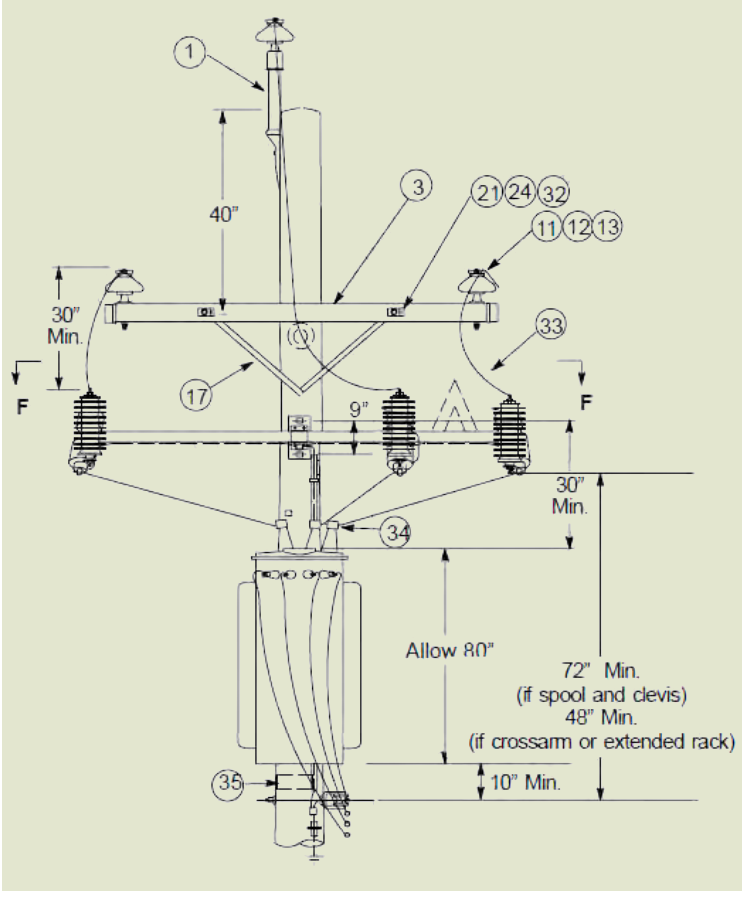
Tangent and Light Angle Construction



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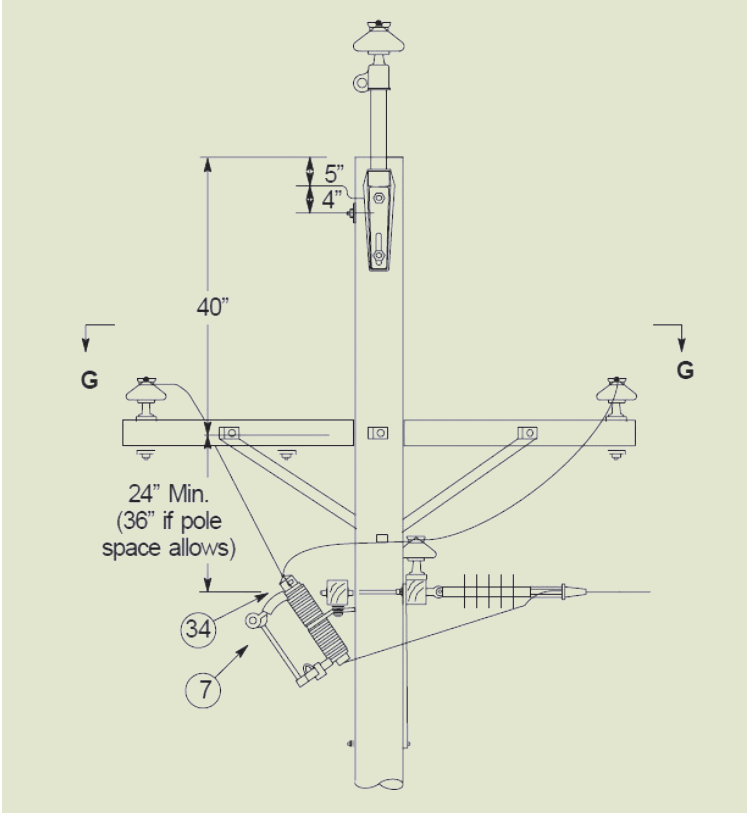
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Tangent Construction: Pole Top
Conventional Transformer with Surge Arrester



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Need more explanation here of this diagram and where to find out more.

Another Construction diagram Here



For additional framing information refer to document:
061149 OH: Framing

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For more information, contact:

Mike Best, Avian Program Manager
MBB8@pge.com

Chuck Partridge, Senior Electric Distribution Engineer
CAP4@pge.com

www.pge.com/environment

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State of California – Natural Resources Agency
DEPARTMENT OF FISH AND WILDLIFE
Bay Delta Region
2825 Cordelia Road, Suite 100
Fairfield, CA 94534
(707) 428-2002
www.wildlife.ca.gov

GAVIN NEWSOM, Governor
CHARLTON H. BONHAM, Director

July 6, 2022

Jon Wilcox
Pacific Gas and Electric Company
77 Beale Street (B28P)
San Francisco, CA 94015
J7WK@pge.com

Subject: Incidental Take Permit 2081-2015-031-03 for the PG&E Bay Area Operations and Maintenance Project

Dear Mr. Wilcox:

Enclosed you will find an electronic copy of the Incidental Take Permit for the above referenced Project, which has been digitally signed by the California Department of Fish and Wildlife (CDFW). Please read the permit carefully and sign the acknowledgement on the permit **no later than 30 days from CDFW signature** and prior to initiation of ground-disturbing activities. You may return an electronic copy of the permit with digital signature to CESA@wildlife.ca.gov. Digital signatures shall comply with Government Code section 16.5. Alternatively, you may return a hard copy of the permit via mail to:

California Department of Fish and Wildlife
Habitat Conservation Planning Branch, CESA Permitting
Post Office Box 944209
Sacramento, CA 94244-2090

You are advised to keep the permit in a secure location and distribute copies to appropriate project staff responsible for ensuring compliance with the conditions of approval of the permit. Note that you are required to comply with certain conditions of approval prior to initiation of ground-disturbing activities. Additionally, a copy of the permit must be maintained at the project work site and made available for inspection by CDFW staff when requested.

The permit will not take effect until the signed acknowledgement is received by CDFW. If you wish to discuss these instructions or have questions regarding the permit, please contact Mr. Craig Weightman, Environmental Program Manager, at Craig.Weightman@wildlife.ca.gov.

Sincerely,

DocuSigned by:
Erin Chappell
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Erin Chappell
Regional Manager
Bay Delta Region

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California Department of Fish and Wildlife
Bay Delta Region
2825 Cordelia Road, Suite 100
Fairfield, CA 94534

California Endangered Species Act
Incidental Take Permit No. 2081-2015-031-03

PG&E BAY AREA OPERATIONS AND MAINTENANCE PROJECT

I. Authority:

This California Endangered Species Act (CESA) Incidental Take Permit (ITP) is issued by the California Department of Fish and Wildlife (CDFW) pursuant to Fish and Game Code section 2081, subdivisions (b) and (c), and California Code of Regulations, Title 14, section 783.0 et. CESA prohibits the take[1] of any species of wildlife designated by the California Fish and Game Commission as an endangered, threatened, or candidate species[2]. However, CDFW may authorize the take of any such species by permit pursuant to the conditions set forth in Fish and Game Code section 2081, subdivisions (b) and (c). (See Cal. Code Regs., tit. 14, § 783.4).

Permittee:	**Pacific Gas and Electric (PG&E)**
Principal Officer:	**Jon Wilcox**
Contact Person:	**Matthew Brown, (559) 246-1592**
Mailing Address:	**77 Beale Street (B28P), San Francisco, CA 94015**

II. Effective Date and Expiration Date of this ITP:

This ITP shall become effective when signed by all parties and received by CDFW as described in the Notices section of this ITP. Unless renewed by CDFW, this ITP's authorization to take the Covered Species shall expire on **December 31, 2052** so long as the Permittee satisfies the 5-year review process described in the Permit Term section below.

III. Permit Term:

Permittee is required to prepare and submit to CDFW a 5-year compliance report in lieu of an annual report by June 30 of each 5-year anniversary of the effective date of this ITP (Condition of Approval 6.7). Permittee shall meet and confer with CDFW within 60 days after the 5-year compliance report submittal to discuss the report and any potential ITP compliance issues. Within 30 days following that meeting, if CDFW determines that there are any outstanding ITP compliance issues, CDFW shall provide a letter describing the outstanding ITP compliance issues and what actions are necessary for the Permittee to remain in or come

[1]Pursuant to Fish and Game Code section 86, "'take' means hunt, pursue, catch, capture, or kill, or attempt to hunt, pursue, catch, capture, or kill." (See also *Environmental Protection Information Center v. California Department of Forestry and Fire Protection* (2008) 44 Cal.4th 459, 507 [for purposes of incidental take permitting under Fish and Game Code section 2081, subdivision (b), "'take' … means to catch, capture or kill").

[2]The definition of an endangered, threatened, and candidate species for purposes of CESA are found in Fish and Game Code sections 2062, 2067, and 2068, respectively.

into compliance. Within 30 days of receiving CDFW's letter, the Permittee shall provide CDFW a response in writing listing actions taken or proposed to show how the compliance issues will be resolved. Permittee shall work with CDFW to confirm the resolution proposed meets the needs to bring the ITP into compliance. If the Permittee fails to provide the required written response or fails to complete the necessary actions to remain in or come into compliance, CDFW may revoke or suspend the permit as provided under California Code of Regulations, Title 14, section 783.7.

Permittee shall be prepared to discuss and include in their 5-year compliance report, at a minimum, the following:

1. A list of Covered Activities (including both construction and maintenance activities) completed over the prior 5-year period, including activities that are currently in progress;

2. Acreages of impacts to Covered Species habitat(s) over the prior 5-year period, along with Geographic Information System (GIS) mapping depicting impacts to Covered Species habitat(s) over the last five years. GIS point data will be provided for impacts less than 0.1 acres and GIS polygon data will be provided for impacts equal to or greater than 0.1 acres;

3. Total acres and GIS mapping depicting on-site restoration of temporarily impacted Covered Species habitat and field verifications of return to baseline conditions within 12 months from the date of initial impacts was achieved;

4. Accounting and discussion of the Covered Activities and associated restoration efforts and field conditions when temporary impacts were recategorized as permanent impacts;

5. Updated spatial models for Covered Species and habitats with written summary;

6. Number of individuals of the Covered Species taken during the last 5-year period;

7. A copy of the table in the Mitigation Monitoring and Reporting Program (MMRP) with notes including the current implementation status of each mitigation measure;

8. An assessment of the effectiveness of each completed or partially completed mitigation measure in avoiding, minimizing, and mitigating impacts associated with Covered Activities;

9. An assessment of whether the Covered Activities and Project Description, as described in this ITP are still valid;

10. A summary of the results of monitoring and mortality reduction and relocation associated with Covered Activities over the prior 5-year period, including the number and location(s) of Covered Species encountered; and

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11. Any new information relevant to the conservation of the Covered Species and/or to the Project Area, as defined in the impact analysis section of this ITP.

If during the 5-year compliance review process, CDFW determines that Project changes or changed biological conditions necessitate an ITP amendment to ensure that all Project-related impacts of the taking to the Covered Species are minimized and fully mitigated, the Permittee shall submit a request for an amendment pursuant to Title 14, Section 783.6 of the California Code of Regulations and associated fee based on the fee schedule at time of submittal.

Notwithstanding the expiration date on the take authorization provided by this ITP, Permittee's obligations pursuant to this ITP do not end until CDFW accepts as complete the Permittee's Final Mitigation Report required by Condition of Approval 6.9 of this ITP.

IV. Project Location:

The PG&E Bay Area Operations and Maintenance Project (Project) locations consist of Permittee's gas and electrical transmission and distribution facilities and their rights-of-way (ROWs) and the lands owned by the Permittee or subject to Permittee's easements to maintain these facilities, access routes associated with Permittee's routine maintenance, lands adjacent to existing ROWs, and conservation lands acquired to mitigate impacts on the three CESA-listed species covered under this permit within the following Bay Area counties: Alameda, Contra Costa, Marin, Napa, San Francisco, San Mateo, Santa Clara, Solano, and Sonoma ("Permit Area") (FIGURE 1).

V. Project Description:

The Permittee provides natural gas and electricity to customers throughout the Permit Area. To maintain services to its customers Permittee must perform ongoing operations and maintenance (hereafter referred to as O&M). A summary overview of Permittee's two systems, the work methods and techniques to operate and maintain each, and detailed descriptions of the specific O&M activities covered by this ITP are described below. Following this overview are descriptions of minor new construction activities and habitat conservation and enhancement activities that are also covered by this ITP.

NATURAL GAS TRANSMISSION AND DISTRIBUTION SYSTEM

System Overview

Permittee's natural gas system consists of a transmission system and a distribution system. The transmission system in the Permit Area includes 16 primary gas transmission lines totaling approximately 1,820 miles of pipeline. The largest three transmission facilities in the Permit Area are Line 2 and Lines 300A and B, as described below.

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Line 2. This 115-mile-long (of which 13.3 miles are within the Permit Area), 12- to 20-inch-diameter pipeline runs from the Brentwood Terminal in Contra Costa County to the Panoche Metering Station in Fresno County.

Lines 300A and 300B. These 502-mile-long (of which 42 miles are within the Permit Area Permit Area), 34-inch-diameter pipelines run from the California/Arizona border near Needles, California, to Permittee's Milpitas Terminal in the Permit Area.

The gas transmission system transports natural gas in steel pipelines buried 3 to 4 feet deep (measured to the top of the pipe). Depending on the location and type of pipe, pipe diameter can vary from 8 to 42 inches. Gas pressure in transmission pipelines generally exceeds 60 pounds per square inch (psi). The Bethany Compressor Station in Alameda County maintains the gas pressure in the pipelines within the Permit Area.

The Permit Area gas distribution system consists of approximately 19,350 miles of both steel and plastic lines. 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 prevent potential damage to the pipes.

The ROW width for the natural gas system varies from 5 to 150 feet. Permittee owns less than one percent of linear ROWs in fee title; the remainder is in easements and franchise. Generally, Permittee has nonexclusive easements that do not allow Permittee the rights to fence the pipeline corridors. Permittee obtains exclusive easements with the right to construct fences when security fencing is required for valve lots, compressor stations, and other aboveground facilities, or subsurface vaults.

Operation and Maintenance Activities for the Natural Gas System

G1. Patrols

Aerial Patrol

Permittee conducts aerial patrols of gas pipelines and associated facilities quarterly using fixed-wing aircraft that fly at an elevation of 500 feet. Helicopters and drones are used periodically as needed.

Ground Patrol

Compliance with California Public Utilities Commission (CPUC) regulations requires periodic ground patrols of the gas transmission lines. On a quarterly to annual basis, Permittee conducts ground patrols of the pipelines and associated facilities on foot, with all-terrain vehicles (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

Permittee 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. Permittee 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.

G2. Inspections

Valves

Valves are located along all pipelines at different intervals depending on the size of the line and number of taps (i.e., point of interconnection of a similar diameter or smaller diameter pipeline) off the line. Permittee inspects 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 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., 1033 grease).

Telecommunication Sites

Permittee 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 Permittee uses fixed-wing aircraft, helicopters, or drones.

Anode Beds

Anode beds are part of the cathodic protection system (CPS) and usually placed approximately every 10–20 miles along the pipeline. Permittee 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. Surveys of pipelines located within the Permit Area typically require 10 days to complete. Light trucks use existing access and pipeline patrol roads.

Pressure Limiting Stations

Permittee conducts routine inspections of existing pressure limiting stations (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

Permittee periodically conducts land surveys of facilities and facility ROWs along the alignment. It isestimated that the entire gas transmission and distribution system is inspected once per year.

G3a. Pipeline Remedial Maintenance

Remedial maintenance corrects erosion and vandalism problems and involves the evaluation of internal pipeline issues. Permittee 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 will not typically exceed 100 feet long or 50 feet wide on any stream. During such installation, Permittee complies with permits for work in waterways. Permittee installs concrete, Ercon mats, or concrete pillow systems at approximately one location per year.

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, Permittee estimates that only 10 will require fencing for protection from vandalism. Fencing these areas requires excavation for fence post installation; this action results in a 50- by 50-foot disturbance area for each fenced location and a 50- by 50-foot work area.

G3b. Internal Pipeline Inspections

Permittee 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, Permittee 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 gauge (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, pipeline replacement is necessary.

Permittee 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 by 10 feet along the exposed pipeline. Soil excavation, soil stockpiling, and construction vehicle travel are within bell hole the work area during the inspection.

For the purposes of estimating impacts, Permittee 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. Permittee hydrostatically tests the new section of pipe and disposes of the water by discharging overland, using a baker tank, discharging to a sewer, or using other approaches. Before test water is discharged from the banker tank to the land or sewer, Permittee tests the water under the appropriate water quality permits.

G4. Compressor Station Upgrades and Maintenance

The Bethany Compressor Station is a 100-acre facility in eastern Alameda County and within the Permit 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. Permittee conducts inspections daily and performs maintenance and upgrades approximately two times every two 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. 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.

G5. Pipeline Electric Test System Installation

The electric test system (ETS) is a component of the cathodic protection system. Units are installed 1-5 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.

Permittee 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.

G6. Pipeline Valve Maintenance—Recoating

As part of activities G10, Pipeline Coating Replacement, and G11, Pipeline Replacement, Permittee 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, Permittee 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.

G7. Pipeline Valve Maintenance—Replacement or Automation

As part of activities G10, Pipeline Coating Replacement, and G11, Pipeline Replacement, Permittee may replace a gas pipeline valve. 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. Permittee also replaces valves to allow for the passage of inspecting devices (i.e., pigging for in-line inspections). To ensure overall pipeline system safety Permittee will be automating valves and, when automation is not possible, replacing valves. Enhancing or replacing approximately eight of the valves per year may include an aboveground valve, several small cabinets for a Supervisory Controlled and Data Acquisition (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. Valves are replaced within the existing station facility corridor. If Permittee replaces a small section of the pipeline during valve placement or automation, the pipeline must be hydrostatically tested. Permittee may replace or automate valves at any time, depending on weather and on operational restrictions related to the need to temporarily shut down the pipeline.

Estimated disturbance areas include the anticipated need for facility upgrades and fencing at 10 percent of the valve locations, 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. Once the pipeline valves are automated, Permittee checks them annually to ensure that they work properly.

G8. Pipeline Cathodic Protection

Corrosion of underground steel pipes is a continual maintenance issue for gas system pipelines. Pipes generate or carry 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. Permittee uses cathodic protection to prevent corrosion.

Permittee undertakes approximately 100 cathodic protection activities per year using the methods described below. Of those activities, approximately 25 require excavation, and an estimated 20 percent (five total activities) are 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 Permittee'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. Installation of deep-well anode beds involves drilling deep ground wells (200–300 feet) and installing zinc or magnesium bars, platinum anode rods, or ground mats. Permittee 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 nontoxic 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 Permit Area, a rectifier is the standard method Permittee uses to provide electricity. Installation of deep-well anodes typically requires 4 days to complete. Work crews evenly distribute leftover fill 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 Permittee anticipates it will occur less than once per year in the Permit Area. A small underground cable delivers an electric current from the horizontal anode bed to the pipeline.

G9. Pipeline Lowering

Permittee 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 pipeline lowering also may be needed 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. 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. Permittee 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.

G10. Pipeline Coating Replacement

Permittee 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, Permittee recoats the pipe with epoxy. To determine whether the coating has maintained its integrity, Permittee 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. Permittee 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.

Permittee recoats approximately 1 mile of pipeline every 5 years. This requires construction vehicles and includes vegetation removal, trenching, soil excavation, and soil stockpiling. 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, Permittee schedules instream maintenance when the stream is dry. One mile of pipeline coating replacement typically involves three different access locations.

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.
- Aging or corrosion has affected the integrity of the pipeline.
- Pipelines have been damaged by private contractor(s) during construction (i.e., dig-ins).
- Acts of nature have damaged the pipeline.

In the case of class location changes, Permittee must move or replace the line with upgraded pipe to comply with regulations mandated by the California Department of Transportation and CPUC. Permittee uses standard pipeline construction techniques. 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. The 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, Permittee will typically place the new section of pipe as close to the abandoned pipeline as possible and modify existing easements by expanding existing ROW or acquiring additional land rights.

Permittee 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 8 miles could be replaced during each targeted replacement effort. Replacing an existing pipeline with a new pipeline includes 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. Permittee may need to acquire additional ROW to accommodate an increase in the pipeline corridor for about 75 percent of the new pipeline. 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. As the new pipeline is installed, Permittee hydrostatically tests the pipe, collects test water in a baker tank for discharge to land or a municipal sewer system (based on water quality, quantity, local conditions and relevant discharge or release requirements), and backfills the trench. Before

test water is discharged from the banker tank to the land or sewer, Permittee tests the water under the appropriate water quality permits.

Permittee estimates that it will replace approximately 248 miles of pipeline during the course of the 30-year permit term. Of the 248 miles, approximately 75 percent (186 miles) are in urban areas. The remaining 62 miles are in nonurban areas. 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.

Permittee may perform 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 to be 0.5-mile in length by 12 feet wide may be necessary to implement this O&M activity.

G12. Pipeline Telecommunication Site Maintenance

A SCADA system monitors pipeline functions remotely and transmits pipeline operational information to Permittee's operations offices at the Brentwood Gas Terminal via Permittee'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. Permittee 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, Permittee must install new fiber optic cable, which requires an estimated 10- by 1,500-foot work area.

G13a. Pipeline Right-of-Way Vegetation Management

Permittee 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 Permittee to patrol periodically for gas leaks. The gas system vegetation management program is designed to remove 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. Permittee 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. To keep incompatible vegetation from growing over the facilities, Permittee does not replant trees within the ROW after vegetation management, although reseeding—with the landowner's notification—will be routinely performed.

Permittee identifies areas within the ROW that require vegetation removal during routine patrols. ROW width averages 20 feet over the gas pipeline and is dependent upon legal documentation. Maintenance width is dependent on the width of the easement. 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. Permittee also relies on chemical control (herbicides) for vegetation management.

Permittee uses herbicides in accordance with label requirements and U.S. Environmental Protection Agency (EPA) regulations, and herbicides are applied by a qualified applicator licensed by the California Department of Pesticide Regulation. In general, herbicides are used in the gas transmission ROWs and for cut-stump applications (where Permittee has notified the landowner). Only federal and California EPA-registered herbicides are used.

These include selective and nonselective, inorganic and organic, contact and translocated, and preemergent and post-emergent types. The use of herbicides is subject to landowner notification. Permittee contracts with licensed and registered pest control advisors to prepare herbicide prescriptions for vegetation control and eradication within ROWs.

The O&M activity described in this section is for those instances in which vegetation management is necessary as a distinct and separate action that Permittee crews perform, and not a part of ROW clearing necessary for other O&M activities, such as pipeline replacement. On average, there are 10 sections of ROW reclaimed 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 one mile in length. Frequency is based on an assumed return interval of 5 years within tree- and shrub-dominated land cover types.

G13b. Pipeline Access Road Maintenance

Access road maintenance work takes place in the ROW. Permittee maintains the road without altering the road profile. Every 2 to 3 years, Permittee performs surface maintenance on an as-needed basis to keep access roads 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. Occasionally a culvert may be replaced during maintenance activities.

Electrical Transmission and Distribution System

Permittee's electrical system consists of a transmission system and a distribution system. The electrical transmission system in the Permit 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 (TSPs), and lattice towers are also used in certain areas.

Permittee currently operates 207 transmission substations in the Permit 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 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 G.O. 95 dictates the design of electrical facilities. Conductor sag (the extent to which an electrical conductor can hang between poles and towers) varies and is dependent on the height of the towers or poles, the electrical load through the conductors, 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 of private lands or public agency landowners of public lands. Permittee owns less than one percent of these ROWs in fee title; the rest are in easements. The ROW widths depend on circuit or line voltage, the number of lines per ROW, terrain, and other factors. The electrical 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 Permittee ROWs. For example, third-party fiber optic communications cables (for telephone, television, or internet) are typically installed on Permittee facilities, either above or below the electrical circuits.

Permittee's electrical distribution system provides links between most customers and the transmission system. Approximately 14,885 miles of overhead distribution lines extend through the Permit Area, and another 8,130 miles are underground. Wood or steel poles support the overhead distribution conductors. The electrical 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 (i.e., residential or commercial) levels. Primary distribution lines carry three-phase AC power in the 2–50 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 electrical power for lighting and 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; non-ceramic insulators made of fiberglass rods and rubber shrouds also are used.

Operation and Maintenance Activities for the Electric System

E1. Patrols

Permittee conducts patrols of its lines and associated facilities annually or on more frequent basis as needed or required. Patrols alternate annually between patrols by air and patrols from the ground.

Aerial Patrol

Permittee conducts aerial patrols of electric transmission lines, distribution lines, and associated facilities biannually (in terms of calendar years) using helicopters or drones.

Ground Patrol

If electric transmission lines and associated facilities are located in no-fly zones, Permittee 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 biannual 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 off-road travel using light trucks or ATVs.

E2. Inspections

Tower, Pole, and Equipment Inspection

Permittee 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 take place because of weather, accidents, equipment failure, or other reasons, Permittee inspects lines to determine the location and probable cause of the outage. Lines are accessed from existing roads or may require off-road travel, either in vehicles or on foot.

Substation Inspection

Permittee inspects all transmission and distribution substations every 1 to 2 months to verify equipment operation and conduct safety inspections. Substations are accessed from existing roads in vehicles.

Telecommunication Sites

Permittee 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 a few minutes, allowing personnel to collect a Global Positioning System (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 and reliable operation. Permittee 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 off-road travel, either in vehicles or on foot.

Land Surveys

When new construction is proposed by a property or land developer, Permittee 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 off-road travel or surveys on foot.

E3. Insulator Washing or Replacement

Conductive airborne particles or bird droppings that settle on ceramic insulators can provide a conductive path across the insulators, causing contamination-induced electric faults. Permittee personnel periodically wash ceramic insulators to reduce the risk of such faults. Non-ceramic 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. Permittee replaces insulators when they have been damaged by gunshot, lightning, 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 crew members, tools, and materials. If access is limited, a helicopter may be used to land crew members and tools on a tower. Insulators are washed or replaced approximately once per year.

E4. Substation Maintenance

Most of Permittee'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 O&M activities could require use of station property or adjacent property for construction staging, materials storage, permanent facilities, and land management. Permittee 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. O&M activities on Permittee lands to control vegetation external to substations may include the mowing of grass and weeds. Treatments include pruning or removal of vegetation where needed inside or on the immediate perimeter of a fenced facility (usually within 3–5 feet of the fence).

Occasionally, public agencies, municipalities, or neighboring landowners ask Permittee to conduct additional fuels reduction activities on Permittee parcels outside of the fenced facility, usually for the purpose of improving or maintaining compliance with local and state fire codes. These activities, 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 result within the fenced perimeters during maintenance because the grounds are paved with blacktop or gravel. An estimated 150 acres of Permittee 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 on an annual basis one of these substations has adjacent natural habitat, resulting in a 20- by 1,000-foot disturbance area.

E5. System Outage Repair

O&M activities involving outage repair are necessary to maintain reliable service and ensure public safety. Weather, equipment failure, accidents, fire, or bird electrocution are typical causes of outages. When an outage is reported, Permittee 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.

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

E6a. Tower Replacement or Repair

Permittee 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. Permittee extends towers approximately 360 times annually.

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- by 40-foot area is graded adjacent to the tower to serve as a level crane pad. 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 off site 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 Permittee 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, Permittee 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 two feet from the footing. If piles are required, the work area may need to be extended to 20 feet outside the tower footprint. Permittee crews may use rubber mats to temporarily access the area requiring maintenance work for a period of up to two hours. 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.

E6b. Access Boardwalk Repair and Replacement

Permittee 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. Permittee 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 Permittee 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- by 10-foot work area is required, soil excavation and soil stockpiling disturb vegetation.

E7. Facility Installations (Shoo-Flies)

Permittee 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 are removed from the old poles or structures and reattached to the shoo-fly structures. In most cases, this is 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) requires a minimum installation of four poles. Shoo-fly supports are removed when the repair or construction work is complete. Shoo-fly installations occur approximately 100 times per year. A work area of approximately 25 by 100 feet is frequently required.

E8a. Pole Equipment Repair and Replacement

Permittee repairs or replaces 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.

E8b. Utility/Wood Pole Replacement

When replacing a Permittee distribution or transmission pole, 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. Permittee pole replacements take place approximately 500 times per year, requiring a 10-foot-long by 7-foot-wide work area.

E9. Line Reconductoring

Permittee replaces 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

on-site, typically deliver and remove the reels. On-site cranes move the conductor reels on and off of the semi-trucks. 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. 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 pull sites for use.

Before pulling the conductor, Permittee 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. 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 per year, and electric transmission reconductoring takes place approximately 10 times per 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 a 25- by 25-foot work area.

E10. Vegetation Management (General)

Permittee 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, Rule 35, the California Independent Systems Operator (CAISO) Transmission Maintenance Agreement, and Northern American Electric Reliability Corporation's (NERC) FAC-003-01 and 02. The clearance regulations identify, by voltage, specific clearance distances that Permittee must maintain between vegetation and energized conductors. Minimum clearance distances range from 18 inches to 20 feet.2 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.

Clearance distances take into account the growth rate of the vegetation in a year's time. So that Permittee has to perform maintenance only annually, pruning clearances include the average growth rate in the clearance calculations. For example, for vegetation with a clearance distance of 4 feet and tree and a growth rate of 8 feet in 1 year, Permittee will clear 12 feet so that the clearance distance will be maintained after 1 year of growth

E10a. Routine Vegetation Maintenance and Management

Routine Maintenance

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. This activity 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 affects larger portions of the tree than other routine vegetation maintenance work. Permittee 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 decay that has historically caused vegetation-related outages and a vegetation specific management prescription is written for trees along those line sections.

Enhanced Vegetation Management

This activity is currently focused on lines within high fire-threat areas, which are those noted as tier 2 or tier 3 on the CPUC fire threat maps. Work includes maintaining expanded clearances, eliminating overhanging branches, and removing hazard trees to reduce fire risk and ensure system reliability, as well as creation of fire defense zones in partnership with customers. Hazard trees are defined as “dead trees, old decadent or rotten trees, trees weakened by decay or disease, and live trees or portions thereof that are leaning toward the line which may contact the line from the side or may fall on the line” as determined by a forester or arborist and further requires that the hazard trees “shall be felled, cut, or trimmed so as to remove such hazard”.

E10b. Pole Clearing

Permittee 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 new poles that have never been cleared of vegetation. Permittee implements both subcategories of clearing annually. Vegetation clearing for existing poles applies to vegetation that has grown over the course of the year (e.g., 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.

Approximately 100 new subject poles are cleared of vegetation in a 10-foot radius around the pole annually in natural vegetation.

E10c. Tree Removal—Small Groups

When determined by Permittee—considering tree species, growth rates, site conditions, landowner notification, and appropriate permits—Permittee removes small groups of trees growing below overhead transmission and distribution facilities while conducting routine maintenance activities (E10a).

Trees are removed in groups affecting approximately 0.1 acre (4,350 square feet) at approximately 25 locations each year. Trees are cut off at ground level, with the roots and stump left in place.

E10d. Tree Removal—Transmission ROW Clearing

Permittee 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. Permittee vegetation management staff prioritizes lines and line sections to be worked annually. 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 transmission 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. Permittee's TVMP is associated with ROWs for its critical transmission lines, which operate at 200 kV or more, and for 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 to grow or fall into Permittee minimum clearance distances). ROW clearing typically is accomplished either mechanically or manually. However, because cutting or mowing can stimulate resprouting of incompatible vegetation, Permittee 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 are considered in selecting and implementing the appropriate management method or methods.

This covered activity is defined by those instances in which vegetation management is necessary as a distinct and separate action. The long-term goal of an integrated 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 or poles. 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). This management concept is depicted in Figure 2.

At approximately 10 locations per year, Permittee 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 all transmission lines from 115 kV to 500 kV. This estimated area is based on an assumption that Permittee 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 will not extend beyond 1,000 feet in one continuous area, and 1,000 feet of clearing is anticipated only once every 3 to 5 years. Riparian removals for this activity are illustrated in Figure 3 and Figure 4. Low-growing trees that stay below the clearance distance height are compatible and are retained. If the trees are incompatible then they will be removed; however, the compatible understory vegetation will be retained.

E10e. Tower Cage Clearing

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

E10f. Fee Strip Maintenance

To comply with city and county ordinances for fuels reduction and beautification, Permittee performs weed abatement work on Permittee-owned land under electric transmission facilities approximately once a year along a one-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, and using string trimmers.

E11a. Wood Pole Test and Treat - Inspection and Maintenance

Permittee identifies the line segments for inspection and testing based on age and condition of the utility assets. 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° angles to the axis of the pole. Each successive boring is 120° 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 takes place frequently, approximately 60,000 times per year. Approximately 10 percent (6,000) of these poles are in nonurban areas.

E11b. Wood Pole Test and Treat - Reinforcement

Approximately 180 poles (or 3 percent of the 6,000 wood poles in non-urban areas) that Permittee 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 minor disturbance.

Minor New Construction

G14. Gas Pressure Limiting Station Construction

Human population densities determine the class location designations of pipelines. A change of class location designation may require Permittee to move or replace a pipeline with upgraded pipe to increase safety, as mandated by CPUC.

An alternative to replacing the pipeline is installing a PLS that lowers the pressure of the gas in the line. A typical PLS is located within or adjacent to the existing ROW and typically 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 and 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 approximately 250 by 100 feet, including fencing. In all cases, the work would disturb less than one acre of land. As part of the PLS installation, natural gas is cleared from a portion of the pipeline using forced air. Once the PLS is in place, the pipeline must be hydrostatically tested.

E14. Minor Substation Expansion

Substations typically are constructed close to residential, commercial, or industrial development but may be located in areas surrounded by agricultural or natural vegetation. Substation expansions would occur adjacent to existing substations. Although this activity is infrequent, Permittee estimates up to 3 acres of permanent potential habitat loss per substation expansion 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. Permittee grades, paves, or surfaces the substation sites and fences the area for safety and security reasons. This ITP covers five electric substation expansions over the 30-year permit term. Permitting and environmental review by the CPUC is not required when Permittee already owns the property or where the high-side voltage does not exceed 50 kV.

E15. Underground Line Construction

Underground line construction is conducted predominately in roadways in urban and high fire threat areas 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 activity construction area length and length of time trenches remain open varies based on the length of the line, the location of the work, and other variables. Open trenches are covered at the end of each workday or when crews are not onsite during active operations, and filled generally within 1-week and as soon as possible once facilities are installed. During construction, trench excavation spoil is removed and stored. If hazardous material is present, construction crews haul the material off site and dispose of it appropriately. Permittee constructs underground lines within undisturbed natural habitat about once every 10 years. Under CPUC G.O. 131-D, environmental review by the CPUC is not required for conversion of existing overhead lines to underground facilities, for similar work in existing franchise, or for other work that is exempt under CPUC G.O. 131-D.

Duct Bank Installation

As the trench for the underground cable is completed, the 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. Dewatering

discharge would not be directed to the land or to water bodies near the work site. 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 in urban areas within public utility easements 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 then 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.

Habitat Conservation, Management and Enhancement

Permittee will conserve, manage, and enhance habitat for the ITP-covered species: California tiger salamander, Alameda whipsnake, and California freshwater shrimp. Permittee will provide an endowment for mitigation lands to fund the management needs of conserved properties. Activities required for land management typically include vehicle use in or near upland habitat, regular pedestrian surveys or sampling, installation and maintenance of fencing, and use of handheld equipment to manage vegetation and invasive species and otherwise enhance or restore habitat. Where possible, Permittee will identify opportunities to enhance conservation lands for the benefit of the covered species. Enhancement actions will include activities such as wetland or breeding pond creation and maintenance, stream restoration, and invasive species management. In the course of acquiring, managing, monitoring, or enhancing mitigation lands consistent with a CDFW-approved habitat conservation, management, and/or enhancement plan, take of covered species could result.

Species and Activities Not Covered Under this ITP

Permittee has elected not to receive take coverage for the following CESA-listed species whose habitats overlap with those of the Covered Species: Swainson’s hawk, San Joaquin kit

fox, northern spotted owl, marbled murrelet, and coho salmon – southern Oregon/northern California Ecologically Significant Unit. Any activity that may result in take of these species will require additional consultation with CDFW and take of these species is not authorized under this ITP. In addition, vegetation management through use of aerial equipment was neither contemplated in the CEQA document for the Project nor in this ITP and is not an authorized activity.

VI. Covered Species Subject to Take Authorization Provided by this ITP:

This ITP covers the following species:

Name	CESA Status[3]
1. California tiger salamander (*Ambystoma californiense*)	Threatened[4]
2. Alameda whipsnake (*Masticophis lateralis euryxanthus*)	Threatened[5]
3. California freshwater shrimp (*Syncaris pacifica*)	Endangered[6]

These species and only these species are the “Covered Species” for the purposes of this ITP.

VII. Impacts of the Taking on Covered Species:

Project activities and their resulting impacts are expected to result in the incidental take of individuals of the Covered Species. The activities described above are expected to result in incidental take of individuals of the Covered Species and include grading; boring; vegetation management such as tree removal or limbing, mowing, discing; materials and spoils storage; equipment storage; equipment and personnel mobilization; excavation; fill placement; clearing and grubbing; dewatering; establishment of temporary access routes; and other activities, such as mitigation lands management and enhancement (Covered Activities).

Incidental take of individuals of the Covered Species in the form of mortality (“kill”) may occur as a result of Covered Activities such as crushing during excavation, trenching, movement of vehicles and materials, entombing in underground burrows during construction activities, displacement into inhospitable environs, desiccation via entrapment and blocking of movement corridors or dewatering. Incidental take of individuals of the Covered Species may also occur from the Covered Activities in the form of pursue, catch, capture, or attempt to do so of the Covered Species from salvage efforts including capture and relocation. The areas where authorized take of the Covered Species is expected to occur include: breeding habitat, upland habitat, Alameda whipsnake core habitat (i.e., areas of concentrated use; habitat in core areas primarily consists of scrub communities such as coastal scrub, coyote brush

[3] Under CESA, a species may be on the list of endangered species, the list of threatened species, or the list of candidate species.
[4]See Cal. Code Regs. tit. 14 § 670.5, subd. (b)(3)(G).
[5]See Cal. Code Regs. tit. 14 § 670.5, subd. (b)(4)(D).
[6]See Cal. Code Regs. tit. 14 § 670.5, subd. (a)(1)(A).

scrub, mixed chaparral, and chamise chaparral but may also include immediately adjacent grassland), and other areas where the Covered Species can be found that are within or immediately adjacent to existing Permittee's ROWs that have existing utility infrastructure in place where ongoing operations and maintenance activities have historically taken place in Alameda, Contra Costa, Marin, Napa, San Francisco, San Mateo, Santa Clara, Solano, and Sonoma counties within Covered Species habitat (collectively, the Project Area).

The estimated extent of the impacts from Covered Activities within the Permit Area is dependent on where Covered Species and the habitats on which they depend occur. Given the large geographic scope of the Permit Area and Covered Activities, Permittee has developed predictive spatial models to map Covered Species habitats to quantify impacts for individual Covered activities. (For spatial model development methodology see ATTACHMENT 1). In addition, the models have been used to map Hot Zones, essentially areas containing a known localized population of Covered Species with a small and well-defined range and where species would be most likely to be affected by Covered Activities. Hot Zones were created for California freshwater shrimp and California tiger salamander (in the Santa Rosa Plain, a portion of Solano County, and Palo Alto). These Hot Zones are mapped and incorporated into PG&E's GIS system for identification of such habitats and prescription of conservation measures.

There are 1,636 acres of modeled California freshwater shrimp habitat within the Permit Area of which 72 acres fall within the Project Area. There are 31,355 acres of modeled habitat for the Sonoma County Distinct Population Segment (DPS) population of California tiger salamander, a distinct and geographically isolated population, and 2,404 of those acres fall within the Project Area. There are 1,149,805 acres of modeled habitat for the Central California DPS of California tiger salamander within the rest of the Permit Area counties covered by this ITP, and 41,151 of those acres fall within the Project Area. There are 335,452 acres of modeled habitat for Alameda whipsnake and 10,804 of those acres falls within the Project Area.

The Project is expected to cause the permanent loss of up to 399.3 acres of habitat for the Covered Species, and temporary loss of 4,319 acres of habitat for the Covered Species. Table 1, below, summarizes the total allowed acreage disturbance to Covered Species habitats by impact type. Impacts of the authorized taking also include adverse impacts to the Covered Species related to temporal losses, increased habitat fragmentation and edge effects, and the Project's incremental contribution to cumulative impacts (indirect impacts). These impacts include: stress resulting from noise and vibrations from tunneling, capture, and relocation, and long-term effects due to increased pollution, displacement from preferred habitat, increased competition for food and space, and increased vulnerability to predation.

Table 1. Maximum Acres of Habitat Loss by Impacts Type and Covered Species Authorized by the ITP

Covered Species Habitat	Habitat Disturbance (Acres)	
	Permanent (30-year Permit Term)	Temporary (30-year Permit Term)
California freshwater shrimp	0.3	2
California tiger salamander (outside of Sonoma County)		
Potential breeding habitat	2	25
Potential upland habitat	298	3,800
California tiger salamander (Sonoma County)	13	80
Alameda whipsnake		
Core	34	13
Perimeter Core	25	70
Movement	27	329

Covered Activities are classified as either small (i.e. affecting less than 0.1 acres), or large (i.e. affecting 0.1 acres or greater). Evaluation of impacts from small Covered Activities will use a modeled habitat approach as an alternative to on-the-ground biological surveys and habitat determinations under most circumstances. Areas containing extant populations of Covered Species where there is a high likelihood of take are defined as Hot Zones. The Permittee maintains a Geographic Information Systems map of Hot Zones that are updated periodically based on current data, observations and with input from both CDFW and U.S. Fish and Wildlife Service.

VIII. Incidental Take Authorization of Covered Species:

This ITP authorizes incidental take of the Covered Species and only the Covered Species. With respect to incidental take of the Covered Species, CDFW authorizes the Permittee, its employees, contractors, and agents to take Covered Species incidentally in carrying out the Covered Activities, subject to the limitations described in this section and the Conditions of Approval identified below. This ITP does not authorize take of Covered Species from activities outside the scope of the Covered Activities, take of Covered Species outside of the

Project Area, take of Covered Species resulting from violation of this ITP, or intentional take of Covered Species except for capture and relocation of Covered Species as authorized by this ITP.

IX. Conditions of Approval:

Unless specified otherwise, the following measures apply to all Covered Activities within the Project Area, including areas used for vehicular, aircraft (e.g. helicopter) ingress and egress, staging and parking, and noise and vibration generating activities that may/will cause take. CDFW's issuance of this ITP and Permittee's authorization to take the Covered Species are subject to Permittee's compliance with and implementation of the following Conditions of Approval:

1. **Legal Compliance:** Permittee shall comply with all applicable federal, state, and local laws in existence on the effective date of this ITP or adopted thereafter.

2. **CEQA Compliance:** Permittee shall implement and adhere to the mitigation measures related to the Covered Species in the Biological Resources section of the Environmental Impact Report (SCH No.: 2017122028) certified by California Department of Fish and Wildlife on July 6, 2022 as lead agency for the Project pursuant to the California Environmental Quality Act (CEQA) (Pub. Resources Code, § 21000 et seq.).

3. **ESA Compliance:** Permittee shall implement and adhere to the terms and conditions related to the Covered Species in the Pacific Gas and Electric Company Bay Area Operations and Maintenance Habitat Conservation Plan (08ESMF00-2013-F-0102-04) for the Project pursuant to the Federal Endangered Species Act (ESA). For purposes of this ITP, where the terms and conditions for the Covered Species in the federal authorization are less protective of the Covered Species or otherwise conflict with this ITP, the conditions of approval set forth in this ITP shall control.

4. **ITP Time Frame Compliance:** Permittee shall fully implement and adhere to the conditions of this ITP within the time frames set forth below and as set forth in the Mitigation Monitoring and Reporting Program (MMRP), which is included as Attachment 2 to this ITP.

5. **General Provisions:**

    5.1. Designated Representative. Before starting Covered Activities, Permittee shall designate a representative (Designated Representative) responsible for communications with CDFW and overseeing compliance with this ITP. Permittee shall notify CDFW in writing before starting Covered Activities of the Designated Representative's name, business address, and contact information, and shall notify CDFW in writing if a substitute Designated Representative is selected or identified at any time during the term of this ITP.

5.2. Designated Biologist(s), General Biological Monitor(s), and/or Veterinarian(s) Requirements and Approvals. Permittee shall submit to CDFW in writing the name, qualifications, business address, and contact information of proposed Designated Biologist(s)) using the Biologist Resume Form (Attachment 3) or another format containing the same information at least 15 days before starting Covered Activities in the year 2022. Permittee shall provide a list prior to January 31 every year thereafter seeking annual re-approval of Designated Biologists and Biologist Resume Forms for proposed, and/or submit Biologist Resume Forms for new Designated Biologist approval requests. Permittee shall ensure that the Designated Biologist(s) and General Biological Monitor(s) are knowledgeable and experienced in the biology, natural history, and for Designated Biologists, collecting and handling of the Covered Species. The Designated Biologist(s) and General Biological Monitor(s) shall be responsible for monitoring Covered Activities to help minimize and fully mitigate or avoid the incidental take of individual Covered Species and to minimize disturbance of Covered Species' habitat as required by this ITP. Permittee shall obtain CDFW approval of the Designated Biologist(s) in writing before starting Covered Activities as prescribed in this Condition of Approval and shall also obtain approval in advance, in writing, if the Designated Biologist(s) must be changed. Permittee shall also provide the resume of General Biological Monitors upon request by CDFW.

5.2.1. Designated Biologist(s). Permittee shall ensure that each Designated Biologist is knowledgeable and experienced in the biology, natural history, collecting, and handling of the applicable Covered Species. The Designated Biologist may be approved by CDFW on a species-specific basis, and in those cases will only be authorized to complete surveys and monitoring of the Covered Species for which they are specifically approved. The Designated Biologists shall be responsible for conducting all activities specific to a Covered Species as prescribed in this ITP and any handling or other actions necessary if individuals of Covered Species are found in the Project Area where Covered Activities are being conducted including temporary staging areas and equipment mobilization routes in Covered Species habitat (Work Area). The Designated Biologists shall be responsible for supervising the General Biological Monitors. Please note that the term Designated Biologist is interchangeable with the term Qualified Biologist as defined in the *Pacific Gas and Electric Company Bay Area Operations and Maintenance Incidental Take Permit Environmental Impact Report* (SCH No. 2017122028).

5.2.2. General Biological Monitor(s). General Biological Monitors are biologists with general roles and technical responsibilities. General Biological Monitors may be used instead of Designated Biologist(s) only for general monitoring activities within each discreet Work Area under the direction of the Designated Biologist(s). General Biological Monitors must have a 4-year degree in wildlife biology or related field, have a minimum, of 6 months of construction monitoring experience, and be experienced in the general biology, natural history, and identification of the applicable Covered Species. The General Biological

Monitors shall receive training and direction from the Designated Biologist(s) for each task performed. The General Biological Monitor(s) shall communicate daily with the Designated Biologist(s) and shall immediately report any occurrence of Covered Species within the Project Area or buffer areas, as well as any apparent non-compliance with any provision of this ITP.

5.3. Biological Monitor Authority. To ensure compliance with the Conditions of Approval of this ITP, all Designated Biologists and General Biological Monitors shall immediately stop any activity, when safe to do so, that does not comply with this ITP and/or order any reasonable measure to avoid the unauthorized take of an individual of the Covered Species. Permittee shall provide unfettered access to each Work Area and otherwise facilitate the Designated Biologists and General Biological Monitors in the performance of his/her duties. If a Designated Biologist or General Biological Monitor are either unable to comply with the ITP or prevented from performing required ITP compliance, then they shall notify the CDFW Representative immediately. Permittee shall not enter into any agreement or contract of any kind, including but not limited to non-disclosure agreements and confidentiality agreements, with its contractors and/or Designated Biologists or Biological Monitors that prohibit or impede open communication with CDFW, including but not limited to providing CDFW staff with the results of any surveys, reports, or studies or notifying CDFW of any non-compliance or take. Failure to notify CDFW of any non-compliance or take or injury of a Covered Species as a result of such agreement or contract may result in CDFW taking actions to prevent or remedy a violation of this ITP.

5.4. Education Program. Permittee shall conduct an education program for all persons employed or otherwise working in the Project Area before performing any work. The program shall consist of a presentation from the Designated Biologist or General Biological Monitor that includes a discussion of the biology and general behavior of the Covered Species, information about the distribution and habitat needs of the Covered Species, sensitivity of the Covered Species to human activities, its status pursuant to CESA including legal protection, recovery efforts, penalties for violations and Project-specific protective measures described in this ITP. Permittee shall provide interpretation for non-English speaking workers, and the same instruction shall be provided to any new workers before they are authorized to perform work in the Project Area. Upon completion of the education program, employees or contractors shall sign a form or equivalent acknowledging that they attended the program and understand all protection measures. This training shall be repeated at least once annually for long-term and/or permanent employees or contractors that will be conducting work in the Project Area. See also Conditions of Approval for activity specific Designated Biologist tailboards.

5.5. Covered Activity Monitoring Documentation. When biological monitoring is required per Condition of Approval 6.4 (Compliance Monitoring) or when required for conducting Covered Activities E9a (Reconductoring), G9 (Pipeline Lowering), G11 (Pipeline Replacement) and minor new construction in modeled habitat, the

Monitoring Biologist(s) shall maintain monitoring documentation on-site in either hard copy or digital format throughout the duration of work, which shall include a copy of this ITP with attachments. Permittee shall ensure a copy of the monitoring documentation is available for review at the Work Area upon request by CDFW.

5.6. Trash Abatement. Permittee shall initiate a trash abatement program before starting Covered Activities and shall continue the program for the duration of the Project. Permittee shall ensure that trash and food items are contained in animal-proof containers and removed, ideally at daily intervals but at least once a week, to avoid attracting opportunistic predators such as ravens, coyotes, and feral dogs.

5.7. Dust Control. Permittee shall implement dust control measures during Covered Activities to facilitate visibility for monitoring of the Covered Species by Biological Monitors and crews. Permittee shall keep the amount of water used to the minimum amount needed and shall not allow water to form puddles.

5.8. Prohibition of Firearms. Firearms and domestic dogs shall be prohibited in each Work Area as well as from site access routes during construction and development of the Project, except those firearms and domestic dogs that are in the possession of authorized security personnel or local, state, or federal law enforcement officials.

5.9. Erosion Control. Permittee shall implement and install all erosion and sediment control measures and devices prior to conducting Covered Activities that include grading, excavation, or placement of fill. Permittee shall utilize erosion control measures where sediment runoff from exposed slopes or surfaces could enter a drainage, stream, wetland or pond. Permittee shall repair and/or replace ineffective measures or contrivances whose integrity has been compromised immediately.

5.10. Erosion Control Materials. Permittee shall prohibit use of erosion control materials potentially harmful to Covered Species and other species, such as monofilament netting (erosion control matting) or similar material, in potential Covered Species' habitat.

5.11. Clean Vehicles. Permittee shall implement the following for Covered Activities E9a (Reconductoring), G9 (Pipeline Lowering), G11 (Pipeline Replacement) and minor new construction that involve ground disturbance:

5.11.1. Mud and/or accumulated soils shall be removed from equipment and vehicles to the maximum extent practicable.

5.11.2. Vehicles and equipment shall be cleaned or washed before entering a new work site.

5.11.3. A log shall be kept for each work site and shall be completed to document each cleaning or washing of vehicles or equipment before entering each new work site.

5.11.4. Vehicles shall be staged and stored on paved or cleared areas to the extent practicable.

5.11.5. Certified weed-free mulch, straw, hay bales, or equivalent materials shall be used where necessary.

5.12. Delineation and Avoidance of Sensitive Habitat Features. For Covered Activities E9a (Reconductoring), G9 (Pipeline Lowering), G11 (Pipeline Replacement) and minor new construction, a Designated Biologist shall clearly identify sensitive resources that crews must avoid for the duration of the activities with posted signs, posting stakes, flags, and/or rope or cord, and place fencing as necessary to minimize or avoid disturbance.

5.13. Work Area Access. To the extent practicable, project related personnel shall access a Work Area using existing routes, and shall not cross Covered Species' habitat outside of or en route to a Work Area. Permittee shall restrict Project-related vehicle traffic to established roads, staging, and parking areas to the maximum extent practicable. Permittee shall ensure that vehicle speeds do not exceed 15 miles per hour to avoid Covered Species on or traversing the roads.

5.14. Staging Areas. Permittee shall confine all Project-related parking, storage areas, laydown sites, equipment storage, and any other surface-disturbing activities to a Work Area using, to the extent possible, previously disturbed areas. No staging areas shall be located in chaparral or scrub habitats, over rock outcroppings or within 300 feet of a stock pond or vernal pool.

5.15. Hazardous Waste. Permittee shall immediately stop and, pursuant to pertinent state and federal statutes and regulations, arrange for repair and clean up by qualified individuals of any fuel or hazardous waste leaks or spills at the time of occurrence, or as soon as it is safe to do so. Permittee shall properly contain and dispose of any unused or leftover hazardous products off-site.

5.16. Pesticides. At no time shall Permittee utilize broadcast baiting of rodenticides within the Project Area. When pesticides are used, PG&E shall follow all applicable state and federal laws, County Agricultural Commissioner regulations, label requirements, and when applicable, according to requirements in habitat management plans associated with Condition of Approval 8.5 (Habitat Acquisition and Protection).

5.17. CDFW Access. Permittee shall provide CDFW staff with reasonable access to Work Areas and mitigation lands under Permittee control, and shall otherwise fully cooperate with CDFW efforts to verify compliance with or effectiveness of mitigation measures set forth in this ITP.

5.18. Refuse Removal. Upon completion of Covered Activities within a Work Area, Permittee shall remove from, and properly dispose of all temporary fill and construction refuse, including, but not limited to, broken equipment parts, wrapping

material, cords, cables, wire, rope, strapping, twine, buckets, metal or plastic containers, and boxes.

5.19. Extent of Hardscape in Streams. Permittee shall limit the extent of concrete, Ercon mat, or concrete pillow systems within a watercourse to a maximum length of 100 feet and a maximum width of 50 feet at any one location unless otherwise approved in writing by CDFW.

6. Monitoring, Notification and Reporting Provisions:

6.1. Notifications Before Commencement of Certain Activities. The Designated Representative shall provide notification (Attachment 4) to CDFW for the following Covered Activities when the activity occurs outside of urban areas in modeled habitat and shall document compliance with all pre-activity Conditions of Approval before starting Covered Activities:

- Minor New Construction
- **E9a** (Reconductoring);
- **G9** (Pipeline Lowering)**;**
- **G11** (Pipeline Replacement)**;**
- **E15** (Underground Line Construction) when the activity occurs outside of existing roadways or urban areas;
- **G10** (Pipeline Coating Replacement) – when excavation or trenching needed in wetlands or streams;
- **G13b** (Pipeline Access Road Maintenance) – when the activity includes culvert or headwall replacement;
- Construction of temporary or permanent access roads in modeled or potential Covered Species habitats;
- Covered Activities that occur within or over California freshwater shrimp habitat and those that may affect undercut banks and the trees that support undercut banks within shrimp habitat;
- All Covered Activities in wetted potential CTS breeding habitat;
- Covered Activities that include bridge replacement or culvert replacements in modeled California freshwater shrimp or California tiger salamander habitats.

- Other Covered Activities that may result in ground disturbance of 1 acre or greater in Covered Species habitats.

Notifications shall be submitted at least 45 days in advance and prior to "release to construction" by the Designated Representative for review by CDFW. Within 14 days of request by CDFW and if not possible then at least 5 days prior to the beginning of the Covered Activity, Permittee shall provide any requested additional information and provide access for a CDFW field review of the proposed Work Area. The proposed Covered Activity may not commence until Permittee has provided the additional information to the specifications of the request by CDFW, or until field review access has been provided to CDFW. If there continues to be unresolved issues or questions, then Permittee or CDFW may request to meet and confer within 10 business of the request to resolve any outstanding issues. CDFW retains the right to determine whether a proposed Covered Activity will not be provided coverage under this ITP.

Notification for Covered Activities listed in Condition of Approval 6.1 that are identified as "Emergency Work" (i.e., work that requires immediate action due to a sudden, unexpected occurrence, involving a clear and imminent danger, demanding immediate action to prevent or mitigate loss of, or damage to, life, health, property, or essential public services) shall be provided within 48 hours of identification. Regulatory compliance deadlines or actions that are to be taken in response to violation notices do not qualify as "Emergency Work".

6.2. Environmental Review, Planning and Screening Process. Permittee shall use an Automated Environmental Assessment (AEA) screening tool to screen many of the small electric (e.g., pole replacements) and small gas Covered Activities. The AEA tool shall automatically use a variety of current 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 release 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 and Hot Zones shall be integrated into the AEA screening process, and a Covered Activity that falls within modeled habitat or a Hot Zone shall be flagged for review. A team of land planners, biologists, foresters, arborists, and tree inspectors shall conduct environmental review of vegetation management covered activities before work in the field commences. Impacted acreages of Covered Species' habitats shall also be calculated either using estimates from modeled habitat or ground-truthed. The Permittee shall also adhere to and implement the Environmental Review, Planning and Screening Process (see Attachment 5) for each Covered Activity. At a minimum, Permittee's HCP Implementation Staff shall first review, plan, and screen Covered Activities. After the completion of any required surveys, studies, or analyses, the Permittee shall develop a release-to-construction memorandum that identifies the

natural resource protection measures that will be implemented in addition to relevant Conditions of Approval required by this ITP.

6.3. Notification of Non-compliance. The Designated Representative shall immediately notify CDFW if the Permittee is not in compliance with any Condition of Approval of this ITP, including but not limited to any actual or anticipated failure to implement measures within the time periods indicated in this ITP and/or the MMRP. The Designated Representative shall follow up within 72 hours with a written report to CDFW describing, in detail, any non-compliance with this ITP and suggested measures to remedy the situation.

6.4. General Compliance Monitoring. The Designated Biologist shall be on-site:

- Daily when Covered Species are encountered within a Work Area;
- At the determination of the Designated Biologist, when Covered Species are relocated outside a Work Area to monitor and assess relocation success;
- When conducting Covered Activities within 500 meters of a known or suspected California tiger salamander (CTS) breeding pond that will result in displacement of soil to a depth of 3-inches or greater and over an area of 0.1 acres or greater, during the clearing and grubbing phase and when conducting any ground disturbing activities;
- All Covered Activities that may directly affect (e.g., tree work) California freshwater shrimp habitat;
- When required by species-specific Conditions of Approval below.

A Biological Monitor shall be on-site:

- Daily when E9a (Reconductoring), G9 (Pipeline Lowering), G11 (Pipeline Replacement), and minor new construction activities are conducted in modeled habitat;
- G10 (Pipeline Coating Replacement) when excavation or trenching occurs in wetlands or streams;
- When Covered Activities with a Work Area equal to or greater than 0.1 acres are conducted during rain events in modeled California tiger salamander habitat unless otherwise approved by CDFW in writing;
- When required by species-specific Conditions of Approval below.

For Covered Activities in Covered Species modeled habitat that require work over a period of two weeks or greater, a General Biological Monitor shall conduct

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compliance inspections, at a minimum, once every week after clearing, grubbing, and grading are completed and during periods of inactivity. The General Biological Monitor shall conduct compliance inspections to:

(1) minimize incidental take of the Covered Species;

(2) prevent unlawful take of species;

(3) check for compliance with all measures of this ITP;

(4) check all exclusion zones; and

(5) ensure that signs, stakes, and fencing are intact, and that Covered Activities are only occurring in the pre-designated Project Area(s).

The Designated Representative or Monitoring Biologist shall prepare daily written observation and inspection records summarizing oversight activities and compliance inspections, observations of Covered Species and their sign, survey results, and monitoring activities required by this ITP.

6.5. Quality Assurance Check and Updates to Covered Species Modeled Habitat Maps. During the first year of ITP implementation, Permittee and CDFW shall coordinate to perform a quality assurance check and update as necessary the habitat models for Covered Species to ensure the spatial data accurately represent the modeled habitats available for the Covered Species. Thereafter, Permittee or CDFW may propose updates to habitat models for Covered Species to ensure the output accurately represents the habitat available for the Covered Species in coordination with, and as approved by, CDFW and the USFWS. For example, if Permittee receives better wetland data for Santa Rosa Plain or Solano County, this data can be integrated to better assist Permittee in avoiding wetland habitats.

6.6. Annual Status Report. Permittee shall provide CDFW with an Annual Status Report (ASR) no later than June 30 of every year beginning with issuance of this ITP and continuing until CDFW accepts the Final Mitigation Report identified below. Each ASR shall include, at a minimum: (1) Biologist compliance monitoring notes/data sheets recorded for the year; (2) a general description of the status of the Project Area and Covered Activities, including actual or projected completion dates, if known; (3) a copy of the table in the MMRP with notes showing the current implementation status of each mitigation measure; (4) an assessment of the effectiveness of each completed or partially completed mitigation measure in avoiding, minimizing and mitigating Project impacts; (5) all available information about Project-related incidental take of the Covered Species including observation reports to the California Natural Diversity Database (Condition of Approval 6.8); (6) an accounting of the number of acres subject to both temporary and permanent disturbance, both for the prior calendar year, and a total since ITP issuance including restoration of temporary impacts and return to baseline as prescribed in the

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Vegetation Restoration Plan (Condition of Approval 8.8); (7) documentation that impacts categorized as temporary have achieved the established baseline; (8) information about other Project impacts on the Covered Species; (9) updates to the Pre-activity Notification Form as deemed necessary by CDFW or those that are mutually agreed upon by both CDFW and Permittee.

6.7. 5-Year Compliance Report. Permittee shall prepare and submit to CDFW a 5-year compliance report by June 30 each 5-year anniversary of the effective date of this ITP, as described in the Permit Term section of this ITP in addition to the information required in the Annual Status Report (Condition of Approval 6.6). CDFW and Permittee shall meet and confer to discuss the report and any ongoing challenges to successful ITP implementation.

6.8. CNDDB Observations. The Designated Biologist or Permittee shall submit all observations of Covered Species to CDFW's California Natural Diversity Database within 60 calendar days of the observation and the Permittee shall include copies of the submitted forms with the next ASR or 5-year compliance report. If observations occur on lands not owned in fee title by Permittee, then Permittee may elect to inform the landowner of an observation. If the landowner objects to submission of the observation, then Permittee may elect to not submit.

6.9. Final Mitigation Report. Within 30 days of the ITP expiration date, Permittee shall provide CDFW with a Final Mitigation Report. The Permittee shall prepare the Final Mitigation Report which shall include, at a minimum: (1) a summary of all ASRs and 5-year compliance reports; (2) a copy of the table in the MMRP with notes showing when each of the mitigation measures was implemented; (3) all available information about Project-related incidental take of the Covered Species; (4) information about other Project impacts on the Covered Species; (5) beginning and ending dates of Covered Activities; (6) an assessment of the effectiveness of this ITP's Conditions of Approval in minimizing and fully mitigating Project impacts of the taking on Covered Species; (7) recommendations on how mitigation measures might be changed to more effectively minimize take and mitigate the impacts of future projects on the Covered Species; and (8) any other pertinent information.

6.10. Notification of Take or Injury. Permittee shall immediately notify the Designated Biologist if a Covered Species is taken or injured by a Project-related activity, or if a Covered Species is otherwise found dead or injured within the vicinity of the Project. The Designated Biologist or Designated Representative shall provide initial notification to CDFW by calling the Regional Office at (707) 428-2002. The initial notification to CDFW shall include information regarding the location, species, and number of animals taken or injured and the ITP Number. Following initial notification, Permittee shall send CDFW a written report within two working days. The report shall include the date and time of the finding or incident, location of the animal or carcass, and if possible, provide a photograph, explanation as to cause of take or injury, and any other pertinent information.

6.11. Temporary Impact Criteria. The following criteria shall be used to define temporary impacts for the purposes of calculating mitigation requirements:

6.11.1. For areas less than one-acre, to be considered a temporary impact, the impacts must meet the following criteria: (1) returned to pre-activity conditions when compared to vegetation characteristics (i.e., percentage of cover by species, vegetation heights and species composition), on undisturbed lands adjacent to the Work Area; and (2) temporarily impacted areas must be restored within 12 months of impacts being initiated. Refer to Condition of Approval 8.8 for restoration and monitoring requirements.

6.11.2. For areas equal to or greater than 1-acre, to be considered a temporary impact, the impacts must meet the following criteria: (1) establishment and documentation of baseline conditions, including percentage of cover by species, vegetation heights and species composition, must be completed prior to impacts; (2) temporarily impacted areas must be restored to baseline conditions within 12 months of impacts being initiated. Refer to Condition of Approval 8.8 for restoration and monitoring requirements.

7. Take Minimization Measures: The following requirements are intended to ensure the minimization of incidental take of Covered Species in the Project Area during Covered Activities. Permittee shall implement and adhere to the following conditions to minimize take of Covered Species:

7.1. Equipment Fueling. No vehicles or heavy equipment will be refueled within 100 feet of a wetland, stream, or other waterway, or within 250 feet of vernal pools, unless secondary containment is used. The fueling operator must always stay with the fueling operation. Tanks may not be topped off. If refueling must be conducted closer to wetlands, construct a secondary containment area subject to review by an environmental field specialist and/or biologist. Permittee shall maintain spill prevention and cleanup equipment in refueling areas. Sufficient spill containment and cleanup equipment shall be present at all mobile, temporary, and permanent equipment fueling locations.

7.2. Lighting. Permittee shall ensure that all artificial outdoor lighting shall be limited to lighting for safety and security, and designed using Illuminating Engineering Society's design guidelines, International Dark-Sky Association-approved fixtures, or other industry standards that address lighting impacts. Lighting above ground level shall be directed downward or inward, where consistent with safety concerns, and shielding shall be utilized, where needed, to minimize light scatter off-site. Light fixtures shall have non-glare finishes that will not cause reflective daytime glare.

7.3. Covered Activities Hours. Construction activities shall cease 30 minutes before sunset and shall not begin prior to 30 minutes after sunrise, to the extent practicable. Emergency night work shall be limited in extent, duration, and brightness, to the extent feasible. For Covered Activities E9a (Reconductoring), G9 (Pipeline Lowering),

G11 (Pipeline Replacement), and minor new construction, work may not occur at night during rain events in CTS habitat within 0.5 miles of known or potential breeding habitat between November 1 and April 30 unless otherwise authorized by CDFW. Covered Activities shall not occur at night for non-emergency work in California freshwater shrimp habitat any time of year unless otherwise authorized by CDFW.

7.4. Stored Materials Inspections. Workers shall thoroughly inspect for AWS and CTS in all construction pipe, culverts, or similar structures with a diameter of 7.6 centimeters (three inches) or greater that are stored for one or more overnight periods before the structure is subsequently moved, buried, or capped. If during inspection one of these animals is discovered inside the structure, workers shall notify the Biological Monitors) and allow the Covered Species to safely escape that section of the structure before moving and utilizing the structure or moved out of harm's way by a Designated Biologist.

7.5. Cover or Ramp Open Excavations. Trenches or pits shall be covered or equipped with an escape ramp if left overnight in Covered Species modeled habitat. Crews shall inspect any trench, pit, or hole every morning prior to conducting Covered Activities to ensure no individuals are trapped; if any animals are found staff shall contact the Designated Biologist(s) to identify whether it is a Covered Species and if so, it shall be moved out of harm's way by the Designated Biologist(s). If the animal is not a Covered Species, then a General Monitoring Biologist or other individual with wildlife handling experience in possession of any applicable handling permits may move it out of harm's way.

7.6. Spoils Stockpiles. Permittee shall ensure that soil stockpiles are placed where soil will not pass into wetlands or any other "waters of the state," in accordance with Fish and Game Code section 5650. Permittee shall cover and protect stockpiles to prevent soil erosion, including wind and rain. Spoils and shall be placed away from chaparral habitat, rock outcroppings, and concentrated ground squirrel, pocket gopher, or other small mammal burrows or habitat features suitable for use by the Covered Species as refugia habitat.

7.7. Screen or Cap Hollow Pipes or Posts. All hollow pipes or posts that are installed as part of Covered Activities, or encountered in a Work Area that the Permittee owns or is responsible for, that are above ground shall be capped, screened, or filled with material by Permittee prior to the end of the day in which installation occurs.

7.8. Equipment Inspection. Workers shall inspect for Covered Species under vehicles and equipment before the vehicles and equipment are moved. If a Covered Species is present, the worker shall notify the Biological Monitors and wait for the Covered Species to move unimpeded to a safe location. Alternatively, the Permittee shall contact a Designated Biologist to determine if they can safely move the Covered Species out of harm's way in compliance with this ITP.

7.9. No Barriers to Covered Species Movement. Permittee shall construct access routes such that there are no steep curbs, v-ditches, berms, straw wattles, or dikes that could prevent Covered Species from traversing through ROWs or from exiting roadways. If curbs/ berms/straw wattles are necessary for safety and/or surface runoff, Permittee shall design and construct them to allow Covered Species to move over them. Permittee shall modify or remove exclusion fencing at the request of Biological Monitors or CDFW staff that may impede Covered Species movements.

California Tiger Salamander Specific Conditions

7.10. California Tiger Salamander Mortality Reduction and Relocation Plan. Permittee shall prepare a CTS standardized mortality reduction and relocation plan (CTS Plan) that includes, but is not limited to, techniques to exclude salamanders from Work Areas; techniques to excavate burrows; and techniques to capture, handle, and relocate CTS safely if they are encountered in aquatic or upland habitats; and protocols for encounters with injured CTS. The CTS Plan shall also include information on materials to use, disease prevention, injuries, and nearby wildlife rehabilitation centers or veterinary facilities capable of evaluating or treating salamanders. The CTS Plan shall incorporate measures from the Fieldwork Code of Practice developed by the Declining Amphibian Populations Task Force to prevent disease transmission when working directly in aquatic habitat. Annual reports (see Condition of Approval 6.6) shall include a summary of the results of implementation of the CTS Plan. Covered Activities where CTS may be present shall not proceed until the CTS Plan is approved in writing by CDFW. Only the Designated Biologist(s) are authorized to handle or capture CTS. Any variance requests for an individual Covered Activity within a specified Work Area shall be approved in writing by CDFW. Upon request by either party, Permittee and CDFW shall meet and confer to update the CTS Plan, otherwise Permittee shall perform a scientific literature review and provide a list of in-line changes with the 5-year Compliance Report (Condition of Approval 6.7).

7.11. California Tiger Salamander Pre-Activity Clearance Surveys. When Covered Activities will result in ground disturbance in potential CTS aquatic habitat (seasonal or perennial), the Designated Biologist(s) shall perform a pre-activity clearance survey no more than 14 days prior to the start of Covered Activities. If Covered Activities will be conducted within 500 meters of a known or suspected CTS breeding pond that will result in displacement of soil to a depth of 3-inches or greater and over an area of 0.1 acres or greater, the Designated Biologist(s) shall perform a pre-activity clearance survey no more than 14 days prior to the start of Covered Activities. For Covered Activities E9a (Reconductoring), G9 (Pipeline Lowering), G11 (Pipeline Replacement), and E14 (Minor Substation Expansion) in modeled habitat, the Designated Biologist(s) shall also conduct a pre-activity clearance survey. If a California tiger salamander in any life stage (adult, metamorph, larval, eggs, etc.) is encountered in a Work Area or at the recommendation of the Designated Biologist, Permittee shall implement the standardized mortality reduction and relocation plan (Condition of Approval 7.10). Pre-activity clearance surveys shall provide 100

percent visual coverage of a Work Area and a 50-foot buffer zone. All small mammal burrows within the Work Area and a 50-foot buffer zone shall be flagged to alert General Biological Monitors and work crews to their presence. Where feasible, an avoidance buffer of 50 feet or greater around active small mammal burrows shall be maintained. The Designated Biologist(s) shall submit a report documenting the results of the pre-construction surveys to CDFW within five days after performing the surveys. If any California tiger salamander are found within the Work Area or 50-foot buffer zone, the Designated Biologist will relocate them from the Work Area or buffer zone(s) in accordance with the CTS standardized mortality reduction and relocation plan (Condition of Approval 7.10).

7.12. Work in or Adjacent to Aquatic Breeding Habitat. A Designated Biologist shall be on-site to oversee any Covered Activities that occur within potential CTS breeding habitat (whether surface water is present or not). To the extent practicable, Permittee shall avoid impacts to potential or known CTS breeding habitat unless completely dry. If Covered Activities in wetted breeding habitat cannot be avoided, then the activities shall be performed under the direction of a Designated Biologist and in a manner consistent with the CTS Mortality Reduction and Relocation Plan. Permittee shall restrict placement of fill or other ground-disturbing activities within a 300-foot buffer from the edge of the ordinary high-water mark of known or potential aquatic breeding habitat to the extent practicable. However, if ground-disturbing work within the 300-foot buffer is necessary then a General Biological Monitor shall 1) oversee excavation of burrows that will be impacted by ground disturbing activities, 2) oversee placement of fill in a manner that avoids burrow entrances, and 3) shall be on-site during all ground-disturbing Covered Activities with the exception of vegetation management, pole replacements, patrols, or inspections. The Designated Biologist shall relocate any live California tiger salamander discovered during burrow excavation in accordance with the CTS Mortality Reduction and Relocation Plan (Condition of Approval 7.10).

7.13. Avoid Vernal Pools in CTS Hot Zones. Permittee shall avoid impacts to vernal pools to the extent practicable. For work that cannot avoid vernal pool impacts that are in CTS Hot Zones, Permittee shall conduct Covered Activities only when vernal pools are completely dry.

7.14. California Tiger Salamander Protection during Upland Movements or Exclusion Fencing. Permittee shall implement the following additional protective measures for Covered Activities E9a (Reconductoring), G9 (Pipeline Lowering), G11 (Pipeline Replacement), and E14 (Minor Substation Expansion), as well as E15 (Underground Line Construction) when the activity occurs outside of existing roadways or urban areas, in CTS habitat within 0.5 mile of known or potential breeding habitat between November 1 and April 30:

7.14.1. Permittee shall not conduct Covered Activities (specified in 7.13) at night during rain events unless otherwise authorized by CDFW. The following day, crews will

check for CTS around tires, equipment, and materials before resuming work. If a CTS is found, the crew shall avoid the area and contact the Designated Biologist(s) for direction.

7.14.2. Prior to a rain event of 0.25 inches or greater within a 24-hour period, Permittee shall install exclusion fencing around the perimeter of Work Areas to prevent CTS movement into the Work Areas. Installation of the exclusion fence shall be overseen and directed by the Designated Biologist(s). The exclusion fence shall be buried a minimum of 4 inches below ground surface and equipped with one-way exits (if the Work Area still has burrows and has not been cleared of CTS) to avoid entrapment of CTS and other amphibians or reptiles within the fenced area. For every 100 feet of exclusion fencing, Permittee shall provide coverboards to provide shelter for CTS.

7.14.3. The exclusion fence shall be supported sufficiently to maintain its integrity under all conditions, such as wind and heavy rain, for the duration of the Covered Activities in the Work Area being fenced. The Designated Biologist(s) shall inspect the completed fencing prior to construction. General Biological Monitors shall check the exclusion fence at least once daily and maintain/repair the fence when necessary. Permittee shall install temporary exclusion fencing in a sequential manner that corresponds to the progression of Covered Activities as specified above within a Work Area. When exclusion fencing is not required to be installed simultaneously throughout a Work Area then it shall be installed for only the portion of a Work Area that is under active construction and removed immediately after the construction has ceased to prevent substantial impediments to CTS movement.

7.15. Discovery of California Tiger Salamander in Work Area(s). If a CTS, including body parts, is found by any person in a Work Area before or during Covered Activities, Permittee shall stop all work when safe to do so that could potentially injure CTS immediately until the Designated Biologist(s) can relocate the California tiger salamander following the California Tiger Salamander Mortality Reduction and Relocation Plan specified in Condition of Approval 7.10. Covered Activities may commence as directed by the Designated Biologist(s) including recommendation that General Biological Monitor(s) be present at the Work Area to monitor Covered Activities.

7.16. California Tiger Salamander Record of Handling. The Designated Biologist shall maintain a record of all CTS captures, relocations, and observations. Records shall include the following information: the date, time, and location of each occurrence using GPS; the name of the party that actually identified the CTS; circumstances of the incident; the general condition and health of each individual CTS; any diagnostic markings, sex, age (juvenile or adult); actions undertaken; and habitat description. The Permittee shall include this information in Annual Reports (Condition of Approval 6.6) and shall submit this information to CDFW.

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Alameda Whipsnake Specific Conditions

7.17. Alameda Whipsnake Pre-Activity Habitat Features Survey. Pre-construction surveys for Alameda whipsnake and sheltering and sunning habitat features (e.g., burrows, rocky outcrops, fallen trees, etc.) shall be conducted in modeled core and perimeter core habitat for Covered Activities E9a (Reconductoring), G9 (Pipeline Lowering), G11 (Pipeline Replacement), and E14 (Minor Substation Expansion). (See also Condition of Approval 7.19 for survey requirements in core habitat). These surveys shall be conducted by a Designated Biologist no more than 30 calendar days prior to any initial ground disturbance. These surveys will consist of walking the work area and, if possible, any accessible adjacent areas within at least 50 feet of the work area. The Designated Biologist shall investigate potential cover sites when it is feasible and safe to do so. This includes thorough investigation of mammal burrows, rocky outcrops, appropriately sized soil cracks, tree cavities, and debris. Sheltering, sunning, or other sensitive species features identified by the Designated Biologist shall be identified with flagging. Permittee shall avoid habitat features flagged by the Designated Biologist to the extent practicable. At the recommendation of the Designated Biologist, Permittee shall install an exclusionary barrier (Condition of Approval 7.18).

7.18. Exclusionary Barrier. Permittee shall install a temporary barrier, where feasible, to prevent the Covered Species from dispersing into the Work Area, including along construction access routes, prior to commencing any other Covered Activities. The barrier shall be installed immediately after the pre-construction surveys have been completed in accordance with Condition of Approval 7.17 above and shall consist of fencing at least 42 inches tall with 36 inches above the soil surface, designed with a lip to prevent the Covered Species from climbing over the barrier, and buried to a depth of six inches below the soil surface. The soil shall be compacted against both sides of the fence to prevent the Covered Species from gaining access. The stakes shall be placed on the inside of the fence. No gaps or holes are permitted in the fencing system except for access areas as required for vehicular and pedestrian traffic. The exit/entry points shall be constructed so that it is flush to the ground and so that the covered Species cannot access the Work Area. The barrier shall be designed to allow trapped individuals to leave the Work Area by installing one-way funnels, ramps, or other methods approved by CDFW. An alternative barrier design or directional treatment techniques in lieu of fencing may be used after receiving written authorization from CDFW. The Designated Biologist or General Monitoring Biologist shall inspect the barrier daily and the barrier shall remain in place until all construction activities have been completed or where recommended by a Designated Biologist. The Permittee shall maintain and repair barrier immediately, if damaged, to ensure that it is functional and without defects. Permittee shall provide refuge opportunities along or near the outer side of the silt fence for the Covered Species (see also Condition of Approval 7.19).

7.19. Refugia Coverboards. Coverboards shall be installed in Work Area(s) as determined by the Designated Biologist in modeled core and perimeter core habitat for Covered

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Activities E9a (Reconductoring), G9 (Pipeline Lowering), G11 (Pipeline Replacement), and E14 (Minor Substation Expansion) prior to conducting Covered Activities. When coverboards are recommended, they shall be placed to provide refuge for the Covered Species fleeing the area, including areas where a directional treatment methodology is used (e.g., phasing a project to encourage Covered Species to move towards core habitats and away from potentially harmful environs). When coverboards are recommended, they shall be inspected at the end of each workday by a General Monitoring Biologist and use by wildlife shall be recorded.

7.20. Alameda Whipsnake Clearance Surveys. Immediately prior to the start of a Covered Activity habitats that impact greater than 0.1 acres that affects core Alameda whipsnake (AWS) habitat, including scrub or chaparral plant communities in modeled habitat, the Designated Biologist(s) shall visually survey the Work Area and adjacent areas, as determined by the Designated Biologist, to clear the area of Alameda whipsnake. If Covered Activities may affect habitat features flagged per Condition of Approval 7.17 then a General Biological Monitor shall conduct daily clearance surveys in the active Work Area(s).

7.21. Alameda Whipsnake Pre-Activity Tailboards. The Designated Biologist or General Biological Monitor may prescribe activity-specific tailboards trainings reminding staff of the importance of following measures to minimize impacts on Alameda whipsnake as they relate to the work site. Site specific tailboards shall be conducted for staff working on Covered Activities that impact greater than 0.1 acres in core habitat or perimeter core habitat.

7.22. Suspected Alameda Whipsnake in Work Area. If a snake is found by any person in the Work Area before or during Covered Activities, all work that could potentially injure the snake shall stop immediately and the snake will be allowed to leave the work area on its own. If the snake does not leave the work area or cannot move to an area with sufficient habitat outside of the work area, the Designated Biologist will move the snake to suitable habitat outside the work area. Covered activities will resume only after the snake has been confirmed to be out of the Work Area.

7.23. Alameda Whipsnake Seasonal Restriction. Disturbance in modeled core and perimeter core habitat for E9a (Reconductoring), G9 (Pipeline Lowering), G11 (Pipeline Replacement), and E14 (Minor Substation Expansion) for Alameda whipsnake will only take place between April 15 and October 31 to the extent feasible when Alameda Whipsnake is more active and less likely to be affected by covered activities. For activities E9a (Reconductoring), G9 (Pipeline Lowering), G11 (Pipeline Replacement), and E14 (Minor Substation Expansion) occurring in core or perimeter core habitat for Alameda whipsnake between November 1 and April 14, a Designated Biologist(s) will be present during operations.

7.24. Alameda Whipsnake Injury. If an AWS has major or serious injuries as a result of Project-related activities, the Designated Biologist shall immediately take it to a

qualified wildlife rehabilitation or veterinary facility. Permittee shall bear any costs associated with the care or treatment of such injured AWS. If the injury is minor or healing and the AWS is likely to survive as determined by the Designated Biologist, it shall be released immediately to an area out of harm's way. The Permittee shall notify CDFW of the injury to the AWS within 2 working days by telephone and e-mail followed by a written incident report as described in Condition 6.3. Notification shall include the name of the facility where the animal was taken.

California Freshwater Shrimp Specific Conditions

7.25. California Freshwater Shrimp Seasonal Restrictions. Permittee shall restrict Covered Activities in or adjacent to streams in modeled habitat for California freshwater shrimp to the period between July 1 (after females release eggs) and November 15 (before they move to the shallow margins of streams, seeking refuge from high water velocities associated with winter storm events) to the extent possible. If work must occur outside of this period, then the Designated Biologist shall be present during all Covered Activities.

7.26. California Freshwater Shrimp Relocation Plan. If Covered Activities in streams in California freshwater shrimp modeled habitat cannot be avoided, Permittee shall prepare a California Freshwater Shrimp Relocation Plan for CDFW review and approval. The California Freshwater Shrimp Relocation Plan shall include, but is not limited to, resumes of individuals qualified to survey and monitor for California freshwater shrimp; survey, capture, and release methods; methods to keep relocated shrimp out of harm's way; and locations with suitable habitat for relocation. Permittee may proceed with Covered Activities described in the California Freshwater Shrimp Relocation Plan upon receipt of CDFW approval of the California Freshwater Shrimp Relocation Plan. Only the Designated Biologist(s) listed in the California Freshwater Shrimp Relocation Plan are authorized to capture and handle California freshwater shrimp. Permittee shall update the California Freshwater Shrimp Relocation Plan upon request by CDFW.

7.27. Implement California Freshwater Shrimp Relocation Plan. If Covered Activities may affect California freshwater shrimp potential aquatic habitat, the Designated Biologist shall survey prior to allowing work to proceed. The Designated Biologist shall survey all undercut banks and submerged tree roots with a butterfly net or fish net. If California freshwater shrimp are captured, the Designated Biologist shall relocate them from the Work Area according to the Freshwater Shrimp Relocation Plan.

8. **Habitat Management Land Acquisition and Restoration:** CDFW has determined that permanent protection and perpetual management of compensatory habitat is necessary and required pursuant to CESA to fully mitigate Project-related impacts of the taking on the Covered Species that will result from implementation of the Covered Activities. This determination is based on factors including an assessment of the importance of the habitat in the Project Area, the extent to which the Covered Activities will impact the

habitat, and CDFW's estimate of the protected acreage required to provide for adequate compensation.

To meet this requirement, the Permittee shall:

(1) Before start of Covered Activities, either contribute funds for restoration of 2.9 acres of aquatic habitat for California freshwater shrimp on Conserved Lands and ensure the restoration has been completed and success criteria met according to a CDFW-approved California freshwater shrimp restoration plan OR provide for both the permanent protection and management of 2.9 acres of aquatic California freshwater shrimp Habitat Management (HM) lands pursuant to Condition of Approval 8.5 below and the calculation and deposit of the management funds pursuant to Condition of Approval 8.6 below. Demonstration of restoration efforts' success OR permanent protection and funding for perpetual management of HM lands must be complete before starting Covered Activities, or within 24 months of the effective date of this ITP if Security is provided pursuant to Condition of Approval 9 below for all uncompleted obligations. The Permittee shall also restore on-site 2 acres of temporarily impacted California freshwater shrimp habitat pursuant to Condition of Approval 8.8 below.

AND:

(2) Purchase AWS and CTS credits from a CDFW-approved mitigation or conservation bank pursuant to Conditions of Approval 8.2 or 8.3 below AND/OR provide for both the permanent protection and management of HM lands for CTS and AWS to meet the amounts required for each as specified in the "Required Mitigation Acreage" column of Table 2 in the manner prescribed below, pursuant to Condition of Approval 8.5 below and the calculation and deposit of the management funds pursuant to Condition of Approval 8.6 below. Permittee shall fulfill at least 2-years' worth of all AWS and CTS HM lands obligations in advance of any impacts prior to the beginning of each "Stay Ahead[7]" period prescribed in Table 3 OR post Security prior to the beginning of each Stay Ahead period pursuant to Condition of Approval 9 below in a manner that shall 1) be in an amount to cover the entirety of a Stay Ahead period of HM Lands and on-site restoration obligations in 2022 Dollars[8] and 2) thereafter recalculate and adjust the Security in 2022 Dollars by the start of the following Stay Ahead period (see Table 3) until Permittee has achieved the 2-year "stay ahead" status. See Table 3 for acreages and stay ahead implementation schedule).

[7] "Stay ahead" is defined as the proportion of each AWS and CTS habitat type that needs to be conserved to meet HM lands requirements in advance of two-years' worth of impacts as a proportion of the total impact expected under the ITP term for each habitat type.

[8] "2022 Dollars" means dollar amounts as adjusted each year based on the annual Home Price Index for the Oakland-Fremont-Hayward, CA Metropolitan Division for the prior calendar year (Office of Federal Housing Enterprise Oversight) and, for the non–land cost portion of the fee amounts, the CPI for the San Francisco–Oakland–San Jose Metropolitan Area (U.S. Bureau of Labor Statistics).

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The Permittee shall also restore on-site approximately 4,317[9] acres of temporarily impacted Covered Species habitat for Covered Activities resulting in ground disturbance equal to or greater than 0.1 acres pursuant to Condition of Approval 8.8 below. CDFW may determine that a specific mitigation property or acreage satisfies the required HM land obligation for more than one Covered Species. Permittee must acquire CDFW's written determination as to which AWS and CTS HM lands obligations could be met by acquisition of a property and the associated acreages, prior to submission of HM Lands Documentation per Condition of Approval 8.5.

Table 2. Maximum Required Mitigation Acreages for Project Impacts to California Tiger Salamander and Alameda Whipsnake over the 30-year ITP Term

Covered Species	Habitat Type	Permanent Impacts (acres)	Temporary Impacts (acres) [10]	Maximum Required Acres
California tiger salamander (outside of Sonoma County)	Upland	298	3,800	4,694[11]
	Breeding	2	25	31
California tiger salamander (Sonoma County)	Upland and Breeding	13	80	119[12]
Alameda whipsnake	Core	34	13	115[13]
	Perimeter Core	25	70	145[14]
	Movement	27	329	410
Total		399.3	4,317	5,514

[9] This number assumes a worst-case scenario in which all temporary impact sites require restoration to baseline conditions. The exact numbers will be determined over the ITP term.
[10] This number assumes worst case scenario that mitigation for temporary impacts will not occur in advance of temporary impacts throughout the life of the ITP. If Permittee provides for mitigation in advance of impacts, then the reduced mitigation ratio of 0.5:1 will be applied.
[11] This number assumes worst case scenario that mitigation for temporary impacts will not occur in advance of temporary impacts throughout the life of the ITP. If Permittee provides for mitigation in advance of impacts, then the reduced mitigation ratio of 0.5:1 will be applied.
[12] Lands acquired or conserved shall be done in a manner consistent with the Santa Rosa Plain Conservation Strategy.
[13] Required acreages for AWS movement habitats can be substituted with perimeter core or core AWS habitats.
[14] Required acreage for AWS perimeter core habitat can be substituted for AWS core habitat.

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Table 3. HM Lands Requirement Schedule for Project Impacts to California Tiger Salamander and Alameda Whipsnake

			Stay Ahead HM Land Acreage Requirement for each "Stay Ahead" period					
Stay Ahead Period	**Date Two-year Period Begins**	**Date Two Year Period Ends**	**CTS Upland (outside Sonoma Co.)**	**CTS Potential Breeding (outside Sonoma Co.)**	**CTS (Sonoma County)**	**AWS Core**	**AWS Perimeter Core**	**AWS Movement**
1	7/1/2022	6/30/2024	312.93	2.07	7.93	7.67	9.67	27.33
2	7/1/2024	6/30/2026	312.93	2.07	7.93	7.67	9.67	27.33
3	7/1/2026	6/30/2028	312.93	2.07	7.93	7.67	9.67	27.33
4	7/1/2028	6/30/2030	312.93	2.07	7.93	7.67	9.67	27.33
5	7/1/2030	6/30/2032	312.93	2.07	7.93	7.67	9.67	27.33
6	7/1/2032	6/30/2034	312.93	2.07	7.93	7.67	9.67	27.33
7	7/1/2034	6/30/2036	312.93	2.07	7.93	7.67	9.67	27.33
8	7/1/2036	6/30/2038	312.93	2.07	7.93	7.67	9.67	27.33
9	7/1/2038	6/30/2040	312.93	2.07	7.93	7.67	9.67	27.33
10	7/1/2040	6/30/2042	312.93	2.07	7.93	7.67	9.67	27.33
11	7/1/2042	6/30/2044	312.93	2.07	7.93	7.67	9.67	27.33
12	7/1/2044	6/30/2046	312.93	2.07	7.93	7.67	9.67	27.33
13	7/1/2046	6/30/2048	312.93	2.07	7.93	7.67	9.67	27.33
14	7/1/2048	6/30/2050	312.93	2.07	7.93	7.67	9.67	27.33
15	7/1/2050	6/30/2052	312.93	2.07	7.93	7.67	9.67	27.33

8.1. Alameda Whipsnake and California Tiger Salamander Cost Estimates. For the purposes of determining the Security amount, CDFW has estimated the cost sufficient for CDFW or its contractors to complete acquisition, protection, and perpetual management of the HM lands and restoration of temporarily disturbed habitat as follows:

8.1.1. Alameda Whipsnake and California tiger salamander Land acquisition costs for HM lands identified in Condition of Approval 8.5 below, estimated at $26,000/acre for 5,514 acres: **$143,364,000**. Land acquisitions costs are estimated using local fair market current value per acre for lands with habitat values meeting mitigation requirements;

8.1.2. All other costs necessary to review and acquire the land in fee title and record a conservation easement as described in Condition of Approval 8.5.1 and 8.5.2 below: **$50,000**;

8.1.3. Start-up costs for HM lands, including initial site protection and enhancement costs as described in Condition of Approval 8.5.6 below, estimated at **$854,367**;

8.1.4. Interim management period funding as described in Condition of Approval 8.5.7 below, estimated at **$406,375**;

8.1.5. Long-term management funding as described in Condition of Approval 8.6 below, estimated at $4,000/acre for 5,514 acres: **$22,056,000**. Long-term management funding is estimated initially for the purpose of providing Security to ensure implementation of HM lands management.

8.1.6. Related transaction fees including but not limited to account set-up fees, administrative fees, title and documentation review and related title transactions, expenses incurred from other state agency reviews, and overhead related to transfer of HM lands to CDFW as described in Condition of Approval 8.7, estimated at **$50,000**.

8.1.7. Restoration of on-site temporary effects to Covered Species habitat as described in Condition of Approval 8.8, calculated at $3,000/acre for 4,317 acres: **$12,951,000**.

8.1.8. All costs associated with CDFW engaging an outside contractor to complete the mitigation tasks, including but not limited to acquisition, protection, and perpetual funding and management of the HM lands and restoration of temporarily disturbed habitat. These costs include but are not limited to the cost of issuing a request for proposals, transaction costs, contract administration costs, and costs associated with monitoring the contractor's work **$50,000**.

8.2. Cost Estimates for California Freshwater Shrimp. For the purposes of determining the Security amount, CDFW has estimated the cost sufficient for CDFW or its contractors to complete acquisition, protection, and perpetual management of the HM lands and restoration of temporarily disturbed habitat as follows:

8.2.1. California freshwater shrimp HM lands identified in Condition of Approval 8.5 below, estimated at $164,530/acre for 2.9 acres: **$477,137**. Land acquisitions

costs are estimated using local fair market current value per acre for lands with habitat values meeting mitigation requirements;

8.2.2. All other costs necessary to review and acquire the land in fee title and record a conservation easement as described in Condition of Approval 8.5.1 and 8.5.2 below: **$5,000**;

8.2.3. Start-up costs for HM lands, including initial site protection and enhancement costs as described in Condition of Approval 8.5.6 below, estimated at **$16,188**;

8.2.4. Interim management period funding as described in Condition of Approval 8.5.7 below, estimated at **$6,300**;

8.2.5. Long-term management funding as described in Condition of Approval 8.6 below, estimated at $26,840/acre for 2.9 acres: **$766,857**. Long-term management funding is estimated initially for the purpose of providing Security to ensure implementation of HM lands management.

8.2.6. Related transaction fees including but not limited to account set-up fees, administrative fees, title and documentation review and related title transactions, expenses incurred from other state agency reviews, and overhead related to transfer of HM lands to CDFW as described in Condition of Approval 8.7, estimated at **$5,000**.

8.2.7. Restoration of on-site temporary effects to Covered Species habitat as described in Condition of Approval 8.8, calculated at $6,000/acre for 2.9 acres: **$16,200**.

8.2.8. All costs associated with CDFW engaging an outside contractor to complete the mitigation tasks, including but not limited to acquisition, protection, and perpetual funding and management of the HM lands and restoration of temporarily disturbed habitat. These costs include but are not limited to the cost of issuing a request for proposals, transaction costs, contract administration costs, and costs associated with monitoring the contractor's work **$5,000**.

8.3. Covered Species Credits. If Permittee elects to purchase Covered Species credits to complete compensatory mitigation obligations, then Permittee shall purchase Covered Species credits from a CDFW-approved mitigation or conservation bank. Prior to purchase of Covered Species credits, Permittee shall obtain CDFW approval to ensure the mitigation or conservation bank is appropriate to compensate for the impacts of the Project. Permittee shall submit to CDFW a copy of the Bill of Sale(s) and Payment Receipt prior to initiating Covered Activities or within 18 months from issuance of this ITP if Security is provided.

8.4. Advanced Purchased Covered Credits. Permittee has purchased Alameda whipsnake and/or California tiger salamander credits from the Ohlone West

Conservation Bank, 603.5 acres from the Muzzy Ranch Conservation Bank, and the Margaret West Conservation Bank. Prior to transfer of Covered Species credits, Permittee shall obtain CDFW approval to ensure the mitigation or conservation bank is appropriate to compensate for the impacts of the Project. Permittee shall submit to CDFW a copy of the executed Credit Transfer Agreement prior to initiating Covered Activities or within 18 months from issuance of this ITP if Security is provided.

8.5. Habitat Management Lands Acquisition and Protection. If Permittee elects to provide for the acquisition, permanent protection, and perpetual management of HM lands to complete compensatory mitigation obligations, then Permittee shall:

8.5.1. Fee Title. Transfer fee title of the HM lands to CDFW pursuant to terms approved in writing by CDFW. Alternatively, CDFW, in its sole discretion, may authorize a governmental entity, special district, non-profit organization, for-profit entity, person, or another entity to hold title to and manage the property provided that the district, organization, entity, or person meets the requirements of Government Code sections 65965-65968, as amended.

8.5.2. Conservation Easement. If CDFW does not hold fee title to the HM lands, CDFW shall act as grantee for a conservation easement over the HM lands or shall, in its sole discretion, approve a non-profit entity, public agency, or Native American tribe to act as grantee for a conservation easement over the HM lands provided that the entity, agency, or tribe meets the requirements of Civil Code section 815.3. If CDFW elects not to be named as the grantee for the conservation easement, CDFW shall be expressly named in the conservation easement as a third-party beneficiary. Permittee shall obtain CDFW written approval of any conservation easement before its execution or recordation. No conservation easement shall be approved by CDFW unless it complies with Civil Code sections 815-816, as amended, and Government Code sections 65965-65968, as amended and includes provisions expressly addressing Government Code sections 65966(j) and 65967(e). Because the “doctrine of merger” could invalidate the conservation interest, under no circumstances can the fee title owner of the HM lands serve as grantee for the conservation easement.

8.5.3. HM Lands Approval. Obtain CDFW written approval of the HM lands before acquisition and/or transfer of the land by submitting, at least three months before acquisition and/or transfer of the HM lands, documentation identifying the land to be purchased or property interest conveyed to an approved entity as mitigation for the Project’s impacts on Covered Species;

8.5.4. HM Lands Documentation. Provide a recent preliminary title report, Phase I Environmental Site Assessment, and other necessary documents (please contact CDFW for document list). All documents conveying the HM lands and all conditions of title are subject to the approval of CDFW, and if applicable, the Wildlife Conservation Board and the Department of General Services;

8.5.5. Land Manager. Designate both an interim and long-term land manager approved by CDFW. The interim and long-term land managers may, but need not, be the same. The interim and/or long-term land managers may be the landowner or another party. Documents related to land management shall identify both the interim and long-term land managers. Permittee shall notify CDFW of any subsequent changes in the land manager within 30 days of the change. If CDFW will hold fee title to the mitigation land, CDFW will also act as both the interim and long-term land manager unless otherwise specified. The grantee for the conservation easement cannot serve as the interim or long-term manager without the express written authorization of CDFW in its sole discretion.

8.5.6. Start-up Activities. Provide for the implementation of start-up activities, including the initial site protection and enhancement of HM lands, once the HM lands have been approved by CDFW. Start-up activities include, at a minimum: (1) preparing a final management plan for CDFW approval (see https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=137386&inline) (2) conducting a baseline biological assessment and land survey report within four months of recording or transfer; (3) developing and transferring Geographic Information Systems (GIS) data if applicable; (4) establishing initial fencing; (5) conducting litter removal; (6) conducting initial habitat restoration or enhancement, if applicable; and (7) installing signage;

8.5.7. Interim Management (Initial and Capital). Provide for the interim management of the HM lands. The Permittee shall ensure that the interim land manager implements the interim management of the HM lands as described in the final management plan and conservation easement approved by CDFW. The interim management period shall be a minimum of three years from the date of HM land acquisition and protection and full funding of the Endowment and includes expected management following start-up activities. Interim management period activities described in the final management plan shall include fence repair, continuing trash removal, site monitoring, and vegetation and invasive species management.

Permittee shall either (1) provide Security to CDFW for the minimum of three years of interim management that the land owner, Permittee, or land manager agrees to manage and pay for at their own expense, (2) establish an escrow account with written instructions approved in advance in writing by CDFW to pay the land manager annually in advance, or (3) establish a short-term enhancement account with CDFW or a CDFW-approved entity for payment to the land manager.

8.6. Endowment Fund. If Permittee elects to provide for the acquisition, permanent protection, and perpetual management of HM lands to complete compensatory mitigation obligations, then Permittee shall ensure that the HM lands are perpetually managed, maintained, and monitored by the long-term land manager as described in this ITP, the conservation easement, and the final management plan approved by

CDFW. After obtaining CDFW approval of the HM lands, Permittee shall provide long-term management funding for the perpetual management of the HM lands by establishing a long-term management fund (Endowment). The Endowment is a sum of money, held in a CDFW-approved fund that is permanently restricted to paying the costs of long-term management and stewardship of the mitigation property for which the funds were set aside, which costs include the perpetual management, maintenance, monitoring, and other activities on the HM lands consistent with this ITP, the conservation easement, and the management plan required by Condition of Approval 8.5.6. Endowment as used in this ITP shall refer to the endowment deposit and all interest, dividends, other earnings, additions and appreciation thereon. The Endowment shall be governed by this ITP, Government Code sections 65965-65968, as amended, and Probate Code sections 18501-18510, as amended.

After the interim management period, Permittee shall ensure that the designated long-term land manager implements the management and monitoring of the HM lands according to the final management plan. The long-term land manager shall be obligated to manage and monitor the HM lands in perpetuity to preserve their conservation values in accordance with this ITP, the conservation easement, and the final management plan. Such activities shall be funded through the Endowment.

8.6.1. Identify an Endowment Manager. The Endowment shall be held by the Endowment Manager, which shall be either CDFW or another entity qualified pursuant to Government Code sections 65965-65968, as amended.

Permittee shall submit to CDFW a written proposal that includes: (i) the name of the proposed Endowment Manager; (ii) whether the proposed Endowment Manager is a governmental entity, special district, nonprofit organization, community foundation, or congressionally chartered foundation; (iii) whether the proposed Endowment Manager holds the property or an interest in the property for conservation purposes as required by Government Code section 65968(b)(1) or, in the alternative, the basis for finding that the Project qualifies for an exception pursuant to Government Code section 65968(b)(2); and (iv) a copy of the proposed Endowment Manager's certification pursuant to Government Code section 65968(e).

Within thirty days of CDFW's receipt of Permittee's written proposal, CDFW shall inform Permittee in writing if it determines the proposal does not satisfy the requirements of Fish and Game Code section 2081(b)(3) and, if so, shall provide Permittee with a written explanation of the reasons for its determination. If CDFW does not provide Permittee with a written determination within the thirty-day period, the proposal shall be deemed consistent with Section 2081(b)(3).

8.6.2. Calculate the Endowment Funds Deposit. After obtaining CDFW written approval of the HM lands, long-term management plan, and Endowment

Manager, Permittee shall prepare an endowment assessment (equivalent to a Property Analysis Record (PAR)) to calculate the amount of funding necessary to ensure the long-term management of the HM lands (Endowment Deposit Amount). Note that the endowment for the easement holder should not be included in this calculation. The Permittee shall submit to CDFW for review and approval the results of the endowment assessment before transferring funds to the Endowment Manager.

8.6.2.1. Capitalization Rate and Fees. Permittee shall obtain the capitalization rate from the selected Endowment Manager for use in calculating the endowment assessment and adjust for any additional administrative, periodic, or annual fees.

8.6.2.2. Endowment Buffers/Assumptions. Permittee shall include in the endowment assessment assumptions the following buffers for endowment establishment and use that will substantially ensure long-term viability and security of the Endowment:

8.6.2.2.1. 10 Percent Contingency. A 10 percent contingency shall be added to each endowment calculation to hedge against underestimation of the fund, unanticipated expenditures, inflation, or catastrophic events.

8.6.2.2.2. Three Years Delayed Spending. The endowment shall be established assuming spending will not occur for the first three years after full funding.

8.6.2.2.3. Non-annualized Expenses. For all large capital expenses to occur periodically but not annually such as fence replacement or well replacement, payments shall be withheld from the annual disbursement until the year of anticipated need or upon request to Endowment Manager and CDFW.

8.6.3. Transfer Long-term Endowment Funds. Permittee shall transfer the long-term endowment funds to the Endowment Manager upon CDFW approval of the Endowment Deposit Amount identified above.

8.6.4. Management of the Endowment. The approved Endowment Manager may pool the Endowment with other endowments for the operation, management, and protection of HM lands for local populations of the Covered Species but shall maintain separate accounting for each Endowment. The Endowment Manager shall, at all times, hold and manage the Endowment in compliance with this ITP, Government Code sections 65965-65968, as amended, and Probate Code sections 18501-18510, as amended.

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Notwithstanding Probate Code sections 18501-18510, the Endowment Manager shall not make any disbursement from the Endowment that will result in expenditure of any portion of the principal of the endowment without the prior written approval of CDFW in its sole discretion. Permittee shall ensure that this requirement is included in any agreement of any kind governing the holding, investment, management, and/or disbursement of the Endowment funds.

Notwithstanding Probate Code sections 18501-18510, if CDFW determines in its sole discretion that an expenditure needs to be made from the Endowment to preserve the conservation values of the HM lands, the Endowment Manager shall process that expenditure in accordance with directions from CDFW. The Endowment Manager shall not be liable for any shortfall in the Endowment resulting from CDFW's decision to make such an expenditure.

8.7. Reimburse CDFW. Permittee shall reimburse CDFW for all reasonable costs incurred by CDFW related to issuance and monitoring of this ITP, including, but not limited to transaction fees, account set-up fees, administrative fees, title and documentation review and related title transactions, costs incurred from other state agency reviews, and overhead related to transfer of HM lands to CDFW.

8.8. Habitat Restoration. Permittee shall restore on-site up to 4,317 acres of Alameda whipsnake and California tiger salamander and 2 acres of California freshwater shrimp habitat that will be temporarily disturbed during construction to pre-project or better conditions. Within 6 months of issuance of this ITP, Permittee shall prepare a standardized Vegetation Restoration Plan (VRP) to facilitate revegetation of up to 4,319 acres of temporary impacts disturbance and shall ensure that the VRP is successfully implemented. The VRP shall include detailed specifications for documenting baseline conditions and restoring all temporarily disturbed areas, such as seed mixes and application methods. The plan shall also indicate the best time of year for seeding to occur. The Plan shall include the following: 1) Areas that have become either barren of vegetation or where ground disturbance has occurred shall be revegetated with native plant species consistent with the vegetative composition immediately surrounding the associated Work Area, and; 2) provide prescriptions of native species shall to be included in seed mixes, and; 3) incorporate the following success criteria:

- Vegetation cover shall consist of no new invasive plant species rated as "high" by the Cal-IPC and the remediated areas shall meet baseline conditions at the end of one year. Vegetation cover of extant invasive species on-site shall not be greater than 20 percent above baseline conditions.

- Actively restored areas shall be monitored for 1 year after planting and/or hydroseeding. Monitoring shall occur in May of the year following initial impacts and at the end of the 12-month period following initial impacts.

- Restored areas must be returned to baseline conditions within 12 months after impacts initially took place.

9. Security: The Permittee may proceed with Covered Activities only after the Permittee has ensured funding (Security) to complete any activity required by Condition of Approval 8 that has not been completed before Covered Activities begin. Permittee shall provide Security as follows:

9.1. Security Amount for AWS and CTS. The Security for 1/15th of the permit term shall be in the amount of **$11,985,450 in 2022 Dollars**. This amount is determined by CDFW based on the cost estimates identified in Condition of Approval 8.1 above, sufficient for CDFW or its contractors to complete land acquisition, property enhancement, startup costs, initial management, long-term management, and monitoring.

9.2. Security Amount for California Freshwater Shrimp. The Security for California freshwater shrimp HM Lands shall be in the amount of **$1,297,682**. This amount is determined by CDFW based on the cost estimates identified in Condition of Approval 8.2 above, sufficient for CDFW or its contractors to complete land acquisition, property enhancement, startup costs, initial management, long-term management, and monitoring.

9.3. Security Form. Security shall be in the form of an irrevocable letter of credit (see Attachment 6) or another form of Security approved in advance in writing by CDFW's Office of the General Counsel.

9.4. Security Timeline. The Security shall be provided to CDFW before Covered Activities begin or within 30 days after the effective date of this ITP, whichever occurs first.

9.5. Security Holder. The Security shall be held by CDFW or in a manner approved in advance in writing by CDFW.

9.6. Security Transmittal. Permittee shall transmit it to CDFW with a completed Mitigation Payment Transmittal Form (see Attachment 7) or by way of an approved instrument such as an escrow agreement, irrevocable letter of credit, or other.

9.7. Security Drawing. The Security shall allow CDFW to draw on the principal sum if CDFW, in its sole discretion, determines that the Permittee has failed to comply with the Conditions of Approval of this ITP.

9.8. Security Release. The Security (or any portion of the Security then remaining) shall be released to the Permittee after CDFW has conducted an on-site inspection and received confirmation that all secured requirements have been satisfied, as evidenced by:

- Copy of Bill of Sale(s) and Payment Receipt(s) or Credit Transfer Agreement for the purchase of Covered Species credits; and

- Timely submission of all required reports.

OR

- Written documentation of the acquisition of the HM lands;
- Copies of all executed and recorded conservation easements;
- Written confirmation from the approved Endowment Manager of its receipt of the full Endowment; and
- Timely submission of all required reports.

Even if Security is provided, the Permittee must complete the required acquisition, protection and transfer of all HM lands and record any required conservation easements no later than 36 months from the effective date of this ITP. CDFW may require the Permittee to provide additional HM lands and/or additional funding to ensure the impacts of the taking are minimized and fully mitigated, as required by law, if the Permittee does not complete these requirements within the specified timeframe.

X. Amendment:

This ITP may be amended as provided by California Code of Regulations, Title 14, section 783.6, subdivision (c), and other applicable law. This ITP may be amended without the concurrence of the Permittee as required by law, including if CDFW determines that continued implementation of the Project as authorized under this ITP would jeopardize the continued existence of the Covered Species or where Project changes or changed biological conditions necessitate an ITP amendment to ensure that all Project-related impacts of the taking to the Covered Species are minimized and fully mitigated.

XI. Stop-Work Order:

If CDFW determines the Permittee has violated any term or condition of this ITP or has engaged in unlawful take, CDFW may issue Permittee a written stop-work order instructing the Permittee to suspend any Covered Activity for an initial period of up to 30 days or risk suspension or revocation of this ITP. CDFW can issue a stop-work order to prevent or remedy a violation of this ITP, including but not limited to the failure to comply with reporting or monitoring obligations, or to prevent the unauthorized take of any CESA endangered, threatened, or candidate species, regardless of whether that species is a Covered Species under this ITP. Permittee shall stop work immediately as directed by CDFW upon receipt of any such stop-work order. Upon written notice to Permittee, CDFW may extend any stop-work order issued to Permittee for a period not to exceed 30 additional days.

If Permittee fails to remedy the violation or to comply with a stop-work order, CDFW may proceed with suspension and revocation of this ITP. Suspension and revocation of this ITP shall be governed by California Code of Regulations, Title 14, section 783.7, and any other

applicable law. Neither the Designated Biologist nor CDFW shall be liable for any costs incurred in complying with stop-work orders.

XII. Compliance with Other Laws:

This ITP sets forth CDFW's requirements for the Permittee to implement the Project pursuant to CESA. This ITP does not necessarily create an entitlement to proceed with the Project. Permittee is responsible for complying with all other applicable federal, state, and local law.

XIII. Notices:

The Permittee shall sign and return this ITP to CDFW. A manual or digital signature is acceptable, provided a digital signature complies with Government Code section 16.5. Digital signatures facilitated by CDFW will be automatically returned. Manual (wet) signatures on duplicate original paper copies shall be returned by the Permittee via registered first-class mail or overnight delivery to the following address:

Habitat Conservation Planning Branch
California Department of Fish and Wildlife
Attention: CESA Permitting Program
Post Office Box 944209
Sacramento, CA 94244-2090

Written notices, reports and other communications relating to this ITP shall be delivered to CDFW by email or registered first class mail at the following address, or at addresses CDFW may subsequently provide the Permittee. Notices, reports, and other communications shall reference the Project name, Permittee, and ITP Number (2081-2015-031-03) in a cover letter and on any other associated documents.

Original cover with attachment(s) to:

Erin Chappell, Regional Manager
California Department of Fish and Wildlife – Bay Delta Region
2825 Cordelia Road, Suite 100
Fairfield, CA 94534
Telephone (707) 428-2002
R3CESA@wildlife.ca.gov

and a copy to:

Habitat Conservation Planning Branch
California Department of Fish and Wildlife
Attention: CESA Permitting Program
Post Office Box 944209
Sacramento, CA 94244-2090
CESA@wildlife.ca.gov

Unless Permittee is notified otherwise, CDFW's Regional Representative for purposes of addressing issues that arise during implementation of this ITP is:

Craig Weightman
California Department of Fish and Wildlife – Bay Delta Region
2825 Cordelia Road, Suite 100
Fairfield, CA 94534
Telephone (707) 428-2002
Craig.Weightman@wildlife.ca.gov

XIV. Compliance with the California Environmental Quality Act:

CDFW's issuance of this ITP is subject to CEQA. CDFW is a lead agency pursuant to CEQA with respect to this ITP. (See generally Pub. Resources Code, § 21067). CDFW's environmental review of the Project is set forth in the Pacific Gas and Electric Company Bay Area Operations and Maintenance Incidental Take Permit Environmental Impact Report (SCH No. 2017122028) dated February 2022, that CDFW certified for the PG&E Bay Area Operations and Maintenance Project**.**

This ITP, along with CDFW's related CEQA findings, which are available as a separate document, provide evidence of CDFW's independent judgment and analysis and the determination that based on the whole record before it, including EIR for the Project and comments received, that there is no substantial evidence that the Project will have a significant effect on the environment.

CDFW finds that issuance of this ITP will not result in any previously undisclosed potentially significant effects on the environment or a substantial increase in the severity of any potentially significant environmental effects previously disclosed by the lead agency. Furthermore, to the extent the potential for such effects exists, CDFW finds adherence to and implementation of the Conditions of Project Approval adopted by CDFW as the lead agency, and that adherence to and implementation of the Conditions of Approval imposed by CDFW through the issuance of this ITP, will avoid or reduce to below a level of significance any such potential effects. CDFW consequently finds that issuance of this ITP will not result in any significant, adverse impacts on the environment.

XV. Findings Pursuant to CESA:

These findings are intended to document CDFW's compliance with the specific findings requirements set forth in CESA and related regulations. (Fish & G. Code § 2081, subs. (b)-(c); Cal. Code Regs., tit. 14, §§ 783.4, subds, (a)-(b), 783.5, subd. (c)(2)).

CDFW finds based on substantial evidence in the ITP application, the EIR, the results of site visits and consultations, and the administrative record of proceedings, that issuance of this ITP complies and is consistent with the criteria governing the issuance of ITPs pursuant to CESA:

(1) Take of Covered Species as defined in this ITP will be incidental to the otherwise lawful activities covered under this ITP;

(2) Impacts of the taking on Covered Species will be minimized and fully mitigated through the implementation of measures required by this ITP and as described in the MMRP. Measures include: (1) permanent habitat protection; (2) establishment of avoidance zones; (3) worker education; and (4) Quarterly Compliance Reports. CDFW evaluated factors including an assessment of the importance of the habitat in the Project Area, the extent to which the Covered Activities will impact the habitat, and CDFW's estimate of the acreage required to provide for adequate compensation. Based on this evaluation, CDFW determined that the protection and management in perpetuity of a minimum of [X] acres of compensatory habitat that is contiguous with other protected Covered Species habitat and/or is of higher quality than the habitat being destroyed by the Project, along with the minimization, monitoring, reporting, and funding requirements of this ITP minimizes and fully mitigates the impacts of the taking caused by the Project;

(3) The take avoidance and mitigation measures required pursuant to the conditions of this ITP and its attachments are roughly proportional in extent to the impacts of the taking authorized by this ITP;

(4) The measures required by this ITP maintain Permittee's objectives to the greatest extent possible;

(5) All required measures are capable of successful implementation;

(6) This ITP is consistent with any regulations adopted pursuant to Fish and Game Code sections 2112 and 2114;

(7) Permittee has ensured adequate funding to implement the measures required by this ITP as well as for monitoring compliance with, and the effectiveness of, those measures for the Project; and

(8) Issuance of this ITP will not jeopardize the continued existence of the Covered Species based on the best scientific and other information reasonably available, and this finding includes consideration of the species' capability to survive and reproduce, and any adverse impacts of the taking on those abilities in light of (1) known population trends; (2) known threats to the species; and (3) reasonably foreseeable impacts on the species from other related projects and activities. Moreover, CDFW's finding is based, in part, on CDFW's express authority to amend the terms and conditions of this ITP without concurrence of the Permittee as necessary to avoid jeopardy and as required by law.

XVI. Attachments:

FIGURE 1	Map of Permit Area
FIGURE 2	ROW Management Concept: wire zones and border zones
FIGURE 3	Riparian removals for Transmission ROW Clearing Illustration 1
FIGURE 4	Riparian removals for Transmission ROW Clearing Illustration 2
ATTACHMENT 1	Covered Species Habitat Model Methodology
ATTACHMENT 2	Mitigation Monitoring and Reporting Program
ATTACHMENT 3	Biologist Resume Form
ATTACHMENT 4	Pre-activity Notification Form
ATTACHMENT 5	Environmental Review, Planning and Screening Process
ATTACHMENT 6	Letter of Credit Form
ATTACHMENT 7	Mitigation Payment Transmittal Form

ISSUED BY THE CALIFORNIA DEPARTMENT OF FISH AND WILDLIFE

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DocuSigned by:
Erin Chappell
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Erin Chappell, Regional Manager
Bay Delta Region

ACKNOWLEDGMENT

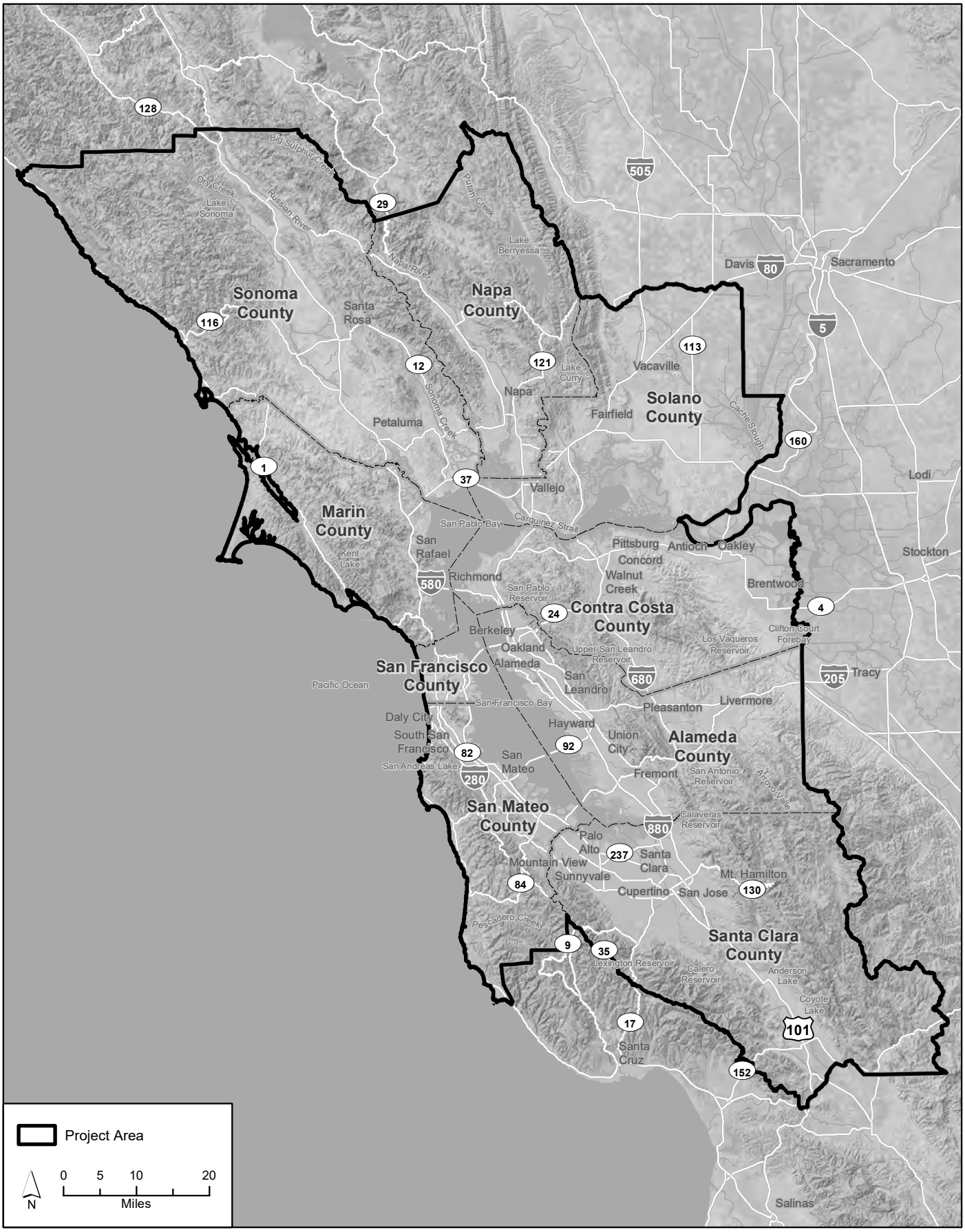
The undersigned: (1) warrants that he or she is acting as a duly authorized representative of the Permittee, (2) acknowledges receipt of this ITP, and (3) agrees on behalf of the Permittee to comply with all terms and conditions.

DocuSigned by:
By: Jon Wilcox
A41B45FF91BA48F... Date: ' & #!##

Printed Name: 2=<Ã5:;7=B Title: 36<698?

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FIGURE 1: Map of Permit Area



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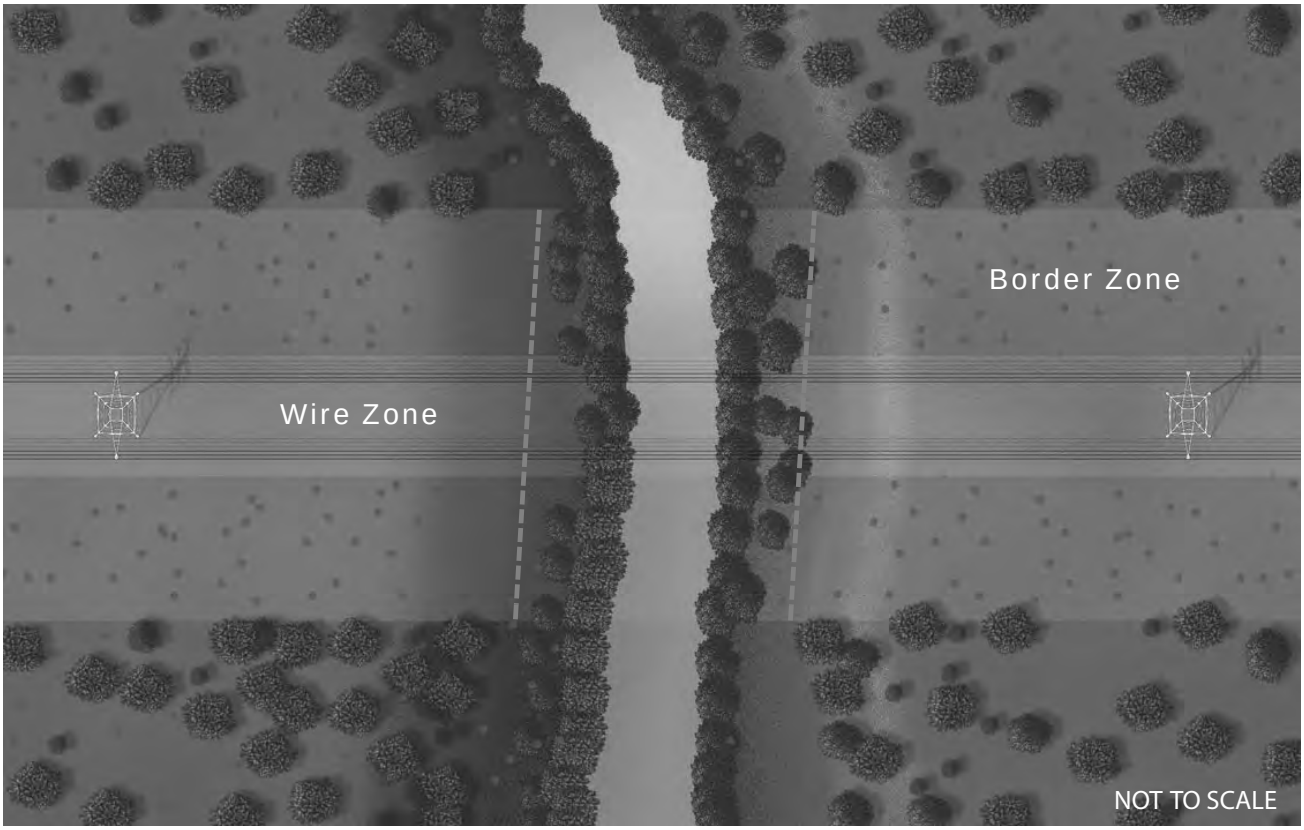
Wire Zone/Border Zone ROW Management Concept



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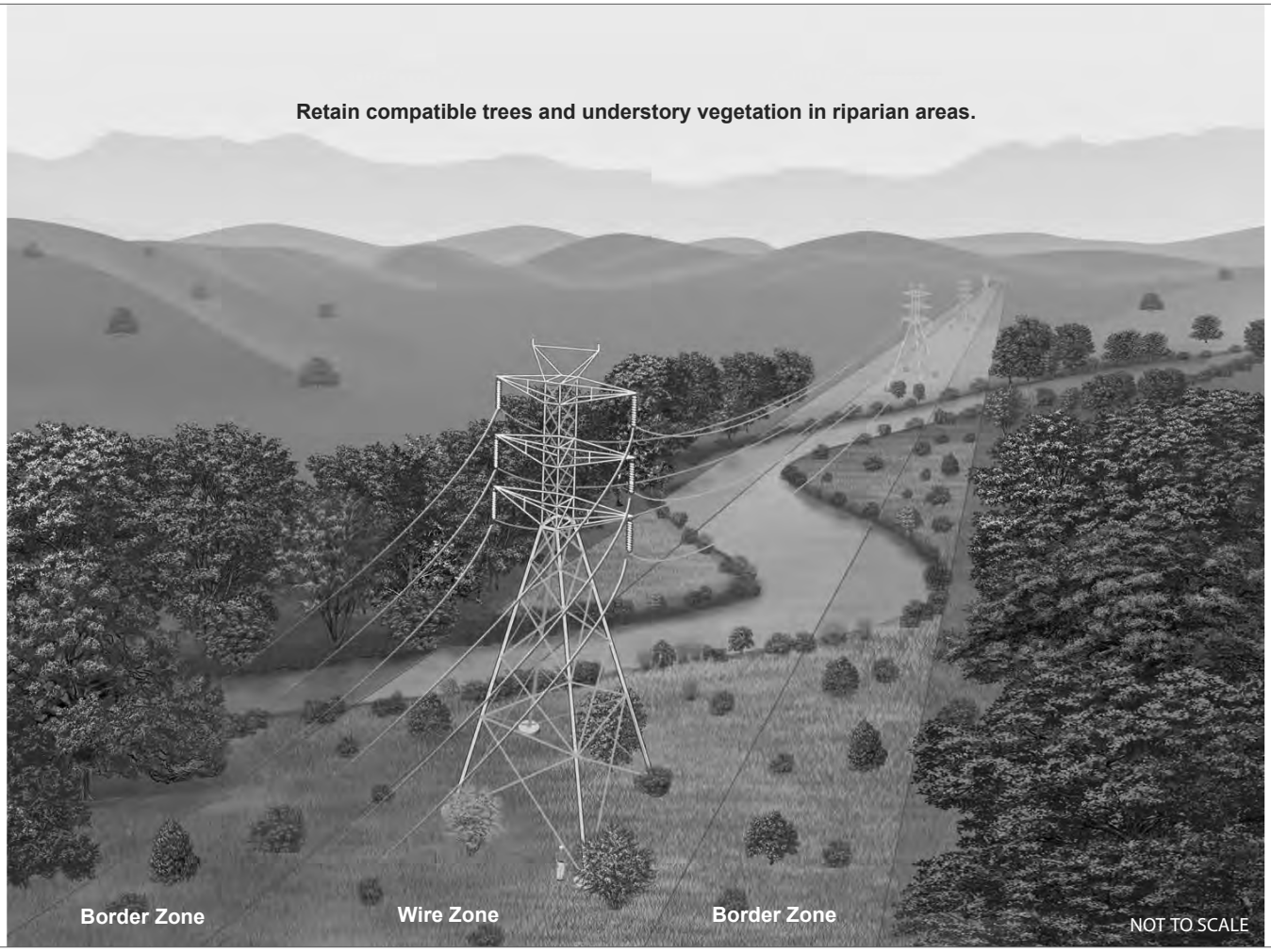
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Figure 2-4
Vegetation Management for Transmission Lines Perpendicular to Riparian Areas

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Figure 3

Vegetation Management for Transmission Lines Parallel to Riparian Areas



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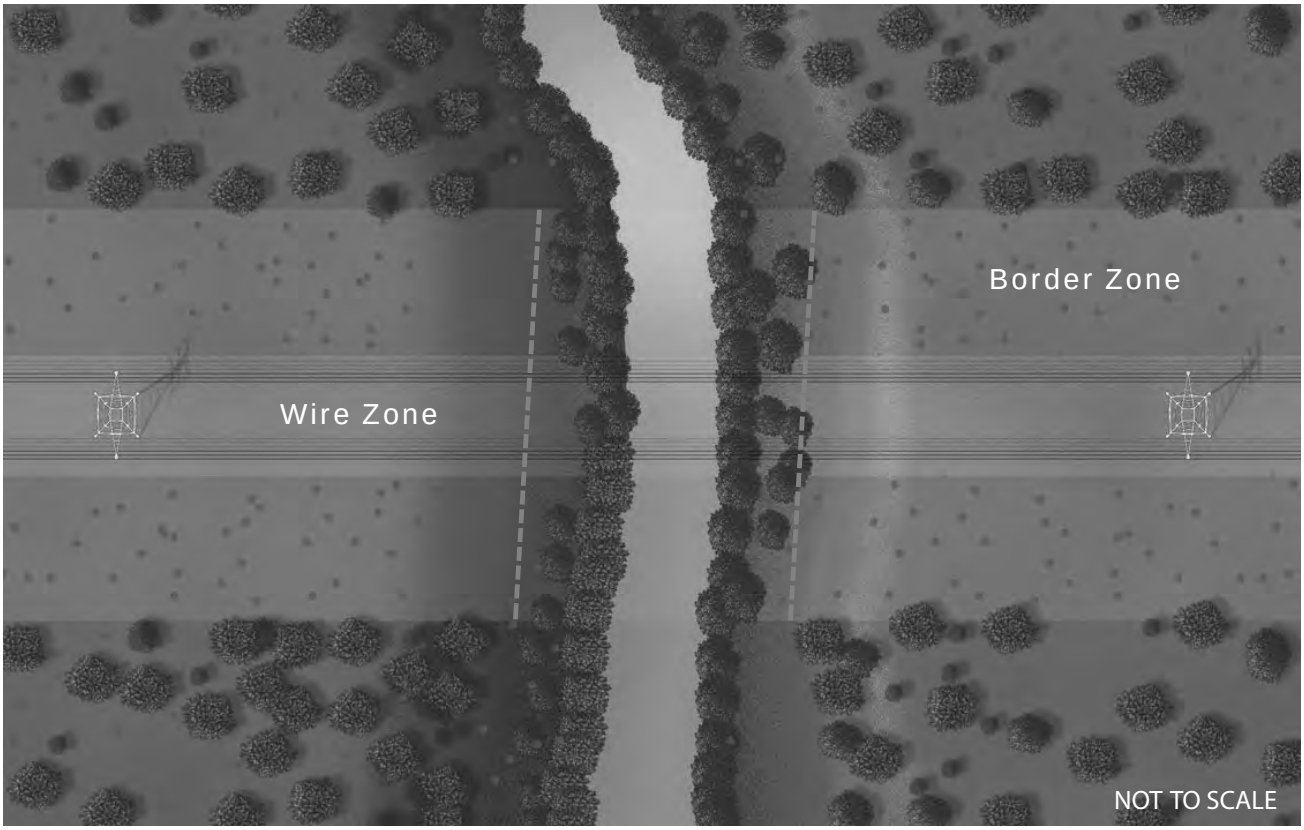
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Figure 4

Vegetation Management for Transmission Lines Perpendicular to Riparian Areas





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Comps *	Address	Size - Acres	Assessed Land Value	Market Cost per Acre	Inflation adjustment **	Transaction costs adjustment ***	Adjusted Cost per Acre
Property 1	25500 SR1, Tomales CA 94971	15	$ 1,516,787	$ 103,535			
Property 2	3770 Warm Springs Rd, Glen Ellen 95442	10	$ 880,000	$ 88,000			
Property 3	2980 Warm Springs Rd, Glen Ellen 95442	2	$ 650,000	$ 275,424			
Property 4	938 Country Club Ln, Sonoma 95476	15	$ 2,064,968	$ 142,412			
Acres of HM lands	2.9			**$ 152,343**	**$ -**	**$ 12,187**	**$ 164,530**
Cost per acre	$ 164,530						
Total Cost	**$ 477,137**						

* Local properties similar to availability of appropriate mitigaton sites that were sold within the last 24 months.

** 5% inflation adjustment in case land values go up while DFG holds the Security.

*** Land acquisition transaction costs in case of default - standard real estate commission is about 8%.

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Acres of HM Lands	Labor	Hours per Acre	Number of Employees	Rate per Hour	Extended Cost per Acre	Extended Cost Total Restoration
2.9	Preparing management plan	8.00	1	$ 100	$ 800	$ 2,320
	Baseline vegetation survey (assuming biological assessment was provided before approval)	2.00	1	$ 100	$ 200	$ 580
	Developing and transferring GIS data	1.00	1	$ 100	$ 100	$ 290
	Fencing and signage - labor	1.00	4	$ 50	$ 200	$ 580
	Habitat restoration	0.00	0	$ -	$ -	$ -
	Grazing lease administration	0.00	1	$ 100	$ -	$ -
	Pond Creation	0.00				$ -
	Artificial Den Establishement	0.00				$ -
	Dumping and vandalism cleanup	0.50	2	$ 50	$ 50	$ 145
	Security	0.50	1	$ 50	$ 25	$ 73

Materials	Unit	Number of Units	Unit Cost	Extended Cost Total Restoration
Fencing (automatically calculated based on parcel size, assumes square parcel)	Linear ft	$ 1,180	$ 10	$ 11,800
Water troughs	Each	$ -	$ 8,000	$ -
Signage (one sign every 1,320 lf of fenceline and at least one sign per side of parcel)	Each	$ 4	$ 100	$ 400

Total Cost	$ 9,485	$ 16,188

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Acres of HM Lands	Labor	Hours per Acre	Number of Employees	Rate per Hour	Extended Cost per Acre	Extended Cost Total Site
2.9	Fence repair	2.00	1	$ 100	$ 200	$ 580
	Trash removal	2.00	1	$ 100	$ 200	$ 580
	Site monitoring	2.00	1	$ 100	$ 200	$ 580
	Vegetation and invasive species management	10.00	2	$ 50	$ 1,000	$ 2,900
	Monitoring reports	2.00	1	$ 100	$ 200	$ 580
	Other management	2.00	1	$ 100	$ 200	$ 580

Materials	Unit	Number of Units	Unit Cost	Extended Cost Total Restoration
Vegetation management supplies and equipment	Each	$ 1	$ 500	$ 500
			$ -	$ -

Total Cost (for 3 yrs)	**$ 2,500**	**$ 6,300**

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Acres of HM Lands	Labor	Hours per Acre	Number of Employees		Rate per Hour		Extended Cost per Acre		Extended Cost Total Site
2.9	Fence and signage repair	2.00	1	$	50	$	100	$	290
	Trash removal	2.00	1	$	50	$	100	$	290
	Site monitoring	2.00	1	$	100	$	200	$	580
	Vegetation and invasive species management	10.00	2	$	50	$	1,000	$	2,900
	Administration	2.00	1	$	100	$	200	$	580

Materials	Unit	Number of Units		Unit Cost		Extended Cost Total Restoration
Fencing (25-year replacement interval)	Linear ft	1,180	$	10	$	11,800
Signage (5-year replacement interval)	Each	4	$	100	$	400
Water troughs (25-year replacement interval	Each	0	$	320	$	-
Vegetation management supplies and equipment	Each	10	$	1,000	$	10,000

		Per acre		Total
Total annual cost	$	1,710	$	26,840
Return rate				0.035
Total Cost	**$**	**264,433**	**$**	**766,857**

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Acres of HM Lands**	Labor	Cost per Acre	Cost - Total Restoration
2.7	Temporary Impac	6,000.00	16,200

Total Cost	**16,200**

**Note: Rheem Creek Restoration 2022 Estimate from 1600-2019-0169 at $1,724,560 to restore 2.27 acres or 1,850 linear feet for permanent impacts

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Task	Cost
Account set-up fees	$ 1,000
Administrative fees	$ 1,000
Title and documentation review	$ 1,000
Other state agency reviews	$ 1,500
Overhead related to transfer of HM lands to DFG	$ -
Total Cost	**$ 4,500**

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Item	Cost	
Land acquisition	$	477,137
Start-up costs	$	16,188
Interim management	$	6,300
Long-term management	$	766,857
DFG transaction fees	$	4,500
Security	$	1,270,982
Restoration	$	16,200
TOTAL SECURITY	**$**	**1,287,182**

Adjusted land acquisition costs to account for economies of scale. Could not find many listed properties of the size needed for mitigation.

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Attachment 2

CALIFORNIA DEPARTMENT OF FISH AND WILDLIFE
MITIGATION MONITORING AND REPORTING PROGRAM (MMRP)
CALIFORNIA ENDANGERED SPECIES ACT

INCIDENTAL TAKE PERMIT NO. 2081-2015-031-03

PERMITTEE: **Pacific Gas and Electric (PG&E)**

PROJECT: **PG&E Bay Area Operation and Maintenance Project**

PURPOSE OF THE MMRP

The purpose of the MMRP is to ensure that the impact minimization and mitigation measures required by the California Department of Fish and Wildlife (CDFW) for the above-referenced Project are properly implemented, and thereby to ensure compliance with section 2081(b) of the Fish and Game Code and section 21081.6 of the Public Resources Code. A table summarizing the mitigation measures required by CDFW is attached. This table is a tool for use in monitoring and reporting on implementation of mitigation measures, but the descriptions in the table do not supersede the mitigation measures set forth in the California Incidental Take Permit (ITP) and in attachments to the ITP, and the omission of a permit requirement from the attached table does not relieve the Permittee of the obligation to ensure the requirement is performed.

OBLIGATIONS OF PERMITTEE

Mitigation measures must be implemented within the time periods indicated in the table that appears below. Permittee has the primary responsibility for monitoring compliance with all mitigation measures and for reporting to CDFW on the progress in implementing those measures. These monitoring and reporting requirements are set forth in the ITP itself and are summarized at the front of the attached table.

VERIFICATION OF COMPLIANCE, EFFECTIVENESS

CDFW may, at its sole discretion, verify compliance with any mitigation measure or independently assess the effectiveness of any mitigation measure.

TABLE OF MITIGATION MEASURES

The following items are identified for each mitigation measure: Mitigation Measure, Source, Implementation Schedule, Responsible Party, and Status/Date/Initials. The Mitigation Measure column summarizes the mitigation requirements of the ITP. The Source column identifies the ITP condition that sets forth the mitigation measure. The Implementation Schedule column shows the date or phase when each mitigation measure will be implemented. The Responsible Party column identifies the person or agency that is primarily responsible for implementing the mitigation measure. The Status/Date/Initials column shall be completed by the Permittee during preparation of each Status Report and the Final Mitigation Report, and must identify the implementation status of each mitigation measure, the date that status was determined, and the initials of the person determining the status.

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	Mitigation Measure	Source	Implementation Schedule	Responsible Party	Status / Date / Initials
	BEFORE COMMENCING COVERED ACTIVITIES				
1	Designated Representative. Before starting Covered Activities, Permittee shall designate a representative (Designated Representative) responsible for communications with CDFW and overseeing compliance with this ITP. Permittee shall notify CDFW in writing before starting Covered Activities of the Designated Representative's name, business address, and contact information, and shall notify CDFW in writing if a substitute Designated Representative is selected or identified at any time during the term of this ITP.	ITP Condition # 5.1	Before commencing Covered Activities/ Entire Project	Permittee	
2	Designated Biologist(s), General Biological Monitor(s), and/or Veterinarian(s) Requirements and Approvals. Permittee shall submit to CDFW in writing the name, qualifications, business address, and contact information of proposed Designated Biologist(s)) using the Biologist Resume Form (Attachment 3) or another format containing the same information at least 15 days before starting Covered Activities in the year 2022. Permittee shall provide a list prior to January 31 every year thereafter seeking annual re-approval of Designated Biologists and Biologist Resume Forms for proposed, and/or submit Biologist Resume Forms for new Designated Biologist approval requests. Permittee shall ensure that the Designated Biologist(s) and General Biological Monitor(s) are knowledgeable and experienced in the biology, natural history, and for Designated Biologists, collecting and handling of the Covered Species. The Designated Biologist(s) and General Biological Monitor(s) shall be responsible for monitoring Covered Activities to help minimize and fully mitigate or avoid the incidental take of individual Covered Species and to minimize disturbance of Covered Species' habitat as required by this ITP. Permittee shall obtain CDFW approval of the Designated Biologist(s) in writing before starting Covered Activities as prescribed in this Condition of Approval and shall also obtain approval in advance, in writing, if the Designated Biologist(s) must be changed. Permittee shall also provide the resume of General Biological Monitors upon request by CDFW. Designated Biologist(s). Permittee shall ensure that each Designated Biologist is knowledgeable and experienced in the biology, natural history, collecting, and handling of the applicable Covered Species. The Designated Biologist may be approved by CDFW on a species-specific basis, and in those cases will only be authorized to complete surveys and monitoring of the Covered Species for which they are specifically approved. The Designated Biologists shall be responsible for conducting all activities specific to a Covered Species as prescribed in this ITP and any handling or other actions necessary if individuals of Covered Species are found in the Project Area where Covered Activities are being conducted including temporary staging areas and equipment mobilization routes in Covered Species habitat (Work Area). The Designated Biologists shall be responsible for supervising the General Biological Monitors. Please note that the term Designated Biologist is interchangeable with the term Qualified Biologist as defined in the Pacific Gas and Electric Company Bay Area Operations and Maintenance Incidental Take Permit Environmental Impact Report (SCH No. 2017122028). General Biological Monitor(s). General Biological Monitors are biologists with general roles and technical responsibilities. General Biological Monitors may be used instead of Designated Biologist(s) only for general monitoring activities within each discreet Work Area under the direction of the Designated Biologist(s). General Biological Monitors must have a 4-year degree in wildlife biology or related field, have a minimum, of 6 months of construction monitoring	ITP Condition # 5.2 to 5.2.2	15 days before commencing Covered Activities in 2022 and before January 31 every year thereafter	Permittee	

	experience, and be experienced in the general biology, natural history, and identification of the applicable Covered Species. The General Biological Monitors shall receive training and direction from the Designated Biologist(s) for each task performed. The General Biological Monitor(s) shall communicate daily with the Designated Biologist(s) and shall immediately report any occurrence of Covered Species within the Project Area or buffer areas, as well as any apparent non-compliance with any provision of this ITP.				
3	Education Program. Permittee shall conduct an education program for all persons employed or otherwise working in the Project Area before performing any work. The program shall consist of a presentation from the Designated Biologist or General Biological Monitor that includes a discussion of the biology and general behavior of the Covered Species, information about the distribution and habitat needs of the Covered Species, sensitivity of the Covered Species to human activities, its status pursuant to CESA including legal protection, recovery efforts, penalties for violations and Project-specific protective measures described in this ITP. Permittee shall provide interpretation for non-English speaking workers, and the same instruction shall be provided to any new workers before they are authorized to perform work in the Project Area. Upon completion of the education program, employees or contractors shall sign a form or equivalent acknowledging that they attended the program and understand all protection measures. This training shall be repeated at least once annually for long-term and/or permanent employees or contractors that will be conducting work in the Project Area. See also Conditions of Approval for activity specific Designated Biologist tailboards.	ITP Condition # 5.4	Before commencing Covered Activities/ Entire Project	Permittee	
4	Trash Abatement. Permittee shall initiate a trash abatement program before starting Covered Activities and shall continue the program for the duration of the Project. Permittee shall ensure that trash and food items are contained in animal-proof containers and removed, ideally at daily intervals but at least once a week, to avoid attracting opportunistic predators such as ravens, coyotes, and feral dogs.	ITP Condition # 5.6	Before commencing Covered Activities/ Entire Project	Permittee	
5	Erosion Control. Permittee shall implement and install all erosion and sediment control measures and devices prior to conducting Covered Activities that include grading, excavation, or placement of fill. Permittee shall utilize erosion control measures where sediment runoff from exposed slopes or surfaces could enter a drainage, stream, wetland or pond. Permittee shall repair and/or replace ineffective measures or contrivances whose integrity has been compromised immediately.	ITP Condition # 5.9	Before commencing Covered Activities/ Entire Project	Permittee	
6	Delineation and Avoidance of Sensitive Habitat Features. For Covered Activities E9a (Reconductoring), G9 (Pipeline Lowering), G11 (Pipeline Replacement) and minor new construction, a Designated Biologist shall clearly identify sensitive resources that crews must avoid for the duration of the activities with posted signs, posting stakes, flags, and/or rope or cord, and place fencing as necessary to minimize or avoid disturbance.	ITP Condition # 5.12	Before commencing specified Covered Activities/ Entire Project	Permittee	
7	CDFW Access. Permittee shall provide CDFW staff with reasonable access to Work Areas and mitigation lands under Permittee control, and shall otherwise fully cooperate with CDFW efforts to verify compliance with or effectiveness of mitigation measures set forth in this ITP.	ITP Condition # 5.17	Before commencing ground- or vegetation-disturbing activities/ During Construction/ Post-Construction/ Entire Project	Permittee	
8	Notifications Before Commencement of Certain Activities. The Designated Representative shall provide notification (ATTACHMENT 4) to CDFW for the following Covered Activities when the activity occurs outside of urban areas in modeled habitat and shall document compliance with all pre-activity Conditions of Approval before starting Covered Activities:	ITP Condition # 6.1	Before commencing specified Covered Activities/ Entire Project	Permittee	

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	• Minor New Construction • E9a (Reconductoring); • G9 (Pipeline Lowering); • G11 (Pipeline Replacement); • E15 (Underground Line Construction) when the activity occurs outside of existing roadways or urban areas; • G10 (Pipeline Coating Replacement) – when excavation or trenching needed in wetlands or streams; • G13b (Pipeline Access Road Maintenance) – when the activity includes culvert or headwall replacement; • Construction of temporary or permanent access roads in modeled or potential Covered Species habitats; • Covered Activities that occur within or over California freshwater shrimp habitat and those that may affect undercut banks and the trees that support undercut banks within shrimp habitat; • All Covered Activities in wetted potential CTS breeding habitat; • Covered Activities that include bridge replacement or culvert replacements in modeled California freshwater shrimp or California tiger salamander habitats. • Other Covered Activities that may result in ground disturbance of 1 acre or greater in Covered Species habitats. Notifications shall be submitted at least 45 days in advance and prior to "release to construction" by the Designated Representative for review by CDFW. Within 14 days of request by CDFW and if not possible then at least 5 days prior to the beginning of the Covered Activity, Permittee shall provide any requested additional information and provide access for a CDFW field review of the proposed Work Area. The proposed Covered Activity may not commence until Permittee has provided the additional information to the specifications of the request by CDFW, or until field review access has been provided to CDFW. If there continues to be unresolved issues or questions, then Permittee or CDFW may request to meet and confer within 10 business of the request to resolve any outstanding issues. CDFW retains the right to determine whether a proposed Covered Activity will not be provided coverage under this ITP. Notification for Covered Activities listed in Condition of Approval 6.1 that are identified as "Emergency Work" (i.e., work that requires immediate action due to a sudden, unexpected occurrence, involving a clear and imminent danger, demanding immediate action to prevent or mitigate loss of, or damage to, life, health, property, or essential public services) shall be provided within 48 hours of identification. Regulatory compliance deadlines or actions that are to be taken in response to violation notices do not qualify as "Emergency Work".				
9	Environmental Review, Planning and Screening Process. Permittee shall use an Automated Environmental Assessment (AEA) screening tool to screen many of the small electric (e.g., pole replacements) and small gas Covered Activities. The AEA tool shall automatically use a variety of current 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 release to construction if no data layers are flagged for manual review. If any	ITP Condition # 6.2	Before commencing specified Covered Activities/ Entire Project	Permittee	

	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 and Hot Zones shall be integrated into the AEA screening process, and a Covered Activity that falls within modeled habitat or a Hot Zone shall be flagged for review. A team of land planners, biologists, foresters, arborists, and tree inspectors shall conduct environmental review of vegetation management covered activities before work in the field commences. Impacted acreages of Covered Species' habitats shall also be calculated either using estimates from modeled habitat or ground-truthed. The Permittee shall also adhere to and implement the Environmental Review, Planning and Screening Process (see ATTACHMENT 5) for each Covered Activity. At a minimum, Permittee's HCP Implementation Staff shall first review, plan, and screen Covered Activities. After the completion of any required surveys, studies, or analyses, the Permittee shall develop a release-to-construction memorandum that identifies the natural resource protection measures that will be implemented in addition to relevant Conditions of Approval required by this ITP.				
10	California Tiger Salamander Mortality Reduction and Relocation Plan. Permittee shall prepare a CTS standardized mortality reduction and relocation plan (CTS Plan) that includes, but is not limited to, techniques to exclude salamanders from Work Areas; techniques to excavate burrows; and techniques to capture, handle, and relocate CTS safely if they are encountered in aquatic or upland habitats; and protocols for encounters with injured CTS. The CTS Plan shall also include information on materials to use, disease prevention, injuries, and nearby wildlife rehabilitation centers or veterinary facilities capable of evaluating or treating salamanders. The CTS Plan shall incorporate measures from the Fieldwork Code of Practice developed by the Declining Amphibian Populations Task Force to prevent disease transmission when working directly in aquatic habitat. Annual reports (see Condition of Approval 6.6) shall include a summary of the results of implementation of the CTS Plan. Covered Activities where CTS may be present shall not proceed until the CTS Plan is approved in writing by CDFW. Only the Designated Biologist(s) are authorized to handle or capture CTS. Any variance requests for an individual Covered Activity within a specified Work Area shall be approved in writing by CDFW. Upon request by either party, Permittee and CDFW shall meet and confer to update the CTS Plan, otherwise Permittee shall perform a scientific literature review and provide a list of in-line changes with the 5-year Compliance Report (Condition of Approval 6.7).	ITP Condition # 7.10	Before commencing work in CTS aquatic or upland habitats	Permittee	
11	California Tiger Salamander Pre-Activity Clearance Surveys. When Covered Activities will result in ground disturbance in potential CTS aquatic habitat (seasonal or perennial), the Designated Biologist(s) shall perform a pre-activity clearance survey no more than 14 days prior to the start of Covered Activities. If Covered Activities will be conducted within 500 meters of a known or suspected CTS breeding pond that will result in displacement of soil to a depth of 3-inches or greater and over an area of 0.1 acres or greater, the Designated Biologist(s) shall perform a pre-activity clearance survey no more than 14 days prior to the start of Covered Activities. For Covered Activities E9a (Reconductoring), G9 (Pipeline Lowering), G11 (Pipeline Replacement), and E14 (Minor Substation Expansion) in modeled habitat, the Designated Biologist(s) shall also conduct a pre-activity clearance survey. If a California tiger salamander in any life stage (adult, metamorph, larval, eggs, etc.) is encountered in a Work Area or at the recommendation of the Designated Biologist, Permittee shall implement the standardized mortality reduction and relocation plan (Condition of Approval 7.10). Pre-activity clearance surveys shall provide 100 percent visual coverage of a Work Area and a 50-foot buffer zone. All small mammal burrows within the Work Area and a 50-foot buffer zone shall be flagged to alert General Biological Monitors and work crews to their presence. Where feasible, an avoidance buffer of 50 feet or greater around active small mammal burrows shall be maintained. The Designated Biologist(s) shall submit a report documenting the results of the pre-construction surveys to CDFW within five days after performing the surveys. If any California tiger salamander are found within the	ITP Condition # 7.11	At least 14 days before commencing ground-disturbing activities in potential CTS aquatic habitat	Permittee	

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	Work Area or 50-foot buffer zone, the Designated Biologist will relocate them from the Work Area or buffer zone(s) in accordance with the CTS standardized mortality reduction and relocation plan (Condition of Approval 7.10).				
12	Alameda Whipsnake Pre-Activity Habitat Features Survey. Pre-construction surveys for Alameda whipsnake and sheltering and sunning habitat features (e.g., burrows, rocky outcrops, fallen trees, etc.) shall be conducted in modeled core and perimeter core habitat for Covered Activities E9a (Reconductoring), G9 (Pipeline Lowering), G11 (Pipeline Replacement), and E14 (Minor Substation Expansion). (See also Condition of Approval 7.19 for survey requirements in core habitat). These surveys shall be conducted by a Designated Biologist no more than 30 calendar days prior to any initial ground disturbance. These surveys will consist of walking the work area and, if possible, any accessible adjacent areas within at least 50 feet of the work area. The Designated Biologist shall investigate potential cover sites when it is feasible and safe to do so. This includes thorough investigation of mammal burrows, rocky outcrops, appropriately sized soil cracks, tree cavities, and debris. Sheltering, sunning, or other sensitive species features identified by the Designated Biologist shall be identified with flagging. Permittee shall avoid habitat features flagged by the Designated Biologist to the extent practicable. At the recommendation of the Designated Biologist, Permittee shall install an exclusionary barrier (Condition of Approval 7.18).	ITP Condition # 7.17	At least 30 days before commencing initial ground-disturbing activities/ Entire Project	Permittee	
13	Exclusionary Barrier. Permittee shall install a temporary barrier, where feasible, to prevent the Covered Species from dispersing into the Work Area, including along construction access routes, prior to commencing any other Covered Activities. The barrier shall be installed immediately after the pre-construction surveys have been completed in accordance with Condition of Approval 7.17 above and shall consist of fencing at least 42 inches tall with 36 inches above the soil surface, designed with a lip to prevent the Covered Species from climbing over the barrier, and buried to a depth of six inches below the soil surface. The soil shall be compacted against both sides of the fence to prevent the Covered Species from gaining access. The stakes shall be placed on the inside of the fence. No gaps or holes are permitted in the fencing system except for access areas as required for vehicular and pedestrian traffic. The exit/entry points shall be constructed so that it is flush to the ground and so that the covered Species cannot access the Work Area. The barrier shall be designed to allow trapped individuals to leave the Work Area by installing one-way funnels, ramps, or other methods approved by CDFW. An alternative barrier design or directional treatment techniques in lieu of fencing may be used after receiving written authorization from CDFW. The Designated Biologist or General Monitoring Biologist shall inspect the barrier daily and the barrier shall remain in place until all construction activities have been completed or where recommended by a Designated Biologist. The Permittee shall maintain and repair barrier immediately, if damaged, to ensure that it is functional and without defects. Permittee shall provide refuge opportunities along or near the outer side of the silt fence for the Covered Species (see also Condition of Approval 7.19).	ITP Condition # 7.18	Before commencing Covered Activities/ Entire Project	Permittee	
14	Refugia Coverboards. Coverboards shall be installed in Work Area(s) as determined by the Designated Biologist in modeled core and perimeter core habitat for Covered Activities E9a (Reconductoring), G9 (Pipeline Lowering), G11 (Pipeline Replacement), and E14 (Minor Substation Expansion) prior to conducting Covered Activities. When coverboards are recommended, they shall be placed to provide refuge for the Covered Species fleeing the area, including areas where a directional treatment methodology is used (e.g., phasing a project to encourage Covered Species to move towards core habitats and away from potentially harmful environs). When coverboards are recommended, they shall be inspected at the end of each workday by a General Monitoring Biologist and use by wildlife shall be recorded.	ITP Condition # 7.19	Before commencing Covered Activities/ Entire Project	Permittee	

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15	Alameda Whipsnake Clearance Surveys. Immediately prior to the start of a Covered Activity habitats that impact greater than 0.1 acres that affects core Alameda whipsnake (AWS) habitat, including scrub or chaparral plant communities in modeled habitat, the Designated Biologist(s) shall visually survey the Work Area and adjacent areas, as determined by the Designated Biologist, to clear the area of Alameda whipsnake. If Covered Activities may affect habitat features flagged per Condition of Approval 7.17 then a General Biological Monitor shall conduct daily clearance surveys in the active Work Area(s).	ITP Condition # 7.20	Immediately before commencing Covered Activities in AWS habitat	Permittee	
16	California Freshwater Shrimp Relocation Plan. If Covered Activities in streams in California freshwater shrimp modeled habitat cannot be avoided, Permittee shall prepare a California Freshwater Shrimp Relocation Plan for CDFW review and approval. The California Freshwater Shrimp Relocation Plan shall include, but is not limited to, resumes of individuals qualified to survey and monitor for California freshwater shrimp; survey, capture, and release methods; methods to keep relocated shrimp out of harm's way; and locations with suitable habitat for relocation. Permittee may proceed with Covered Activities described in the California Freshwater Shrimp Relocation Plan upon receipt of CDFW approval of the California Freshwater Shrimp Relocation Plan. Only the Designated Biologist(s) listed in the California Freshwater Shrimp Relocation Plan are authorized to capture and handle California freshwater shrimp. Permittee shall update the California Freshwater Shrimp Relocation Plan upon request by CDFW.	ITP Condition # 7.26	Before commencing Covered Activities in streams with modeled freshwater shrimp habitat	Permittee	
17	Implement California Freshwater Shrimp Relocation Plan. If Covered Activities may affect California freshwater shrimp potential aquatic habitat, the Designated Biologist shall survey prior to allowing work to proceed. The Designated Biologist shall survey all undercut banks and submerged tree roots with a butterfly net or fish net. If California freshwater shrimp are captured, the Designated Biologist shall relocate them from the Work Area according to the Freshwater Shrimp Relocation Plan.	ITP Condition # 7.27	Before commencing Covered Activities in freshwater shrimp potential aquatic habitat	Permittee	
18	Habitat Management Land Acquisition and Restoration: CDFW has determined that permanent protection and perpetual management of compensatory habitat is necessary and required pursuant to CESA to fully mitigate Project-related impacts of the taking on the Covered Species that will result from implementation of the Covered Activities. This determination is based on factors including an assessment of the importance of the habitat in the Project Area, the extent to which the Covered Activities will impact the habitat, and CDFW's estimate of the protected acreage required to provide for adequate compensation. To meet this requirement, the Permittee shall: (1) Before start of Covered Activities, either contribute funds for restoration of 2.9 acres of aquatic habitat for California freshwater shrimp on Conserved Lands and ensure the restoration has been completed and success criteria met according to a CDFW-approved California freshwater shrimp restoration plan OR provide for both the permanent protection and management of 2.9 acres of aquatic California freshwater shrimp Habitat Management (HM) lands pursuant to Condition of Approval 8.5 below and the calculation and deposit of the management funds pursuant to Condition of Approval 8.6 below. Demonstration of restoration efforts' success OR permanent protection and funding for perpetual management of HM lands must be complete before starting Covered Activities, or within 24 months of the effective date of this ITP if Security is provided pursuant to Condition of Approval 9 below for all uncompleted obligations. The Permittee shall also restore on-site 2 acres of temporarily impacted California freshwater shrimp habitat pursuant to Condition of Approval 8.8 below. AND:	ITP Condition # 8	Before commencing Covered Activities (or within 24 months of issuance of the ITP if Security is provided)	Permittee	

	(2) Purchase AWS and CTS credits from a CDFW-approved mitigation or conservation bank pursuant to Conditions of Approval 8.2 or 8.3 below AND/OR provide for both the permanent protection and management of HM lands for CTS and AWS to meet the amounts required for each as specified in the "Required Mitigation Acreage" column of Table 2 in the manner prescribed below, pursuant to Condition of Approval 8.5 below and the calculation and deposit of the management funds pursuant to Condition of Approval 8.6 below. Permittee shall fulfill at least 2-years' worth of all AWS and CTS HM lands obligations in advance of any impacts prior to the beginning of each "Stay Ahead " period prescribed in Table 3 OR post Security prior to the beginning of each Stay Ahead period pursuant to Condition of Approval 9 below in a manner that shall 1) be in an amount to cover the entirety of a Stay Ahead period of HM Lands and on-site restoration obligations in 2022 Dollars and 2) thereafter recalculate and adjust the Security in 2022 Dollars by the start of the following Stay Ahead period (see Table 3) until Permittee has achieved the 2-year "stay ahead" status. See Table 3 for acreages and stay ahead implementation schedule). The Permittee shall also restore on-site approximately 4,317 acres of temporarily impacted Covered Species habitat for Covered Activities resulting in ground disturbance equal to or greater than 0.1 acres pursuant to Condition of Approval 8.8 below. CDFW may determine that a specific mitigation property or acreage satisfies the required HM land obligation for more than one Covered Species. Permittee must acquire CDFW's written determination as to which AWS and CTS HM lands obligations could be met by acquisition of a property and the associated acreages, prior to submission of HM Lands Documentation per Condition of Approval 8.5.				
19	Alameda Whipsnake and California Tiger Salamander Cost Estimates. For the purposes of determining the Security amount, CDFW has estimated the cost sufficient for CDFW or its contractors to complete acquisition, protection, and perpetual management of the HM lands and restoration of temporarily disturbed habitat as follows: Alameda Whipsnake and California tiger salamander Land acquisition costs for HM lands identified in Condition of Approval 8.5 below, estimated at $26,000/acre for 5,514 acres: $143,364,000. Land acquisitions costs are estimated using local fair market current value per acre for lands with habitat values meeting mitigation requirements; All other costs necessary to review and acquire the land in fee title and record a conservation easement as described in Condition of Approval 8.5.1 and 8.5.2 below: $50,000; Start-up costs for HM lands, including initial site protection and enhancement costs as described in Condition of Approval 8.5.6 below, estimated at $854,367; Interim management period funding as described in Condition of Approval 8.5.7 below, estimated at $406,375; Long-term management funding as described in Condition of Approval 8.6 below, estimated at $4,000/acre for 5,514 acres: $22,056,000. Long-term management funding is estimated initially for the purpose of providing Security to ensure implementation of HM lands management. Related transaction fees including but not limited to account set-up fees, administrative fees, title and documentation review and related title transactions, expenses incurred from other state agency reviews, and overhead related to transfer of HM lands to CDFW as described in Condition of Approval 8.7, estimated at $50,000. Restoration of on-site temporary effects to Covered Species habitat as described in Condition of Approval 8.8, calculated at $3,000/acre for 4,317 acres: $12,951,000.	ITP Condition # 8.1 to 8.1.8	Before commencing Covered Activities (or within 24 months of issuance of the ITP if Security is provided)	Permittee	

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	All costs associated with CDFW engaging an outside contractor to complete the mitigation tasks, including but not limited to acquisition, protection, and perpetual funding and management of the HM lands and restoration of temporarily disturbed habitat. These costs include but are not limited to the cost of issuing a request for proposals, transaction costs, contract administration costs, and costs associated with monitoring the contractor's work $50,000.				
20	Cost Estimates for California Freshwater Shrimp. For the purposes of determining the Security amount, CDFW has estimated the cost sufficient for CDFW or its contractors to complete acquisition, protection, and perpetual management of the HM lands and restoration of temporarily disturbed habitat as follows: California freshwater shrimp HM lands identified in Condition of Approval 8.5 below, estimated at $164,530/acre for 2.9 acres: $477,137. Land acquisitions costs are estimated using local fair market current value per acre for lands with habitat values meeting mitigation requirements; All other costs necessary to review and acquire the land in fee title and record a conservation easement as described in Condition of Approval 8.5.1 and 8.5.2 below: $5,000; Start-up costs for HM lands, including initial site protection and enhancement costs as described in Condition of Approval 8.5.6 below, estimated at $16,188; Interim management period funding as described in Condition of Approval 8.5.7 below, estimated at $6,300; Long-term management funding as described in Condition of Approval 8.6 below, estimated at $26,840/acre for 2.9 acres: $766,857. Long-term management funding is estimated initially for the purpose of providing Security to ensure implementation of HM lands management. Related transaction fees including but not limited to account set-up fees, administrative fees, title and documentation review and related title transactions, expenses incurred from other state agency reviews, and overhead related to transfer of HM lands to CDFW as described in Condition of Approval 8.7, estimated at $5,000. Restoration of on-site temporary effects to Covered Species habitat as described in Condition of Approval 8.8, calculated at $6,000/acre for 2.9 acres: $16,200. All costs associated with CDFW engaging an outside contractor to complete the mitigation tasks, including but not limited to acquisition, protection, and perpetual funding and management of the HM lands and restoration of temporarily disturbed habitat. These costs include but are not limited to the cost of issuing a request for proposals, transaction costs, contract administration costs, and costs associated with monitoring the contractor's work $5,000.	ITP Condition # 8.2 to 8.2.8	Before commencing Covered Activities (or within 24 months of issuance of the ITP if Security is provided)	Permittee	
21	Covered Species Credits. If Permittee elects to purchase Covered Species credits to complete compensatory mitigation obligations, then Permittee shall purchase Covered Species credits from a CDFW-approved mitigation or conservation bank. Prior to purchase of Covered Species credits, Permittee shall obtain CDFW approval to ensure the mitigation or conservation bank is appropriate to compensate for the impacts of the Project. Permittee shall submit to CDFW a copy of the Bill of Sale(s) and Payment Receipt prior to initiating Covered Activities or within 18 months from issuance of this ITP if Security is provided.	ITP Condition # 8.3	Before commencing Covered Activities (or within 18 months of issuance of the ITP if Security is provided)	Permittee	

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22	Advanced Purchased Covered Credits. Permittee has purchased Alameda whipsnake and/or California tiger salamander credits from the Ohlone West Conservation Bank, 603.5 acres from the Muzzy Ranch Conservation Bank, and the Margaret West Conservation Bank. Prior to transfer of Covered Species credits, Permittee shall obtain CDFW approval to ensure the mitigation or conservation bank is appropriate to compensate for the impacts of the Project. Permittee shall submit to CDFW a copy of the executed Credit Transfer Agreement prior to initiating Covered Activities or within 18 months from issuance of this ITP if Security is provided.	ITP Condition # 8.4	Before commencing Covered Activities (or within 18 months of issuance of the ITP if Security is provided)	Permittee	
23	Habitat Management Lands Acquisition and Protection. If Permittee elects to provide for the acquisition, permanent protection, and perpetual management of HM lands to complete compensatory mitigation obligations, then Permittee shall: Fee Title. Transfer fee title of the HM lands to CDFW pursuant to terms approved in writing by CDFW. Alternatively, CDFW, in its sole discretion, may authorize a governmental entity, special district, non-profit organization, for-profit entity, person, or another entity to hold title to and manage the property provided that the district, organization, entity, or person meets the requirements of Government Code sections 65965-65968, as amended. Conservation Easement. If CDFW does not hold fee title to the HM lands, CDFW shall act as grantee for a conservation easement over the HM lands or shall, in its sole discretion, approve a non-profit entity, public agency, or Native American tribe to act as grantee for a conservation easement over the HM lands provided that the entity, agency, or tribe meets the requirements of Civil Code section 815.3. If CDFW elects not to be named as the grantee for the conservation easement, CDFW shall be expressly named in the conservation easement as a third-party beneficiary. Permittee shall obtain CDFW written approval of any conservation easement before its execution or recordation. No conservation easement shall be approved by CDFW unless it complies with Civil Code sections 815-816, as amended, and Government Code sections 65965-65968, as amended and includes provisions expressly addressing Government Code sections 65966(j) and 65967(e). Because the “doctrine of merger” could invalidate the conservation interest, under no circumstances can the fee title owner of the HM lands serve as grantee for the conservation easement. HM Lands Approval. Obtain CDFW written approval of the HM lands before acquisition and/or transfer of the land by submitting, at least three months before acquisition and/or transfer of the HM lands, documentation identifying the land to be purchased or property interest conveyed to an approved entity as mitigation for the Project’s impacts on Covered Species; HM Lands Documentation. Provide a recent preliminary title report, Phase I Environmental Site Assessment, and other necessary documents (please contact CDFW for document list). All documents conveying the HM lands and all conditions of title are subject to the approval of CDFW, and if applicable, the Wildlife Conservation Board and the Department of General Services; Land Manager. Designate both an interim and long-term land manager approved by CDFW. The interim and long-term land managers may, but need not, be the same. The interim and/or long-term land managers may be the landowner or another party. Documents related to land management shall identify both the interim and long-term land managers. Permittee shall notify CDFW of any subsequent changes in the land manager within 30 days of the change. If CDFW will hold fee title to the mitigation land, CDFW will also act as both the interim and long-term land manager unless otherwise specified. The grantee for the conservation easement cannot serve as the interim or long-term manager without the express written authorization of CDFW in its sole discretion.	ITP Condition # 8.5 to 8.5.7	Before commencing Covered Activities (or within 24 months of issuance of the ITP if Security is provided)	Permittee	

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	Start-up Activities. Provide for the implementation of start-up activities, including the initial site protection and enhancement of HM lands, once the HM lands have been approved by CDFW. Start-up activities include, at a minimum: (1) preparing a final management plan for CDFW approval (see https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=137386&inline) (2) conducting a baseline biological assessment and land survey report within four months of recording or transfer; (3) developing and transferring Geographic Information Systems (GIS) data if applicable; (4) establishing initial fencing; (5) conducting litter removal; (6) conducting initial habitat restoration or enhancement, if applicable; and (7) installing signage; Interim Management (Initial and Capital). Provide for the interim management of the HM lands. The Permittee shall ensure that the interim land manager implements the interim management of the HM lands as described in the final management plan and conservation easement approved by CDFW. The interim management period shall be a minimum of three years from the date of HM land acquisition and protection and full funding of the Endowment and includes expected management following start-up activities. Interim management period activities described in the final management plan shall include fence repair, continuing trash removal, site monitoring, and vegetation and invasive species management. Permittee shall either (1) provide Security to CDFW for the minimum of three years of interim management that the land owner, Permittee, or land manager agrees to manage and pay for at their own expense, (2) establish an escrow account with written instructions approved in advance in writing by CDFW to pay the land manager annually in advance, or (3) establish a short-term enhancement account with CDFW or a CDFW-approved entity for payment to the land manager.				
24	Endowment Fund. If Permittee elects to provide for the acquisition, permanent protection, and perpetual management of HM lands to complete compensatory mitigation obligations, then Permittee shall ensure that the HM lands are perpetually managed, maintained, and monitored by the long-term land manager as described in this ITP, the conservation easement, and the final management plan approved by CDFW. After obtaining CDFW approval of the HM lands, Permittee shall provide long-term management funding for the perpetual management of the HM lands by establishing a long-term management fund (Endowment). The Endowment is a sum of money, held in a CDFW-approved fund that is permanently restricted to paying the costs of long-term management and stewardship of the mitigation property for which the funds were set aside, which costs include the perpetual management, maintenance, monitoring, and other activities on the HM lands consistent with this ITP, the conservation easement, and the management plan required by Condition of Approval 8.5.6. Endowment as used in this ITP shall refer to the endowment deposit and all interest, dividends, other earnings, additions and appreciation thereon. The Endowment shall be governed by this ITP, Government Code sections 65965-65968, as amended, and Probate Code sections 18501-18510, as amended. After the interim management period, Permittee shall ensure that the designated long-term land manager implements the management and monitoring of the HM lands according to the final management plan. The long-term land manager shall be obligated to manage and monitor the HM lands in perpetuity to preserve their conservation values in accordance with this ITP, the conservation easement, and the final management plan. Such activities shall be funded through the Endowment.	ITP Condition # 8.6 to 8.6.4	Before commencing Covered Activities (or within 24 months of issuance of the ITP if Security is provided)	Permittee	

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	Identify an Endowment Manager. The Endowment shall be held by the Endowment Manager, which shall be either CDFW or another entity qualified pursuant to Government Code sections 65965-65968, as amended. Permittee shall submit to CDFW a written proposal that includes: (i) the name of the proposed Endowment Manager; (ii) whether the proposed Endowment Manager is a governmental entity, special district, nonprofit organization, community foundation, or congressionally chartered foundation; (iii) whether the proposed Endowment Manager holds the property or an interest in the property for conservation purposes as required by Government Code section 65968(b)(1) or, in the alternative, the basis for finding that the Project qualifies for an exception pursuant to Government Code section 65968(b)(2); and (iv) a copy of the proposed Endowment Manager's certification pursuant to Government Code section 65968(e). Within thirty days of CDFW's receipt of Permittee's written proposal, CDFW shall inform Permittee in writing if it determines the proposal does not satisfy the requirements of Fish and Game Code section 2081(b)(3) and, if so, shall provide Permittee with a written explanation of the reasons for its determination. If CDFW does not provide Permittee with a written determination within the thirty-day period, the proposal shall be deemed consistent with Section 2081(b)(3). Calculate the Endowment Funds Deposit. After obtaining CDFW written approval of the HM lands, long-term management plan, and Endowment Manager, Permittee shall prepare an endowment assessment (equivalent to a Property Analysis Record (PAR)) to calculate the amount of funding necessary to ensure the long-term management of the HM lands (Endowment Deposit Amount). Note that the endowment for the easement holder should not be included in this calculation. The Permittee shall submit to CDFW for review and approval the results of the endowment assessment before transferring funds to the Endowment Manager. Capitalization Rate and Fees. Permittee shall obtain the capitalization rate from the selected Endowment Manager for use in calculating the endowment assessment and adjust for any additional administrative, periodic, or annual fees. Endowment Buffers/Assumptions. Permittee shall include in the endowment assessment assumptions the following buffers for endowment establishment and use that will substantially ensure long-term viability and security of the Endowment: 10 Percent Contingency. A 10 percent contingency shall be added to each endowment calculation to hedge against underestimation of the fund, unanticipated expenditures, inflation, or catastrophic events. Three Years Delayed Spending. The endowment shall be established assuming spending will not occur for the first three years after full funding. Non-annualized Expenses. For all large capital expenses to occur periodically but not annually such as fence replacement or well replacement, payments shall be withheld from the annual disbursement until the year of anticipated need or upon request to Endowment Manager and CDFW. Transfer Long-term Endowment Funds. Permittee shall transfer the long-term endowment funds to the Endowment Manager upon CDFW approval of the Endowment Deposit Amount identified above.				

	Management of the Endowment. The approved Endowment Manager may pool the Endowment with other endowments for the operation, management, and protection of HM lands for local populations of the Covered Species but shall maintain separate accounting for each Endowment. The Endowment Manager shall, at all times, hold and manage the Endowment in compliance with this ITP, Government Code sections 65965-65968, as amended, and Probate Code sections 18501-18510, as amended. Notwithstanding Probate Code sections 18501-18510, the Endowment Manager shall not make any disbursement from the Endowment that will result in expenditure of any portion of the principal of the endowment without the prior written approval of CDFW in its sole discretion. Permittee shall ensure that this requirement is included in any agreement of any kind governing the holding, investment, management, and/or disbursement of the Endowment funds. Notwithstanding Probate Code sections 18501-18510, if CDFW determines in its sole discretion that an expenditure needs to be made from the Endowment to preserve the conservation values of the HM lands, the Endowment Manager shall process that expenditure in accordance with directions from CDFW. The Endowment Manager shall not be liable for any shortfall in the Endowment resulting from CDFW's decision to make such an expenditure.				
25	Reimburse CDFW. Permittee shall reimburse CDFW for all reasonable costs incurred by CDFW related to issuance and monitoring of this ITP, including, but not limited to transaction fees, account set-up fees, administrative fees, title and documentation review and related title transactions, costs incurred from other state agency reviews, and overhead related to transfer of HM lands to CDFW.	ITP Condition # 8.7	Before commencing Covered Activities (or within 24 months of issuance of the ITP if Security is provided)	Permittee	
26	Habitat Restoration. Permittee shall restore on-site up to 4,317 acres of Alameda whipsnake and California tiger salamander and 2 acres of California freshwater shrimp habitat that will be temporarily disturbed during construction to pre-project or better conditions. Within 6 months of issuance of this ITP, Permittee shall prepare a standardized Vegetation Restoration Plan (VRP) to facilitate revegetation of up to 4,319 acres of temporary impacts disturbance and shall ensure that the VRP is successfully implemented. The VRP shall include detailed specifications for documenting baseline conditions and restoring all temporarily disturbed areas, such as seed mixes and application methods. The plan shall also indicate the best time of year for seeding to occur. The Plan shall include the following: 1) Areas that have become either barren of vegetation or where ground disturbance has occurred shall be revegetated with native plant species consistent with the vegetative composition immediately surrounding the associated Work Area, and; 2) provide prescriptions of native species shall to be included in seed mixes, and; 3) incorporate the following success criteria: • Vegetation cover shall consist of no new invasive plant species rated as "high" by the Cal-IPC and the remediated areas shall meet baseline conditions at the end of one year. Vegetation cover of extant invasive species on-site shall not be greater than 20 percent above baseline conditions. • Actively restored areas shall be monitored for 1 year after planting and/or hydroseeding. Monitoring shall occur in May of the year following initial impacts and at the end of the 12-month period following initial impacts. • Restored areas must be returned to baseline conditions within 12 months after impacts initially took place.	ITP Condition # 8.8	Within 6 months of issuance of the ITP/ During Construction/ Entire Project	Permittee	

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27	Security Amount for AWS and CTS. The Security for 1/15th of the permit term shall be in the amount of $11,985,450 in 2022 Dollars. This amount is determined by CDFW based on the cost estimates identified in Condition of Approval 8.1 above, sufficient for CDFW or its contractors to complete land acquisition, property enhancement, startup costs, initial management, long-term management, and monitoring.	ITP Condition # 9.1	Before commencing Covered Activities (or within 24 months of issuance of the ITP if Security is provided)	Permittee	
28	Security Amount for California Freshwater Shrimp. The Security for California freshwater shrimp HM Lands shall be in the amount of $1,297,682. This amount is determined by CDFW based on the cost estimates identified in Condition of Approval 8.2 above, sufficient for CDFW or its contractors to complete land acquisition, property enhancement, startup costs, initial management, long-term management, and monitoring.	ITP Condition # 9.2	Before commencing Covered Activities (or within 24 months of issuance of the ITP if Security is provided)	Permittee	
29	Security Form. Security shall be in the form of an irrevocable letter of credit (see Attachment 6) or another form of Security approved in advance in writing by CDFW's Office of the General Counsel. Security Timeline. The Security shall be provided to CDFW before Covered Activities begin or within 30 days after the effective date of this ITP, whichever occurs first. Security Holder. The Security shall be held by CDFW or in a manner approved in advance in writing by CDFW. Security Transmittal. Permittee shall transmit it to CDFW with a completed Mitigation Payment Transmittal Form (see Attachment 7) or by way of an approved instrument such as an escrow agreement, irrevocable letter of credit, or other. Security Drawing. The Security shall allow CDFW to draw on the principal sum if CDFW, in its sole discretion, determines that the Permittee has failed to comply with the Conditions of Approval of this ITP. Security Release. The Security (or any portion of the Security then remaining) shall be released to the Permittee after CDFW has conducted an on-site inspection and received confirmation that all secured requirements have been satisfied, as evidenced by: • Copy of Bill of Sale(s) and Payment Receipt(s) or Credit Transfer Agreement for the purchase of Covered Species credits; and • Timely submission of all required reports. OR • Written documentation of the acquisition of the HM lands; • Copies of all executed and recorded conservation easements; • Written confirmation from the approved Endowment Manager of its receipt of the full Endowment; and • Timely submission of all required reports. Even if Security is provided, the Permittee must complete the required acquisition, protection and transfer of all HM lands and record any required conservation easements no later than 36 months from the effective date of this ITP. CDFW may require the Permittee to provide additional HM lands and/or additional funding to ensure the impacts of the taking are minimized	ITP Condition # 9.3 to 9.8	Before commencing Covered Activities (or within 24 months of issuance of the ITP if Security is provided)	Permittee	

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	and fully mitigated, as required by law, if the Permittee does not complete these requirements within the specified timeframe.				
	DURING CONSTRUCTION				
30	Biological Monitor Authority. To ensure compliance with the Conditions of Approval of this ITP, all Designated Biologists and General Biological Monitors shall immediately stop any activity, when safe to do so, that does not comply with this ITP and/or order any reasonable measure to avoid the unauthorized take of an individual of the Covered Species. Permittee shall provide unfettered access to each Work Area and otherwise facilitate the Designated Biologists and General Biological Monitors in the performance of his/her duties. If a Designated Biologist or General Biological Monitor are either unable to comply with the ITP or prevented from performing required ITP compliance, then they shall notify the CDFW Representative immediately. Permittee shall not enter into any agreement or contract of any kind, including but not limited to non-disclosure agreements and confidentiality agreements, with its contractors and/or Designated Biologists or Biological Monitors that prohibit or impede open communication with CDFW, including but not limited to providing CDFW staff with the results of any surveys, reports, or studies or notifying CDFW of any non-compliance or take. Failure to notify CDFW of any non-compliance or take or injury of a Covered Species as a result of such agreement or contract may result in CDFW taking actions to prevent or remedy a violation of this ITP.	ITP Condition # 5.3	Entire Project	Permittee	
31	Covered Activity Monitoring Documentation. When biological monitoring is required per Condition of Approval 6.4 (Compliance Monitoring) or when required for conducting Covered Activities E9a (Reconductoring), G9 (Pipeline Lowering), G11 (Pipeline Replacement) and minor new construction in modeled habitat, the Monitoring Biologist(s) shall maintain monitoring documentation on-site in either hard copy or digital format throughout the duration of work, which shall include a copy of this ITP with attachments. Permittee shall ensure a copy of the monitoring documentation is available for review at the Work Area upon request by CDFW.	ITP Condition # 5.5	Entire Project	Permittee	
32	Dust Control. Permittee shall implement dust control measures during Covered Activities to facilitate visibility for monitoring of the Covered Species by Biological Monitors and crews. Permittee shall keep the amount of water used to the minimum amount needed and shall not allow water to form puddles.	ITP Condition # 5.7	Entire Project	Permittee	
33	Prohibition of Firearms. Firearms and domestic dogs shall be prohibited in each Work Area as well as from site access routes during construction and development of the Project, except those firearms and domestic dogs that are in the possession of authorized security personnel or local, state, or federal law enforcement officials.	ITP Condition # 5.8	Entire Project	Permittee	
34	Erosion Control Materials. Permittee shall prohibit use of erosion control materials potentially harmful to Covered Species and other species, such as monofilament netting (erosion control matting) or similar material, in potential Covered Species' habitat.	ITP Condition # 5.10	Entire Project	Permittee	
35	Clean Vehicles. Permittee shall implement the following for Covered Activities E9a (Reconductoring), G9 (Pipeline Lowering), G11 (Pipeline Replacement) and minor new construction that involve ground disturbance: Mud and/or accumulated soils shall be removed from equipment and vehicles to the maximum extent practicable. Vehicles and equipment shall be cleaned or washed before entering a new work site.	ITP Condition # 5.11 to 5.11.5	Entire Project	Permittee	

	A log shall be kept for each work site and shall be completed to document each cleaning or washing of vehicles or equipment before entering each new work site. Vehicles shall be staged and stored on paved or cleared areas to the extent practicable. Certified weed-free mulch, straw, hay bales, or equivalent materials shall be used where necessary.				
36	Work Area Access. To the extent practicable, project related personnel shall access a Work Area using existing routes, and shall not cross Covered Species' habitat outside of or en route to a Work Area. Permittee shall restrict Project-related vehicle traffic to established roads, staging, and parking areas to the maximum extent practicable. Permittee shall ensure that vehicle speeds do not exceed 15 miles per hour to avoid Covered Species on or traversing the roads.	ITP Condition # 5.13	Entire Project	Permittee	
37	Staging Areas. Permittee shall confine all Project-related parking, storage areas, laydown sites, equipment storage, and any other surface-disturbing activities to a Work Area using, to the extent possible, previously disturbed areas. No staging areas shall be located in chaparral or scrub habitats, over rock outcroppings or within 300 feet of a stock pond or vernal pool.	ITP Condition # 5.14	Entire Project	Permittee	
38	Hazardous Waste. Permittee shall immediately stop and, pursuant to pertinent state and federal statutes and regulations, arrange for repair and clean up by qualified individuals of any fuel or hazardous waste leaks or spills at the time of occurrence, or as soon as it is safe to do so. Permittee shall properly contain and dispose of any unused or leftover hazardous products off-site.	ITP Condition # 5.15	Entire Project	Permittee	
39	Pesticides. At no time shall Permittee utilize broadcast baiting of rodenticides within the Project Area. When pesticides are used, PG&E shall follow all applicable state and federal laws, County Agricultural Commissioner regulations, label requirements, and when applicable, according to requirements in habitat management plans associated with Condition of Approval 8.5 (Habitat Acquisition and Protection).	ITP Condition # 5.16	Entire Project	Permittee	
40	Extent of Hardscape in Streams. Permittee shall limit the extent of concrete, Ercon mat, or concrete pillow systems within a watercourse to a maximum length of 100 feet and a maximum width of 50 feet at any one location unless otherwise approved in writing by CDFW.	ITP Condition # 5.19	Entire Project	Permittee	
41	Notification of Non-compliance. The Designated Representative shall immediately notify CDFW if the Permittee is not in compliance with any Condition of Approval of this ITP, including but not limited to any actual or anticipated failure to implement measures within the time periods indicated in this ITP and/or the MMRP. The Designated Representative shall follow up within 72 hours with a written report to CDFW describing, in detail, any non-compliance with this ITP and suggested measures to remedy the situation.	ITP Condition # 6.3	Entire Project	Permittee	
42	General Compliance Monitoring. The Designated Biologist shall be on-site: • Daily when Covered Species are encountered within a Work Area; • At the determination of the Designated Biologist, when Covered Species are relocated outside a Work Area to monitor and assess relocation success; • When conducting Covered Activities within 500 meters of a known or suspected California tiger salamander (CTS) breeding pond that will result in displacement of soil to a depth of 3-	ITP Condition # 6.4	Entire Project	Permittee	

	inches or greater and over an area of 0.1 acres or greater, during the clearing and grubbing phase and when conducting any ground disturbing activities; • All Covered Activities that may directly affect (e.g., tree work) California freshwater shrimp habitat; • When required by species-specific Conditions of Approval below. A Biological Monitor shall be on-site: • Daily when E9a (Reconductoring), G9 (Pipeline Lowering), G11 (Pipeline Replacement), and minor new construction activities are conducted in modeled habitat; • G10 (Pipeline Coating Replacement) when excavation or trenching occurs in wetlands or streams; • When Covered Activities with a Work Area equal to or greater than 0.1 acres are conducted during rain events in modeled California tiger salamander habitat unless otherwise approved by CDFW in writing; • When required by species-specific Conditions of Approval below. For Covered Activities in Covered Species modeled habitat that require work over a period of two weeks or greater, a General Biological Monitor shall conduct compliance inspections, at a minimum, once every week after clearing, grubbing, and grading are completed and during periods of inactivity. The General Biological Monitor shall conduct compliance inspections to: (1) minimize incidental take of the Covered Species; (2) prevent unlawful take of species; (3) check for compliance with all measures of this ITP; (4) check all exclusion zones; and (5) ensure that signs, stakes, and fencing are intact, and that Covered Activities are only occurring in the pre-designated Project Area(s). The Designated Representative or Monitoring Biologist shall prepare daily written observation and inspection records summarizing oversight activities and compliance inspections, observations of Covered Species and their sign, survey results, and monitoring activities required by this ITP.				
43	Quality Assurance Check and Updates to Covered Species Modeled Habitat Maps. During the first year of ITP implementation, Permittee and CDFW shall coordinate to perform a quality assurance check and update as necessary the habitat models for Covered Species to ensure the spatial data accurately represent the modeled habitats available for the Covered Species. Thereafter, Permittee or CDFW may propose updates to habitat models for Covered Species to ensure the output accurately represents the habitat available for the Covered Species in coordination with, and as approved by, CDFW and the USFWS. For example, if Permittee receives better wetland data for Santa Rosa Plain or Solano County, this data can be integrated to better assist Permittee in avoiding wetland habitats.	ITP Condition # 6.5	During first year of ITP implementation/ Entire Project	Permittee	

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44	Annual Status Report. Permittee shall provide CDFW with an Annual Status Report (ASR) no later than June 30 of every year beginning with issuance of this ITP and continuing until CDFW accepts the Final Mitigation Report identified below. Each ASR shall include, at a minimum: (1) Biologist compliance monitoring notes/data sheets recorded for the year; (2) a general description of the status of the Project Area and Covered Activities, including actual or projected completion dates, if known; (3) a copy of the table in the MMRP with notes showing the current implementation status of each mitigation measure; (4) an assessment of the effectiveness of each completed or partially completed mitigation measure in avoiding, minimizing and mitigating Project impacts; (5) all available information about Project-related incidental take of the Covered Species including observation reports to the California Natural Diversity Database (Condition of Approval 6.8); (6) an accounting of the number of acres subject to both temporary and permanent disturbance, both for the prior calendar year, and a total since ITP issuance including restoration of temporary impacts and return to baseline as prescribed in the Vegetation Restoration Plan (Condition of Approval 8.8); (7) documentation that impacts categorized as temporary have achieved the established baseline and (8) information about other Project impacts on the Covered Species.	ITP Condition # 6.6	Annually	Permittee	
45	5-Year Compliance Report. Permittee shall prepare and submit to CDFW a 5-year compliance report by June 30 each 5-year anniversary of the effective date of this ITP, as described in the Permit Term section of this ITP in addition to the information required in the Annual Status Report (Condition of Approval 6.6). CDFW and Permittee shall meet and confer to discuss the report and any ongoing challenges to successful ITP implementation.	ITP Condition # 6.7	Quinquennially	Permittee	
46	CNDDB Observations. The Designated Biologist or Permittee shall submit all observations of Covered Species to CDFW's California Natural Diversity Database within 60 calendar days of the observation and the Permittee shall include copies of the submitted forms with the next ASR or 5-year compliance report. If observations occur on lands not owned in fee title by Permittee, then Permittee may elect to inform the landowner of an observation. If the landowner objects to submission of the observation, then Permittee may elect to not submit.	ITP Condition # 6.8	Entire Project	Permittee	
47	Notification of Take or Injury. Permittee shall immediately notify the Designated Biologist if a Covered Species is taken or injured by a Project-related activity, or if a Covered Species is otherwise found dead or injured within the vicinity of the Project. The Designated Biologist or Designated Representative shall provide initial notification to CDFW by calling the Regional Office at (707) 428-2002. The initial notification to CDFW shall include information regarding the location, species, and number of animals taken or injured and the ITP Number. Following initial notification, Permittee shall send CDFW a written report within two working days. The report shall include the date and time of the finding or incident, location of the animal or carcass, and if possible, provide a photograph, explanation as to cause of take or injury, and any other pertinent information.	ITP Condition # 6.10	Entire Project	Permittee	
48	Temporary Impact Criteria. The following criteria shall be used to define temporary impacts for the purposes of calculating mitigation requirements: For areas less than one-acre, to be considered a temporary impact, the impacts must meet the following criteria: (1) returned to pre-activity conditions when compared to vegetation characteristics (i.e., percentage of cover by species, vegetation heights and species composition), on undisturbed lands adjacent to the Work Area; and (2) temporarily impacted areas must be restored within 12 months of impacts being initiated. Refer to Condition of Approval 8.8 for restoration and monitoring requirements.	ITP Condition # 6.11 to 6.11.2	Entire Project	Permittee	

	For areas equal to or greater than 1-acre, to be considered a temporary impact, the impacts must meet the following criteria: (1) establishment and documentation of baseline conditions, including percentage of cover by species, vegetation heights and species composition, must be completed prior to impacts; (2) temporarily impacted areas must be restored to baseline conditions within 12 months of impacts being initiated. Refer to Condition of Approval 8.8 for restoration and monitoring requirements.				
49	Equipment Fueling. No vehicles or heavy equipment will be refueled within 100 feet of a wetland, stream, or other waterway, or within 250 feet of vernal pools, unless secondary containment is used. The fueling operator must always stay with the fueling operation. Tanks may not be topped off. If refueling must be conducted closer to wetlands, construct a secondary containment area subject to review by an environmental field specialist and/or biologist. Permittee shall maintain spill prevention and cleanup equipment in refueling areas. Sufficient spill containment and cleanup equipment shall be present at all mobile, temporary, and permanent equipment fueling locations.	ITP Condition # 7.1	Entire Project	Permittee	
50	Lighting. Permittee shall ensure that all artificial outdoor lighting shall be limited to lighting for safety and security, and designed using Illuminating Engineering Society's design guidelines, International Dark-Sky Association-approved fixtures, or other industry standards that address lighting impacts. Lighting above ground level shall be directed downward or inward, where consistent with safety concerns, and shielding shall be utilized, where needed, to minimize light scatter off-site. Light fixtures shall have non-glare finishes that will not cause reflective daytime glare.	ITP Condition # 7.2	Entire Project	Permittee	
51	Covered Activities Hours. Construction activities shall cease 30 minutes before sunset and shall not begin prior to 30 minutes after sunrise, to the extent practicable. Emergency night work shall be limited in extent, duration, and brightness, to the extent feasible. For Covered Activities E9a (Reconductoring), G9 (Pipeline Lowering), G11 (Pipeline Replacement), and minor new construction, work may not occur at night during rain events in CTS habitat within 0.5 miles of known or potential breeding habitat between November 1 and April 30 unless otherwise authorized by CDFW. Covered Activities shall not occur at night for non-emergency work in California freshwater shrimp habitat any time of year unless otherwise authorized by CDFW.	ITP Condition # 7.3	Entire Project	Permittee	
52	Stored Materials Inspections. Workers shall thoroughly inspect for AWS and CTS in all construction pipe, culverts, or similar structures with a diameter of 7.6 centimeters (three inches) or greater that are stored for one or more overnight periods before the structure is subsequently moved, buried, or capped. If during inspection one of these animals is discovered inside the structure, workers shall notify the Biological Monitors) and allow the Covered Species to safely escape that section of the structure before moving and utilizing the structure or moved out of harm's way by a Designated Biologist.	ITP Condition # 7.4	Entire Project	Permittee	
53	Cover or Ramp Open Excavations. Trenches or pits shall be covered or equipped with an escape ramp if left overnight in Covered Species modeled habitat. Crews shall inspect any trench, pit, or hole every morning prior to conducting Covered Activities to ensure no individuals are trapped; if any animals are found staff shall contact the Designated Biologist(s) to identify whether it is a Covered Species and if so, it shall be moved out of harm's way by the Designated Biologist(s). If the animal is not a Covered Species, then a General Monitoring Biologist or other individual with wildlife handling experience in possession of any applicable handling permits may move it out of harm's way.	ITP Condition # 7.5	Entire Project	Permittee	

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54	Spoils Stockpiles. Permittee shall ensure that soil stockpiles are placed where soil will not pass into wetlands or any other "waters of the state," in accordance with Fish and Game Code section 5650. Permittee shall cover and protect stockpiles to prevent soil erosion, including wind and rain. Spoils and shall be placed away from chaparral habitat, rock outcroppings, and concentrated ground squirrel, pocket gopher, or other small mammal burrows or habitat features suitable for use by the Covered Species as refugia habitat.	ITP Condition # 7.6	Entire Project	Permittee	
55	Screen or Cap Hollow Pipes or Posts. All hollow pipes or posts that are installed as part of Covered Activities, or encountered in a Work Area that the Permittee owns or is responsible for, that are above ground shall be capped, screened, or filled with material by Permittee prior to the end of the day in which installation occurs.	ITP Condition # 7.7	Entire Project	Permittee	
56	Equipment Inspection. Workers shall inspect for Covered Species under vehicles and equipment before the vehicles and equipment are moved. If a Covered Species is present, the worker shall notify the Biological Monitors and wait for the Covered Species to move unimpeded to a safe location. Alternatively, the Permittee shall contact a Designated Biologist to determine if they can safely move the Covered Species out of harm's way in compliance with this ITP.	ITP Condition # 7.8	Entire Project	Permittee	
57	No Barriers to Covered Species Movement. Permittee shall construct access routes such that there are no steep curbs, v-ditches, berms, straw wattles, or dikes that could prevent Covered Species from traversing through ROWs or from exiting roadways. If curbs/ berms/straw wattles are necessary for safety and/or surface runoff, Permittee shall design and construct them to allow Covered Species to move over them. Permittee shall modify or remove exclusion fencing at the request of Biological Monitors or CDFW staff that may impede Covered Species movements.	ITP Condition # 7.9	Entire Project	Permittee	
58	Work in or Adjacent to Aquatic Breeding Habitat. A Designated Biologist shall be on-site to oversee any Covered Activities that occur within potential CTS breeding habitat (whether surface water is present or not). To the extent practicable, Permittee shall avoid impacts to potential or known CTS breeding habitat unless completely dry. If Covered Activities in wetted breeding habitat cannot be avoided, then the activities shall be performed under the direction of a Designated Biologist and in a manner consistent with the CTS Mortality Reduction and Relocation Plan. Permittee shall restrict placement of fill or other ground-disturbing activities within a 300-foot buffer from the edge of the ordinary high-water mark of known or potential aquatic breeding habitat to the extent practicable. However, if ground-disturbing work within the 300-foot buffer is necessary then a General Biological Monitor shall 1) oversee excavation of burrows that will be impacted by ground disturbing activities, 2) oversee placement of fill in a manner that avoids burrow entrances, and 3) shall be on-site during all ground-disturbing Covered Activities with the exception of vegetation management, pole replacements, patrols, or inspections. The Designated Biologist shall relocate any live California tiger salamander discovered during burrow excavation in accordance with the CTS Mortality Reduction and Relocation Plan (Condition of Approval 7.10).	ITP Condition # 7.12	Entire Project	Permittee	
59	Avoid Vernal Pools in CTS Hot Zones. Permittee shall avoid impacts to vernal pools to the extent practicable. For work that cannot avoid vernal pool impacts that are in CTS Hot Zones, Permittee shall conduct Covered Activities only when vernal pools are completely dry.	ITP Condition # 7.13	Entire Project	Permittee	
60	California Tiger Salamander Protection during Upland Movements or Exclusion Fencing. Permittee shall implement the following additional protective measures for Covered Activities E9a (Reconductoring), G9 (Pipeline Lowering), G11 (Pipeline Replacement), and E14 (Minor Substation Expansion), as well as E15 (Underground Line Construction) when the activity	ITP Condition # 7.14 to 7.14.3	Entire Project	Permittee	

	occurs outside of existing roadways or urban areas, in CTS habitat within 0.5 mile of known or potential breeding habitat between November 1 and April 30: Permittee shall not conduct Covered Activities (specified in 7.13) at night during rain events unless otherwise authorized by CDFW. The following day, crews will check for CTS around tires, equipment, and materials before resuming work. If a CTS is found, the crew shall avoid the area and contact the Designated Biologist(s) for direction. Prior to a rain event of 0.25 inches or greater within a 24-hour period, Permittee shall install exclusion fencing around the perimeter of Work Areas to prevent CTS movement into the Work Areas. Installation of the exclusion fence shall be overseen and directed by the Designated Biologist(s). The exclusion fence shall be buried a minimum of 4 inches below ground surface and equipped with one-way exits (if the Work Area still has burrows and has not been cleared of CTS) to avoid entrapment of CTS and other amphibians or reptiles within the fenced area. For every 100 feet of exclusion fencing, Permittee shall provide coverboards to provide shelter for CTS. The exclusion fence shall be supported sufficiently to maintain its integrity under all conditions, such as wind and heavy rain, for the duration of the Covered Activities in the Work Area being fenced. The Designated Biologist(s) shall inspect the completed fencing prior to construction. General Biological Monitors shall check the exclusion fence at least once daily and maintain/repair the fence when necessary. Permittee shall install temporary exclusion fencing in a sequential manner that corresponds to the progression of Covered Activities as specified above within a Work Area. When exclusion fencing is not required to be installed simultaneously throughout a Work Area then it shall be installed for only the portion of a Work Area that is under active construction and removed immediately after the construction has ceased to prevent substantial impediments to CTS movement.				
61	Discovery of California Tiger Salamander in Work Area(s). If a CTS, including body parts, is found by any person in a Work Area before or during Covered Activities, Permittee shall stop all work when safe to do so that could potentially injure CTS immediately until the Designated Biologist(s) can relocate the California tiger salamander following the California Tiger Salamander Mortality Reduction and Relocation Plan specified in Condition of Approval 7.10. Covered Activities may commence as directed by the Designated Biologist(s) including recommendation that General Biological Monitor(s) be present at the Work Area to monitor Covered Activities.	ITP Condition # 7.15	Entire Project	Permittee	
62	California Tiger Salamander Record of Handling. The Designated Biologist shall maintain a record of all CTS captures, relocations, and observations. Records shall include the following information: the date, time, and location of each occurrence using GPS; the name of the party that actually identified the CTS; circumstances of the incident; the general condition and health of each individual CTS; any diagnostic markings, sex, age (juvenile or adult); actions undertaken; and habitat description. The Permittee shall include this information in Annual Reports (Condition of Approval 6.6) and shall submit this information to CDFW.	ITP Condition # 7.16	Entire Project	Permittee	
63	Alameda Whipsnake Pre-Activity Tailboards. The Designated Biologist or General Biological Monitor may prescribe activity-specific tailboards trainings reminding staff of the importance of following measures to minimize impacts on Alameda whipsnake as they relate to the work site. Site specific tailboards shall be conducted for staff working on Covered Activities that impact greater than 0.1 acres in core habitat or perimeter core habitat.	ITP Condition # 7.21	Entire Project	Permittee	

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64	Suspected Alameda Whipsnake in Work Area. If a snake is found by any person in the Work Area before or during Covered Activities, all work that could potentially injure the snake shall stop immediately and the snake will be allowed to leave the work area on its own. If the snake does not leave the work area or cannot move to an area with sufficient habitat outside of the work area, the Designated Biologist will move the snake to suitable habitat outside the work area. Covered activities will resume only after the snake has been confirmed to be out of the Work Area.	ITP Condition # 7.22	Entire Project	Permittee	
65	Alameda Whipsnake Seasonal Restriction. Disturbance in modeled core and perimeter core habitat for E9a (Reconductoring), G9 (Pipeline Lowering), G11 (Pipeline Replacement), and E14 (Minor Substation Expansion) for Alameda whipsnake will only take place between April 15 and October 31 to the extent feasible when Alameda Whipsnake is more active and less likely to be affected by covered activities. For activities E9a (Reconductoring), G9 (Pipeline Lowering), G11 (Pipeline Replacement), and E14 (Minor Substation Expansion) occurring in core or perimeter core habitat for Alameda whipsnake between November 1 and April 14, a Designated Biologist(s) will be present during operations.	ITP Condition # 7.23	Entire Project	Permittee	
66	Alameda Whipsnake Injury. If an AWS has major or serious injuries as a result of Project-related activities, the Designated Biologist shall immediately take it to a qualified wildlife rehabilitation or veterinary facility. Permittee shall bear any costs associated with the care or treatment of such injured AWS. If the injury is minor or healing and the AWS is likely to survive as determined by the Designated Biologist, it shall be released immediately to an area out of harm's way. The Permittee shall notify CDFW of the injury to the AWS within 2 working days by telephone and e-mail followed by a written incident report as described in Condition 6.3. Notification shall include the name of the facility where the animal was taken.	ITP Condition # 7.24	Entire Project	Permittee	
67	California Freshwater Shrimp Seasonal Restrictions. Permittee shall restrict Covered Activities in or adjacent to streams in modeled habitat for California freshwater shrimp to the period between July 1 (after females release eggs) and November 15 (before they move to the shallow margins of streams, seeking refuge from high water velocities associated with winter storm events) to the extent possible. If work must occur outside of this period, then the Designated Biologist shall be present during all Covered Activities.	ITP Condition # 7.25	Entire Project	Permittee	
	POST-CONSTRUCTION				
68	Refuse Removal. Upon completion of Covered Activities within a Work Area, Permittee shall remove from, and properly dispose of all temporary fill and construction refuse, including, but not limited to, broken equipment parts, wrapping material, cords, cables, wire, rope, strapping, twine, buckets, metal or plastic containers, and boxes.	ITP Condition # 5.18	Post-construction	Permittee	
69	Final Mitigation Report. Within 30 days of the ITP expiration date, Permittee shall provide CDFW with a Final Mitigation Report. The Permittee shall prepare the Final Mitigation Report which shall include, at a minimum: (1) a summary of all ASRs and 5-year compliance reports; (2) a copy of the table in the MMRP with notes showing when each of the mitigation measures was implemented; (3) all available information about Project-related incidental take of the Covered Species; (4) information about other Project impacts on the Covered Species; (5) beginning and ending dates of Covered Activities; (6) an assessment of the effectiveness of this ITP's Conditions of Approval in minimizing and fully mitigating Project impacts of the taking on Covered Species; (7) recommendations on how mitigation measures might be changed to more effectively minimize take and mitigate the impacts of future projects on the Covered Species; and (8) any other pertinent information.	ITP Condition # 6.9	Post-construction and within 30 days of the ITP expiration date	Permittee	

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Project Name:
LSA Agreement/ITP Number(s):

Department of Fish and Wildlife

BIOLOGIST RESUME COVER SHEET

SUBMIT EACH RESUME AS A SEPARATE DOCUMENT

Number of Resumes Included in Transmittal: _____

Name	Requested Role(s)[1]	Species/Resource(s)

[1] Requested roles correspond to the biological staffing requirements indicated in the Lake and Streambed Alteration (LSA) Agreement or California Endangered Species Act Incidental Take Permit (ITP). Roles may include a "Qualified Biologist" or "Designated Biologist" with the necessary experience to survey for special status species, or a "Biological Monitor" with the necessary experience to monitor construction activities for special status species. An individual may request more than one role.

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Project Name:
LSA Agreement/ITP Number(s):

Department of Fish and Wildlife

BIOLOGIST RESUME FORM

This form requests information about the qualifications of the Qualified Biologist, Designated Biologist and Biological Monitor specified in California Endangered Species Act Incidental Take Permits (ITP) and Lake or Streambed Alteration (LSA) Agreements issued by California Department of Fish and Wildlife (CDFW).

Completing this form will ensure the receipt of adequate information and expedite CDFW review of qualifications.

SECTION I. NAME AND CONTACT INFORMATION

Name:		Title:	
Company Name & Address:		Phone:	
		Email:	

SECTION II. EDUCATION

College/University & Degree Type Related to Natural Resource Science:	
Other Relevant Workshops & Training:	

SECTION III. ROLE(S) AND PERMIT REQUIREMENTS

Requested Role(s):	
Relevant LSA Agreement Measures or ITP Conditions[2]:	

SECTION IV. SPECIES AND RESOURCE EXPERIENCE – SUMMARY

This section summarizes experience by special status species and other resource. Use one row for each species or other resource where surveys or special protections are required in the CESA ITP or LSA Agreement for which biologist approval is requested.[3] If more space is needed, add rows to this table. Provide details in Section 5.

Species or Resource	Number of Field Seasons & Hours, Life Stages Observed *Provide project details in Section 5*	Life History Knowledge *Describe formal workshops & training with dates, or informal training details*	CDFW SCP, MOU, & USFWS 10a1a Authorization Number & Authorized Activities *This form does not fulfill SCP, MOU, & USFWS 10a1a reporting requirements*	
Insert Species or Resource 1	Field seasons: Hours: Life Stages:			Issued to: Expiration: Agency contact:
Insert Species or Resource 2	Field seasons: Hours: Life Stages:			Issued to: Expiration: Agency contact:
Insert Species or Resource 3	Field seasons: Hours: Life Stages:			Issued to: Expiration: Agency contact:

[2] List all measures and conditions from the LSA Agreement or ITP requiring biological staff (i.e., Qualified Biologist, Designated Biologist, or Biological Monitor).

[3] Often LSA Agreements/ITPs require surveys and other protections for multiple species and other resources. Include only those for which the biologist has experience and is requesting approval.

Project Name:
LSA Agreement/ITP Number(s):

SECTION V. SPECIES AND RESOURCE EXPERIENCE – DETAILS

This section details experience from the three most recent and relevant projects for each species and resource identified in Section 4. If more space is needed, attach additional pages in the same table format (i.e., copy/paste format).

A. Species or Resource:			
Project 1 Name & Location:		Project Start & End Dates:	
LSA Agreement, ITP, or Other Agency Permit Number:		Role(s)[4]:	
Survey Type(s)[5]:		Construction Monitoring[6]:	Days: Activities:
Species Life Stages Observed & Handled, Number of Each:	Life Stage: Number Observed: Number Handled: Reported to CNDDB[7] (Y/N):	Company Name, Professional Reference Name, Phone, Email:	
If not reported to CNDDB, why:			
CDFW and Other Agency Email:			
Project 2 Name & Location:		Project Start & End Dates:	
LSA Agreement, ITP, or Other Agency Permit Number:		Role(s):	
Survey Type(s):		Construction Monitoring:	Days: Activities:
Species Life Stages Observed & Handled, Number of Each:	Life Stage: Number Observed: Number Handled: Reported to CNDDB (Y/N):	Company Name, Professional Reference Name, Phone, Email:	
If not reported to CNDDB, why:			
CDFW and Other Agency Email:			
Project 3 Name & Location:		Project Start & End Dates:	
LSA Agreement, ITP, or Other Agency Permit Number:		Role(s):	
Survey Type(s):		Construction Monitoring:	Days: Activities:

[4] Insert the role as described in the associated LSA Agreement, ITP or other agency permit. If these permits were not issued, describe the role based on the duties, e.g., "lead biologist with handling authorization" or "biological monitor."
[5] For example, pre-construction survey or description of the protocol or guideline followed.
[6] Include the number of days and describe the types of activities monitored (e.g., heavy equipment operation).
[7] CNDDB is the abbreviation for California Natural Diversity Database.

Project Name:
LSA Agreement/ITP Number(s):

Species Life Stages Observed & Handled, Number of Each:	Life Stage: Number Observed: Number Handled: Reported to CNDDB (Y/N):	Company Name, Professional Reference Name, Phone, Email:	
If not reported to CNDDB, why:			
CDFW and Other Agency Email:			
Additional Information:			

B. Species or Resource:			
Project 1 Name & Location:		Project Start & End Dates:	
LSA Agreement, ITP, or Other Agency Permit Number:		Role(s):	
Survey Type(s):		Construction Monitoring:	Days: Activities:
Species Life Stages Observed & Handled, Number of Each:	Life Stage: Number Observed: Number Handled: Reported to CNDDB (Y/N):	Company Name, Professional Reference Name, Phone, Email:	
If not reported to CNDDB, why:			
CDFW and Other Agency Email:			
Project 2 Name & Location:		Project Start & End Dates:	
LSA Agreement, ITP, or Other Agency Permit Number:		Role(s):	
Survey Type(s):		Construction Monitoring:	Days: Activities:
Species Life Stages Observed & Handled, Number of Each:	Life Stage: Number Observed: Number Handled: Reported to CNDDB (Y/N):	Company Name, Professional Reference Name, Phone, Email:	
If not reported to CNDDB, why:			
CDFW and Other Agency Email:			
Project 3 Name & Location:		Project Start & End Dates:	
LSA Agreement, ITP, or Other Agency Permit Number:		Role(s):	
Survey Type(s):		Construction Monitoring:	Days: Activities:

Project Name:
LSA Agreement/ITP Number(s):

Species Life Stages Observed & Handled, Number of Each:	Life Stage: Number Observed: Number Handled: Reported to CNDDB (Y/N):	Company Name, Professional Reference Name, Phone, Email:	
If not reported to CNDDB, why:			
CDFW and Other Agency Email:			
Additional Information:			

C. Species or Resource:			
Project 1 Name & Location:		Project Start & End Dates:	
LSA Agreement, ITP, or Other Agency Permit Number:		Role(s):	
Survey Type(s):		Construction Monitoring:	Days: Activities:
Species Life Stages Observed & Handled, Number of Each:	Life Stage: Number Observed: Number Handled: Reported to CNDDB (Y/N):	Company Name, Professional Reference Name, Phone, Email:	
If not reported to CNDDB, why:			
CDFW and Other Agency Email:			
Project 2 Name & Location:		Project Start & End Dates:	
LSA Agreement, ITP, or Other Agency Permit Number:		Role(s):	
Survey Type(s):		Construction Monitoring:	Days: Activities:
Species Life Stages Observed & Handled, Number of Each:	Life Stage: Number Observed: Number Handled: Reported to CNDDB (Y/N):	Company Name, Professional Reference Name, Phone, Email:	
If not reported to CNDDB, why:			
CDFW and Other Agency Email:			
Project 3 Name & Location:		Project Start & End Dates:	
LSA Agreement, ITP, or Other Agency Permit Number:		Role(s):	
Survey Type(s):		Construction Monitoring:	Days: Activities:

Project Name:
LSA Agreement/ITP Number(s):

Species Life Stages Observed & Handled, Number of Each:	Life Stage: Number Observed: Number Handled: Reported to CNDDB (Y/N):	Company Name, Professional Reference Name, Phone, Email:	
If not reported to CNDDB, why:			
CDFW and Other Agency Email:			
Additional Information:			

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FOR DEPARTMENT USE ONLY				
Date Received	Landowner Agreement	Incidental Take Permit	Date Complete	Notification Number

PG&E Bay Area O&M ITP 2081-2015-031-03 Pre-activity Notification Form

Complete EACH field unless otherwise indicated, following the enclosed instructions and submit ALL required enclosures. Attach additional pages, if necessary.

1. ACTIVITY ID NUMBER OR NAME AND DURATION

Activity Identifier				
B. Activity Term		C. Seasonal Work Period		D. Estimated Number of Workdays
Beginning (*month/year*)	Ending (*month/year*)	Start Date (*month/day*)	End Date (*month/day*)	

2. COVERED ACTIVITY AND WORK TYPE *(Check each box that applies)*

GAS ACTIVITY		ELECTRIC ACTIVITY	
G9: Pipeline Lowering	☐	E9a: Reconductoring	☐
G10: Pipeline Coating Replacement (when excavation or trenching occurs in wetlands or streams)	☐	E14: Minor Substation Expansion	☐
G11: Pipeline Replacement	☐	E15: Electric Underground Line Construction	☐
G13b: Vegetation Management and Access Road Maintenance (when culvert or headwall replacement is required)	☐		
G14: Gas Pressure Limiting Station Construction	☐		

OTHER ACTIVITIES REQUIRING NOTIFICATION	
Construction of temporary or permanent access roads in modeled or potential Covered Species habitats.	☐
Covered Activities that occur within or over California freshwater shrimp habitat and those that may affect undercut banks and the trees that support undercut banks within shrimp habitat.	☐
Covered Activities in wetted potential CTS breeding habitat.	☐
Covered Activities that include bridge replacement or culvert replacements in modeled California freshwater shrimp or California tiger salamander habitats.	☐

Other Covered Activities that may result in ground disturbance of 1 acre or greater in Covered Species habitats. ☐

3. ACTIVITY TYPE

Check the applicable box
☐ Routine Operations and Maintenance (Submit at Least 45 Days in Advance)
☐ Urgent Operation and Maintenance (Requested Start Date: _____)
☐ Emergency Work (Submit at Least 48 Hours After Identification of Emergency)

4. ACTIVITY LOCATION

A. Address or description of activity location. Include a map that marks the location of the activity with a reference to the nearest city or town, and provide driving directions from a major road or highway.				
☐ *Continued on additional page(s)*				
B. County				
C. USGS 7.5 Minute Quad Map Name	D. Township	E. Range	F. Section	G. ¼ Section
☐ *Attached or continued on additional page(s)*				
H. Meridian (*check one*)	☐ Humboldt	☐Mt. Diablo	☐ San Bernardino	
I. Assessor's Parcel Number(s)				
□ *Attached or continued on additional page(s)*				
J. Coordinates (*If available, provide at least latitude/longitude or UTM coordinates and check appropriate boxes)*				
Latitude/Longitude	*Latitude:*	*Longitude:*		
	☐ Degrees/Minutes/Seconds	☐ Decimal Degrees	☐ Decimal Minutes	
UTM	*Easting:*	*Northing:*	☐ Zone 10	☐ Zone 11
Datum used for Latitude/Longitude or UTM	☐ NAD 27	☐ NAD 83 or WGS 84		

5. SITE INSPECTION

Check one box only
☐ In the event the Department determines that a site inspection is necessary, I hereby authorize a Department representative to enter the property where the activity described in this notification will take place at any reasonable time, and hereby certify that I am authorized to grant the Department such entry.
☐ I request the Department to first contact _____ at _____to schedule a date and time to enter the property where the activity described in this notification will take place.

7. ACTIVITY DESCRIPTION

A. Describe the Activity (including justification for "urgent" or "emergency" work) and describe the environmental setting where work will occur.

☐ *Continued on additional page(s)*

B. Enclosure checklist.

☐ Google Earth KMZ file or GIS Shape file
☐ Map on Aerial Photo for each discrete location with the following information:
- ☐ Location of the activity or if multiple activities, the location of each activity
- ☐ Project access (public/private roads or proposed new temporary access)
- ☐ Location of staging area
- ☐ Any spoils placement
- ☐ Outline acreages of temporary or permanent habitat impacts

☐ Representative photos for large-scale sites or site-specific photos for discrete locations
☐ Engineering and/or design plans
☐ Other: _____

8. ACTIVITY IMPACTS

Habitat Type	Temporary Impact (acres or SqFt)	Permanent Impact (acres or SqFt)
CTS Upland (Central DPS)		
CTS Aquatic (Central DPS)		
CTS Upland (Sonoma DPS)		
CTS Aquatic (Sonoma DPS)		
AWS Core		
AWS Perimeter Core		
AWS Movement		
CA Freshwater Shrimp		

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9. MEASURES TO PROTECT FISH, WILDLIFE, AND PLANT RESOURCES

A. List all applicable HCP AMMs, FPs, or BMPs etc. for this Covered Activity.

☐ *Continued on additional page(s)*

B. Applicable Pre-Activity Species-Specific ITP Take Minimization Measures.

☐ CTS Pre-Activity Clearance Surveys. Planned survey date(s): _____

☐ Work in or Adjacent to CTS Aquatic Breeding Habitat.

☐ Alameda Whipsnake Pre-Activity Habitat Features Survey. Planned survey date(s): _____

☐ AWS Exclusionary Barrier.

☐ Alameda Whipsnake Clearance Surveys.

C. ITP Compliance Monitoring Requirements.

☐ Covered Activities are within 500 meters of a known or suspected California tiger salamander (CTS) breeding pond and will result in displacement of soil to a depth of 3-inches or greater and over an area of 0.1 acres or greater. Designated Biologist will be onside during clearing or grubbing and during active ground disturbance.

☐ Covered Activities may directly affect (e.g., tree work) California freshwater shrimp habitat. Designated Biologist will be onside during active operations.

☐ Conducting E9a (Reconductoring), G9 (Pipeline Lowering), G11 (Pipeline Replacement), and minor new construction activities in any modeled habitat; a General Monitoring biologist will be onsite daily.

☐ Conducting G10 (Pipeline Coating Replacement) when excavation or trenching occurs in wetlands or streams in modeled habitat; a General Monitoring biologist will be onsite daily.

☐ When Covered Activities over 0.1 acres are conducted during precipitation events in modeled California tiger salamander habitat a General Monitoring biologist will be onsite.

☐ Alameda Whipsnake Seasonal Restriction. For activities E9a (Reconductoring), G9 (Pipeline Lowering), G11 (Pipeline Replacement), and E14 (Minor Substation Expansion) occurring in core or perimeter core habitat for Alameda whipsnake between November 1 and April 14, a Designated Biologist(s) will be present during operations.

☐ Covered Activities in Covered Species modeled habitat will require work over a period of two weeks or greater. a General Biological Monitor shall conduct compliance inspections, at a minimum, once every week after clearing, grubbing, and grading are completed and during periods of inactivity.

10. PERMITS

List any local, state, and federal permits the activity requires and check the corresponding box (other than the Bay Area HCP). Enclose a copy of each permit issued.

A. _____ ☐ Applied ☐ Issued

B. _____ ☐ Applied ☐ Issued

C. Unknown whether ☐ local, ☐ state, or ☐ federal permit is needed for the activity. (*Check each box that applies.*)

☐ *Continued on additional page(s)*

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Attachment 5

Pacific Gas and Electric's Environmental Review, Planning and Screening Process: Excerpt from Pacific Gas and Electric Company Bay Area Operations and Maintenance Incidental Take Permit Final Environmental Impact Report, SCH No. 2017122028

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2.9 Overview of PG&E's Environmental Review Process

PG&E employs a large and diverse staff of environmental and regulatory compliance professionals whose primary roles are to ensure that activities are completed in compliance with applicable environmental and natural resource laws and regulations. This process is followed for all PG&E projects, including O&M, minor new construction, and larger projects, although it may be truncated or delayed for emergency projects. Environmental staff screens and reviews projects and activities when natural resources could be affected, and staff routinely identifies and prescribes standard BMPs that are implemented during PG&E's routine O&M activities.

~~Activities that would be covered by the proposed ITP are not necessarily subject to review under CEQA.~~Most of PG&E's covered activities involve routine O&M activities that are not typically subject to review under CEQA. First, no discretionary permit may be required for the work. If there is discretionary permitting, the operation, repair, maintenance, or minor alteration of existing facilities is considered a Class 1 exemption under CEQA Guidelines Section 15301(b). Replacement or reconstruction of existing structures with no or negligible expansion is considered as a Class 2 exemption under CEQA Guidelines Section 15302(c). Much of PG&E's wildfire prevention work is

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covered by the emergency exemption under CEQA Guidelines Section 15369. When there are exceptions to exemptions under CEQA Guidelines Section 15300.2, then formal CEQA review will be required.

When required, PG&E's environmental staff obtains ministerial and discretionary permits, and assists in implementing the corresponding permit conditions and BMPs. Sections 2.9.1 through 2.9.4 describe PG&E environmental staff practices for reviewing covered activities, with the goals of avoiding and minimizing effects on natural resources as a result of covered activities. To achieve these goals, PG&E's overall environmental screening processes can be categorized into four phases: project assessment, environmental screening and review, project refinement, and environmental release to construction (Figure 2-6). PG&E's measures to avoid and minimize impacts are described in Section 2.10, *Project Measures to Reduce Impacts*.

2.9.1 Phase 1—Project Assessment

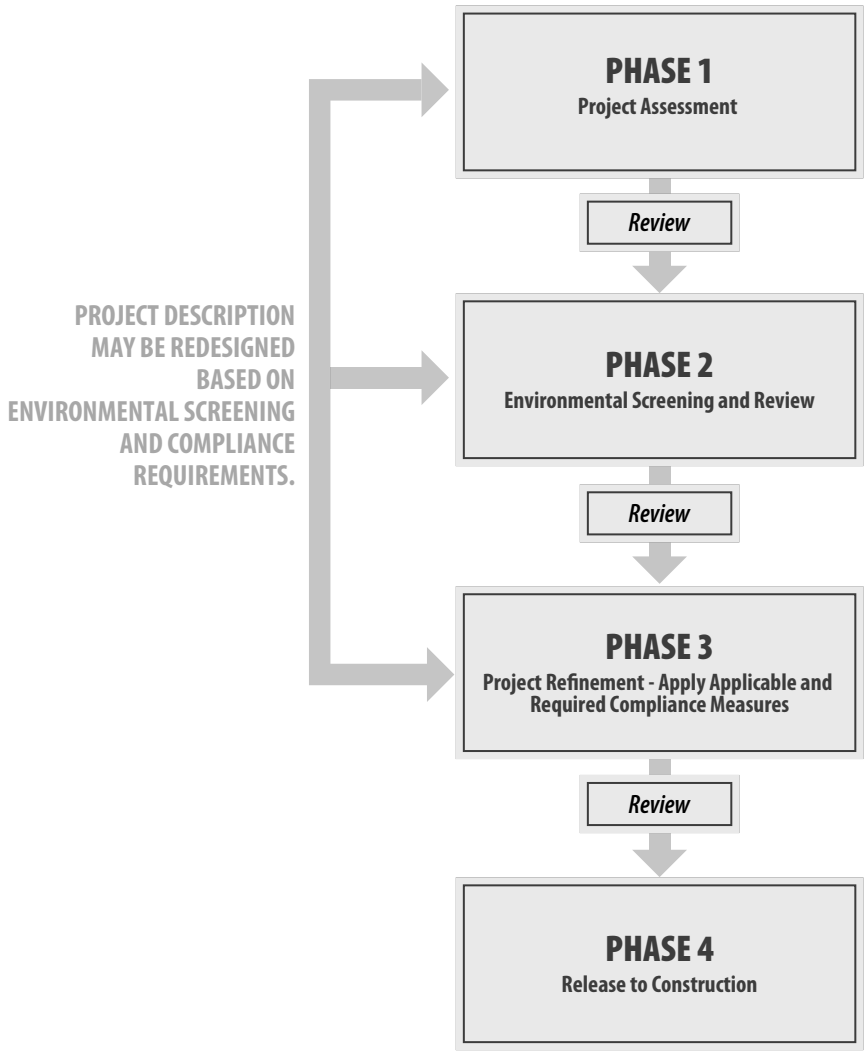
Covered activities arise out of an extensive multi-year planning process that factors in the age of the facilities, life of the equipment, equipment conditions, wear, outage history, and other considerations. During the first phase, PG&E land planners and engineers evaluate a given project and begin developing the project scope and description. The level of detail in the project description varies based on the activity size (e.g., less detailed for small projects and more detailed for large projects) and an initial assessment of the site conditions and constraints. Typically, a project description for a large capital improvement project, such as electric reconductoring or gas pipeline replacement project includes an evaluation of site access, temporary construction areas, construction footprint, construction schedule, and outage schedule, with the ultimate goal of assessing the environmental impacts and potential discretionary permits and environmental review requirements. The time required developing the project scope and description varies from 1 day to greater than 1 year, with some projects taking 2 years or more for assessment and design because of required field surveys.

2.9.2 Phase 2—Environmental Screening and Review

During the second phase, PG&E's staff of land planners, biologists, cultural resource specialists, vegetation management staff, and environmental field specialists conducts initial environmental screening and review of the proposed project and associated work activities. Multiple environmental screening processes are used by the various staff members supporting the project depending on the line of business and type of work. Land planners review ministerial and discretionary permits as well as land rights. Land planners, vegetation management inspectors, and biologists conduct riparian screening for vegetation management activities. During the screening process, projects and activities are evaluated for potential impacts on wetlands, on state and federal waters, on species protected by the CESA or federal Endangered Species Act and other special-status species, and on the habitats for these species. PG&E staff verifies that the necessary land rights are obtained for both temporary and permanent easements. The environmental permitting process may also begin in this phase. Table 2-5 outlines the anticipated permits and approvals that could be required. PG&E maintains a comprehensive geographic information system to evaluate projects, and routinely uses this system to evaluate all aspects of a project's scope or description.

PG&E's Environmental Team routinely evaluates the impacts of proposed projects and recommends the appropriate avoidance~~,~~ and minimization ~~, or mitigation~~ measures, based on best practices and permit requirements, as follows.

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Figure 2-6
PG&E's Generalized Environmental Screening Process

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- For siting work locations, land use and planning practices to minimize impacts.
- Visual resource practices to lessen the visual impacts on a sensitive receptor.
- Biological resources evaluation and screening to minimize environmental impacts.
- Geology and soils practices to engineer facilities correctly and minimize erosion.
- Water quality practices to protect water quality.
- Cultural resources practices to protect cultural resources.
- Transportation and circulation practices to minimize traffic impacts.
- Noise and vibration practices to minimize noise and vibration impacts on sensitive receptors.
- Air quality practices to minimize air quality impacts and vehicle emissions.
- Hazardous materials practices to ensure the proper management, use, disposal, and storage of hazardous materials.
- Environmental justice practices to ensure minority communities are not adversely affected.
- Cleanup and restoration practices to ensure work areas are restored.
- Detailed project measures PG&E uses to address these resources are described in Section 2.10, *Project Measures to Reduce Impacts*.

2.9.3 Phase 3—Project Refinement

During the third phase, based on the results of the environmental screening and review, PG&E staff (land planners, biologists, field crews, and other specialists) identify appropriate AMMs and BMPs to avoid and minimize impacts from the activity. These AMMs, described in Section 2.10, are added to the project work as required conditions. These AMMs include environmental protection measures, applicant proposed measures (APMs), BMPs, FPs, and required compliance measures, such as permit conditions or agency agreements ~~and mitigation measures~~. Based on this information and information from the second phase, the project may be refined or modified to minimize its impacts.

2.9.4 Phase 4—Environmental Release to Construction

The fourth phase is a release to construction review. PG&E staff implements an environmental release-to-construction (ERTC) process, or an equivalent procedure, to ensure projects and activities are reviewed for environmental constraints or restrictions, and all appropriate measures are included in the work plans. Work crews are given specific directions concerning permit conditions, BMPs, AMMs and other project requirements.

This screening process, in conjunction with PG&E's annual environmental awareness training and project-specific tailboard trainings, helps ensure that PG&E avoids and minimizes project impacts and complies with applicable environmental laws and regulations. Table 2-5 summarizes the range of permits and approvals that may be required for PG&E activities. While the ERTC process is primarily for large activities that would more likely have a potential environmental impact, many small activities are covered by PG&E's automated environmental assessment process or other line of business procedures.

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PG&E frequently uses third party contractors to perform O&M and minor new construction work and is responsible for the performance of the work conducted by these contractors. PG&E requires third-party contractors to perform the following actions when applicable.

- Train employees and contractors performing O&M and minor new construction activities on the permit requirements that are applicable to their job duties and work.
- Enter into a new or revised contract with PG&E that contains enforceable provisions committing the third party to comply with provisions of the permit.

The ITP administrator would provide training and training materials for all PG&E crews and contractors to ensure compliance with environmental laws and regulations, including permit conditions associated with the ITP. The ITP administrator maintains a log of all personnel trained on the conditions of the ITP.

With issuance of an ITP, the downstream effects of the environmental screening process would not differ substantially from current practice (baseline), and ITP-related permit conditions issued by CDFW would be integrated into the review process and used, where appropriate, for covered activities.

2.10 Project Measures to Reduce Impacts

PG&E implements a suite of measures to avoid and minimize its impacts. These measures consist of its general practices, including BMPs, the AMMs from its Bay Area O&M HCP, and requirements imposed by applicable federal, state or local laws. The general practices, including BMPs, and legal requirements are set forth in the applicable impact chapters. The AMMs from PG&E's Bay Area O&M HCP that are applicable to the ITP are below in Table 2-3. PG&E has also proposed APMs for this project, which are listed in Table 2-4. ~~Finally, the project proposes to include one mitigation measure requiring compensatory mitigation for impacts on the covered species to ensure that any remaining impacts are less than significant under CEQA and to fully mitigate impacts on covered species under CESA.~~

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[***Financial institution letterhead***]

IRREVOCABLE STANDBY LETTER OF CREDIT
NO. [***number issued by financial institution***]

Issue Date: [***date***]

Beneficiary:

California Department of Fish and Wildlife
Habitat Conservation Planning Branch
Post Office Box 944209
Sacramento, CA 94244-2090
Attn: HCPB Contract Coordinator

Amount: U.S. $[***dollar number***] [(***dollar amount***)]

Expiry: [***Date***] at our counters

Dear Sirs:

1. At the request and on the instruction of our customer, [***name of applicant***] ("Applicant"), we, [***name of financial institution***] ("Issuer"), hereby establish in favor of the beneficiary, the California Department of Fish and Wildlife ("CDFW"), this irrevocable standby letter of credit ("Credit") in the principal sum of U.S. $[***dollar number***] [(***dollar amount***)] ("Principal Sum").

2. We are informed this Credit is and has been established for the benefit of CDFW pursuant to the terms of the incidental take permit for the [***name of project***] issued by CDFW to the Applicant on [***date***] (No. [***number***]) ("Permit").

3. We are further informed that pursuant to the Permit, the Applicant has agreed to complete certain mitigation requirements, as set forth in conditions [***numbers***] in the Permit ("Mitigation Requirements").

4. We are finally informed that this Credit is intended by CDFW and the Applicant to serve as a security device for the performance by the Applicant of the Mitigation Requirements.

5. CDFW shall be entitled to draw upon this Credit only by presentation of a duly executed Certificate for Drawing ("Certificate") in the same form as Attachment A,

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which is attached hereto, at our office located at [***name and address of financial institution***].

6. The Certificate shall be completed and signed by an Authorized Representative of CDFW as defined in paragraph 12 below. Presentation by CDFW of a completed Certificate may be made in person or by registered mail, return receipt requested, or by overnight courier.

7. Upon presentation of a duly executed Certificate as above provided, payment shall be made to CDFW, or to the account of CDFW, in immediately available funds, as CDFW shall specify.

8. If a demand for payment does not conform to the terms and conditions of this Credit, we shall give CDFW prompt notice that the demand for payment was not effected in accordance with the terms and conditions of this Credit, state the reasons therefore, and await further instruction.

9. Upon being notified that the demand for payment was not effected in conformity with the Credit, CDFW may correct any such non-conforming demand for payment under the terms and conditions stated herein.

10. All drawings under this Credit shall be paid with our funds. Each drawing honored by us hereunder shall reduce, *pro tanto*, the Principal Sum. By paying to CDFW an amount demanded in accordance herewith, we make no representations as to the correctness of the amount demanded.

11. This Credit will be cancelled or the Principal Sum will be reduced upon receipt by us of Certificate of Cancellation/Reduction, which: (i) shall be in the form of Attachment B, which is attached hereto, and (ii) shall be completed and signed by an Authorized Representative of CDFW, as defined in paragraph 12 below.

12. An Authorized Representative shall mean the Director of CDFW; the General Counsel of CDFW; a Regional Manager of CDFW; or the Branch Chief of CDFW's Habitat Conservation Planning Branch.

13. This Credit shall be automatically extended without amendment for additional periods of one year from the present or any future expiration date hereof, unless at least sixty (60) days prior to any such date, we notify CDFW in writing by registered mail, return receipt requested, or by overnight courier that we elect not to consider this Credit extended for any such period.

14. Communications with respect to this Credit shall be in writing and addressed to us at [***name and address of financial institution***], specifically referring upon such writing to this credit by number. The address for notices with respect to this Credit shall be: (i) for CDFW: Department of Fish and Wildlife, Habitat

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Conservation Planning Branch, Post Office Box 944209, Sacramento, CA 94244-2090, Attn: HCPB Contract Coordinator; and (ii) for the Applicant: [***name and address of applicant***].

15. This Credit may not be transferred.

16. This Credit is subject to the International Standby Practices 1998 ("ISP 98"). As to matters not covered by the ISP 98 and to the extent not inconsistent with the ISP 98, this credit shall be governed by and construed in accordance with the Uniform Commercial Code, Article 5 of the State of California.

17. This Credit shall, if not canceled, expire on [***expiration date***], or any extended expiration date.

18. We hereby agree with CDFW that documents presented in compliance with the terms of this Credit will be duly honored upon presentation, as specified herein.

19. This Credit sets forth in full the terms of our undertaking. Such undertaking shall not in any way be modified, amended or amplified by reference to any document or instrument referred to herein or in which this Credit is referred to or to which this Credit relates and any such reference shall not be deemed to incorporate herein by reference any document or instrument.

[***Name of financial institution***]

By: _____
Name: _____
Title: _____
Telephone: _____

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ATTACHMENT A

CERTIFICATE FOR DRAWING

[***CDFW Letterhead***]

[***Date***]

[***Name and address of financial institution***]

Re: Irrevocable Standby Letter of Credit No. [***number issued by financial institution***]

The undersigned, a duly Authorized Representative of the California Department of Fish and Wildlife ("CDFW"), as defined in paragraph 12 of the above-referenced standby letter of credit ("Credit"), hereby certifies to the Issuer that:

1. [***Insert one of the following statements:*** "In the opinion of CDFW, the Applicant has failed to complete the Mitigation Requirements referenced in paragraph 3 of the Credit." ***or*** "As set forth in paragraph 13, the Issuer has informed CDFW that the Credit will not be extended and the Applicant has not provided CDFW with an equivalent security approved by CDFW to replace the Credit."]

2. The undersigned is authorized under the terms of the Credit to present this Certificate as the sole means of demanding payment on the Credit.

3. CDFW is therefore making a drawing under the Credit in amount of U.S. $_____.

4. The amount demanded does not exceed the Principal Sum of the Credit.

Therefore, CDFW has executed and delivered this certificate as of this ___day of [***month***], [***year***].

CALIFORNIA DEPARTMENT OF FISH AND WILDLIFE

_____

[***Insert one of the following:*** "Director" ***or*** "General Counsel" ***or*** "Regional Manager, [***Name of Regional Office***]" ***or*** "Chief, Habitat Conservation Planning Branch"]

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ATTACHMENT B

CERTIFICATE FOR CANCELLATION/REDUCTION

[***CDFW Letterhead***]

[***Date***]

[***Name and address of financial institution***]

Re: Irrevocable Standby Letter of Credit No. [***number issued by financial institution***]

The undersigned, a duly Authorized Representative of the California Department of Fish and Wildlife ("CDFW"), as defined in the paragraph 12 in the above-referenced Irrevocable Standby Letter of Credit ("Credit"), hereby certifies to the Issuer that:

1. [***Insert one of the following statements:*** "The Applicant has presented documentary evidence of full compliance with the Mitigation Requirements referenced in paragraph 3 of the Credit." ***or*** "The Applicant has presented documentary evidence of compliance with the following Mitigation Requirement[(***s***)] referenced in paragraph 3 of the Credit: [***insert brief description of requirement(s) or requirement number(s) completed***]." ***or*** "The Applicant has provided CDFW with an equivalent security approved by CDFW to replace the Credit."]

2. [***Insert one of the following statements:*** "CDFW therefore requests the cancellation of the Credit." ***or*** "CDFW therefore requests a reduction in the Principal Sum in the amount of $_____, thereby making the new Principal Sum $_____."]

Therefore, CDFW has executed and delivered this certificate as of this ____ day of [***month***], [***year***].

CALIFORNIA DEPARTMENT OF FISH AND WILDLIFE

_____

[***Insert one of the following:*** "Director" ***or*** "General Counsel" ***or*** "Regional Manager, [***Name of Regional Office***]" ***or*** "Chief, Habitat Conservation Planning Branch"]

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State of California - Department of Fish and Wildlife

MITIGATION PAYMENT TRANSMITTAL FORM

DFW 1057 (REV.05/18/21)

Project Applicant Instructions: Please fill out and attach this form to payment. For conservation banks, also attach the Bill(s) of Sale for credits sold. One form may be used for multiple transactions, **BUT YOU MUST USE A SEPARATE FORM FOR EACH CHECK YOU TRANSMIT**. Make sure to include Project Name, Project Tracking Number, and ASB Mitigation Tracking Number (if available) on the attached payment type.

1. DATE: _____

TO: _____
Regional Manager

_____
Region Office Address

2. FROM: _____
Name

_____
Mailing Address

_____
City, State, Zip

_____
Telephone Number/FAX Number

3. RE: _____
Project Name as appears on permit/agreement

4. AGREEMENT/ACCOUNT INFORMATION: (check the applicable type)

☐ 2081 Permit ☐ Conservation Bank ☐ 2835 NCCP ☐ 1802 Agreement ☐ 1600 Agreement ☐ Other _____

_____
Project Tracking Number

5. PAYMENT TYPE (One check per form only): The following funds are being remitted in connection with the above referenced project:

Check information:

Total $_____ Check No. _____

Account No. _____ Bank Routing No. _____

a. Endowment: for Long-Term Management Subtotal $_____

b. Habitat Enhancement Subtotal $_____

c. Security:

1. Cash Refundable Security Deposit Subtotal $_____

2. Letter of Credit Subtotal $_____

1. Financial Institution: _____

2. Letter of Credit Number: _____

3. Date of Expiration: _____

ACCOUNTING OFFICE USE ONLY	
Description	**FI$Cal Coding**
Speedchart (Project, Program, Reference, Fund)	
Reporting Structure	
Category	
Date Established: _____ By: _____	

Please send this form to asbmitigation@wildlife.ca.gov

Nesting Bird Management Plan

Nesting Birds: Species-Specific Buffers for PG&E Activities

November 2015
Public Version

Nesting Birds: Species-Specific Buffers for PG&E Activities

Within PG&E's Avian Program, standard nest buffers were developed for all common and special-status birds present within its Service Territory. There are no standard nest buffers specified in the Migratory Bird Treaty Act (MBTA) or within California Fish and Game Code. Table 1 provides nest buffers based on the best available information, including relevant literature review and avian biology. Disturbance factors including *nest location*, *human activity*, *activity duration*, and *noise level* may influence nesting behavior and reproductive success, and were each considered in establishing standard buffer distances for individual species. Where regulatory agencies have provided information on nest buffer distances for special-status species, those buffer distances are primarily used as *standard buffers* in Table 1. *Standard buffers* are species-specific buffer distances between occupied nest sites and work activities where work will not occur while the nest is active (containing eggs or young). These standard buffers are intended to be applied to nests located in proximity to PG&E activities at a sufficient distance to provide suitable nest protection. For example, a nesting black-crowned night heron has a standard buffer distance of 400 feet (Table 1).

Because it is not always possible to apply the standard buffer, non-standard species-specific buffer distances have also been established. As part of the determination of these non-standard buffers, PG&E activities are assigned disturbance rankings (Low, Medium, or High) for each factor identified above. Evaluation of all disturbance factors combined produces an overall disturbance category by assessing each disturbance factor for one or more PG&E activities. If the overall disturbance category is high, the standard buffer will generally apply. If the evaluation results in low or medium overall disturbance categories, the standard buffer is applied as feasible or reduced buffers may be appropriate. For example, in some circumstances it may be necessary to perform certain types of work within the standard buffer. In these cases, biologists consider all relevant site-specific conditions, including the species' tolerance for disturbance, work activity type, noise levels, and distance to nest to determine if reducing the standard buffer is appropriate. Alternatively, the buffer may be increased beyond the standard buffer for certain exceptions. Helicopters are the main exception that may require increased buffers.

Table 1 lists the standard buffers and non-standard buffer ranges for activities with low-medium and medium-high disturbances. Nest buffers will be implemented and adjusted by the biologist[1].

The following site-specific conditions are considered in determining if a reduced or increased buffer is appropriate:

- **Disturbance**. Evaluate nest disturbance, including consideration of activity intensity and duration, construction type, amount of habitat disturbance, level of human disturbance or acclimation, activity length, and the amount of noise generated by the activity.
- **Existing Conditions**. Assess site conditions to determine if there is acclimation to human disturbance.
- **Nest Concealment**. Evaluate surrounding habitat for its ability to provide visual and/or acoustic barriers between the nest and construction.
- **Species Natural History**. Consider individual species' natural history, nest stage (incubation, rearing, fledging), and known tolerances to disturbance.
- **Habituation**. Consider species habituation to new or ongoing activities.
- **Environmental Conditions**. Consider weather and other related factors.
- **Helicopter Use.** Consider helicopter type, flight plans, and duration.

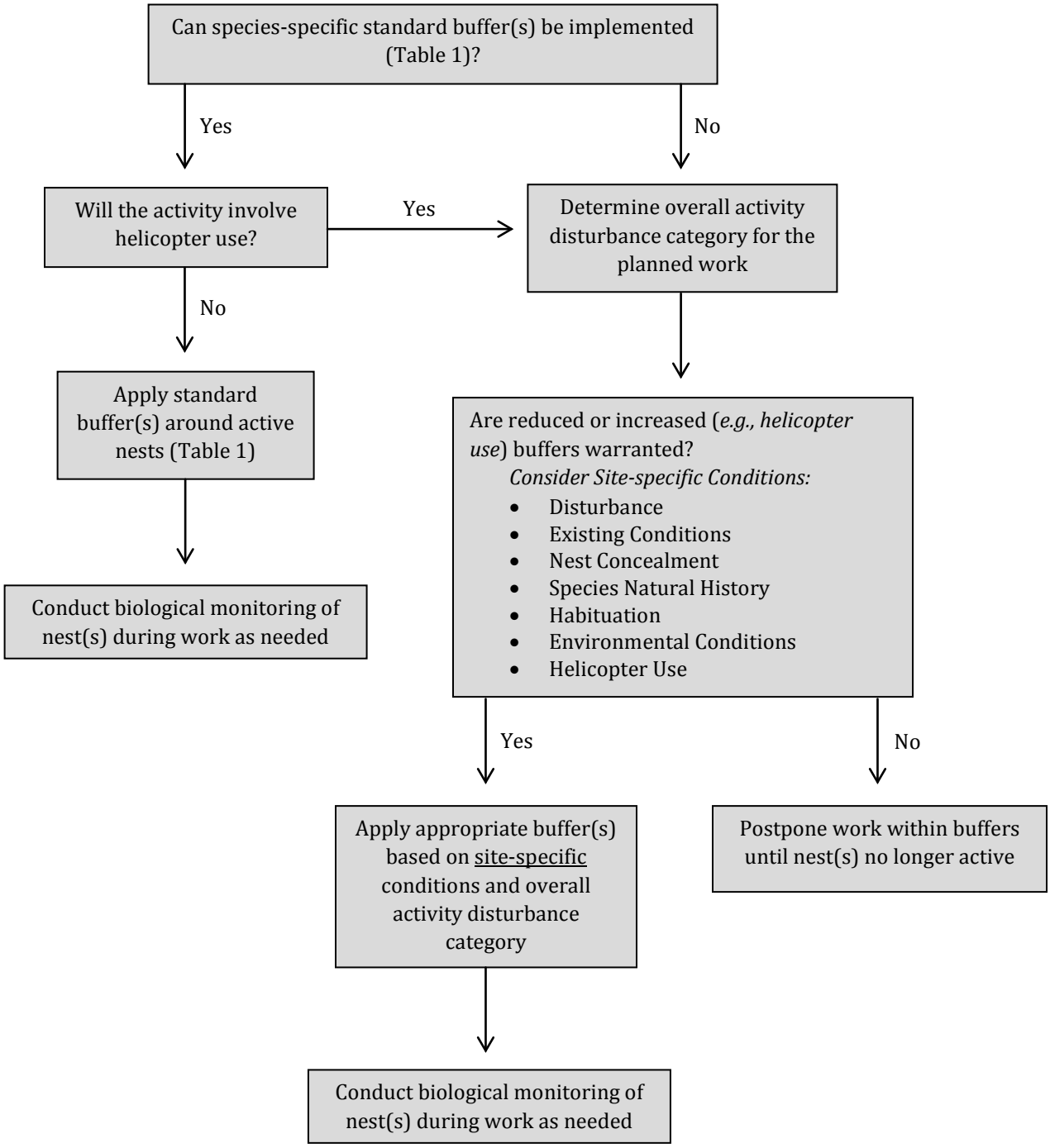
Nest Buffer Implementation Guidelines

Step/Task/Responsible	Outcome and Components
1. Desktop review *Biologist*	• Assess habitat types and potential nesting bird species • Identify potentially appropriate buffers for the species that may nest
2. Preconstruction nesting bird surveys *Biologist*	• Conduct preconstruction surveys within the standard buffers • Document species detections including nests and active nests
3. Assign Buffers *Biologist*	• Assess intensity/duration of activity • Assess acclimation to human disturbance • Assess site-specific conditions • Consider species' natural history, reproductive stage, tolerances to disturbance, and observed behavior • Evaluate and assign standard, reduced, or increased buffers
4. Implement Buffers *Biologist/Biological Monitor*	• Implement buffers when work activities are occurring • Conduct periodic biological monitoring where needed • Adjust buffers as appropriate

[1] Biologist refers to an individual with a bachelor's degree or above in a field related to biological sciences and demonstrated field expertise in ornithology, in particular, nesting behavior; these qualified biologists may be PG&E employees or contractors.

Species-Specific Buffers for PG&E Activities

Buffer Assignment Process – Quick Reference



Other Biological Considerations in Determining Buffers

- Provisioning frequency of hatchlings or older young
- Egg turning
- Egg incubation (female or male or combination)
- Egg hardiness
- Ambient Temperatures
- Heat tolerance (eggs or nestlings)
- Cold tolerance (eggs or nestlings)
- Unsheltered nest risk
- Premature fledging risk
- Unattended nests and predation risk

Time on Nest is Important. An egg initially requires a controlled heat input, but later in incubation the embryo may produce more heat and may need to be cooled rather than heated. Ambient temperatures need to be considered. Unattended unsheltered nests may experience temperature extremes (heat or cold). Egg turning during incubation is also a critical component for successful hatching; absence of turning during incubation will result in reduced and delayed hatching. During the nestling stage for altricial birds (i.e., birds that typically require feeding by adults), adults must provision food to nestlings. Provisioning rate is highly variable between species and is correlated to clutch size and body size, but most birds make frequent trips to attend nestlings. Collectively referred to as brooding, these forms of parental care are essential for reproductive success. Unattended nests also may experience increased rates of predation. Premature fledging is more likely to occur during later nest stages, when young are nearing fledging stage but not yet capable of flight.

Table 1. Species-specific Nest Buffers for PG&E Work Activities

**Atypically high-intensity activities, such as helicopter use usually require increased buffers beyond the standard buffer*

Common Name	Scientific Name	Nest Location, Substrate, and Habitat	Vertical Height	Peak Breeding Season/Number of Broods per Season	Incubation Duration/Chick-rearing Duration	Standard Buffer* (feet)	Medium to High Disturbance Category Buffer (feet)	Low to Medium Disturbance Category Buffer (feet)
Mallard	*Anas platyrhynchos*	Scrapes under overhanging cover or in dense vegetation in uplands near water.	Ground	March through June; single brood.	Clutch incubated for 26–29 days by female; young are precocial.	100	30–100	15–30
Cinnamon Teal	*Anas cyanoptera*	Scrapes under overhanging cover or in dense vegetation in uplands near water.	Ground	April through August; single brood.	Clutch incubated for 24–25 days by female; young are precocial.	100	30–100	15–30
Canada Goose	*Branta canadensis*	Scrapes on slightly elevated, firm ground in uplands near water.	Ground	February through June; single brood.	Clutch incubated for 27–28 days by female; young are precocial.	100	30–100	15–30
Wood Duck	*Aix sponsa*	Cavities in riparian woodlands and other woodland habitats near water.	Up to 60 feet	April through August; single or double brood.	Clutch incubated for 27–35 days by female; young are precocial.	100	30–100	15–30
Blue-winged Teal	*Anas discors*	Scrapes in dense grass or forbs in wetlands or grasslands near water.	Ground	June through July; single brood	Clutch incubated for 23–24 days by female; young are precocial.	100	30–100	15–30
Northern Shoveler	*Anas clypeata*	Scrapes in low grasses or forbs in uplands near water.	Ground	March through July; single brood.	Clutch incubated for 25–27 days by female; young are precocial.	100	30–100	15–30
Gadwall	*Anas strepera*	Scrapes in dense, low emergent vegetation or grasses in uplands near water.	Ground	April through July; single brood.	Clutch incubated for 22–29 days by female; young are precocial.	100	30–100	15–30
American Wigeon	*Anas americana*	Scrapes in dense vegetation cover in uplands near water.	Ground	May through July; single brood.	Clutch incubated for 24–25 days by female; young are precocial.	100	30–100	15–30

Common Name	Scientific Name	Nest Location, Substrate, and Habitat	Vertical Height	Peak Breeding Season/Number of Broods per Season	Incubation Duration/Chick-rearing Duration	Standard Buffer* (feet)	Medium to High Disturbance Category Buffer (feet)	Low to Medium Disturbance Category Buffer (feet)
Redhead	*Aythya americana*	Platform nests over water in dense vegetation; occasionally nests in uplands near water.	Ground	April through June; single brood.	Clutch incubated for 24–26 days by both sexes; young are precocial.	100	30–100	15–30
Ring-necked Duck	*Aythya collaris*	Platform nests over water in dense emergent vegetation in wetlands.	Ground	May through August; single brood.	Clutch incubated for approximately 26 days by female; young are precocial.	100	30–100	15–30
Common Merganser	*Mergus merganser*	Cavities in trees, snags and stumps in riparian woodlands.	Up to 200 feet	March through September; single brood.	Clutch incubated for 28–32 days by female; young are precocial.	100	30–100	15–30
Ruddy Duck	*Oxyura jamaicensis*	Platform nests constructed on shallow water in dense, tall emergent vegetation.	Ground	April through October; single or double brood.	Clutch incubated for approximately 23 days by female; young are precocial.	100	30–100	15–30
Pied-billed Grebe	*Podilymbus podiceps*	Platform nests constructed in emergent vegetation bordering open water.	Ground	March through July; double brood.	Clutch incubated for approximately 23 days by both sexes; young are precocial.	100	30–100	15–30
Eared Grebe	*Podiceps nigricollis*	Platform nests in water on emergent wetland vegetation.	Ground	April through July; single brood.	Clutch incubated for approximately 21 days by both sexes by both sexes; young are precocial.	100	30–100	15–30
Western Grebe	*Aechmophorus occidentalis*	Platform nests in emergent vegetation or open water or, less frequently, on dry land near water.	Ground	May through August; single brood.	Clutch incubated for approximately 23 days by both sexes; young are precocial.	100	30–100	15–30

Common Name	Scientific Name	Nest Location, Substrate, and Habitat	Vertical Height	Peak Breeding Season/Number of Broods per Season	Incubation Duration/Chick-rearing Duration	Standard Buffer* (feet)	Medium to High Disturbance Category Buffer (feet)	Low to Medium Disturbance Category Buffer (feet)
Clark's Grebe	*Aechmophorus clarkii*	Platform nests constructed in emergent vegetation or open water or, less frequently, on dry land near water.	Ground	May through August; single brood.	Clutch incubated for approximately 23 days by both sexes; young are precocial.	100	30–100	15–30
Double-crested Cormorant	*Phalacrocorax auritus*	Platform nests on islands, on the ground or in trees; also in power poles and other artificial structures. Colonial nester.	Ground	March through August; single brood.	Clutch incubated for 25–29 days by both sexes; altricial young fledge at 37–44 days.	400	75–400	50–75
Pelagic Cormorant	*Phalacrocorax pelagicus*	Platform nests on steep cliffs along rocky and exposed shorelines along outer coasts, bays, inlets, estuaries, rapids, coves, surge narrows, harbors, lagoons, and coastal log-storage sites. Colonial nester.	Ground	April through August; single or double brood	Clutch incubated for 28–32 days by both sexes; altricial young fledge at approximately 47 days	400	75–400	50–75
American Bittern	*Botaurus lentiginosus*	Platform nests in shallow water or on ground near water.	Ground	April through July; single brood.	Clutch incubated for approximately 24 days by female; altricial young fledge at approximately 14 days.	100	50–100	25–50
Least Bittern	*Ixobrychus exilis*	Platform nests about a foot above the water in freshwater marshes.	Ground	March through July; double brood.	Clutch incubated for 16–19 days by both sexes; altricial young fledge at 13–15 days.	100	50–100	25–50

Common Name	Scientific Name	Nest Location, Substrate, and Habitat	Vertical Height	Peak Breeding Season/Number of Broods per Season	Incubation Duration/Chick-rearing Duration	Standard Buffer* (feet)	Medium to High Disturbance Category Buffer (feet)	Low to Medium Disturbance Category Buffer (feet)
Great Blue Heron	*Ardea herodias*	Platform nests in tall trees or other types of vegetation near water. Colonial nester.	Up to 130 feet	January through July; single brood.	Clutch incubated for 25–29 days by both sexes; altricial young fledge at approximately 60 days.	400	75–400	50–75
Great Egret	*Ardea alba*	Platform nests in tall trees or other types of vegetation near water. Colonial nester.	10–80 feet	March through July; single brood.	Clutch incubated for approximately 26 days; semi-altricial young fledge at approximately 35–42 days.	400	75–400	50–75
Snowy Egret	*Egretta thula*	Platform nests in tall trees or other types of vegetation near water. Colonial nester.	Up to 30 feet but usually 10–15 feet	March through July; single brood.	Clutch incubated for 20–24 days by both sexes; semi-altricial young fledge at 21–28 days.	400	75–400	50–75
Cattle Egret	*Bubulcus ibis*	Platform nests in tall shrubs and trees near water.	Up to 30 feet but usually 5–15 feet	April to July; single brood.	Clutch incubated for 23–25 days; semi-altricial young fledge at about 40 days.	400	75–400	50–75
Green Heron	*Butorides striatus*	Platform nests in shrubs, trees, thickets, or other vegetation near water.	10–30 feet, sometimes higher	March through July; single or double brood.	Clutch incubated for 19–21 days by both sexes; semi-altricial young fledge at 21–23 days.	100	50–100	25–50
Black-crowned Night-Heron	*Nycticorax*	Platform nests in shrubs, trees, thickets, or other vegetation near water. Colonial nester.	Up to 150 feet	January through June; double brood.	Clutch incubated for approximately 24 days by female; semi-altricial young fledge at 42–49 days.	400	75–400	50–75
White-faced Ibis	*Plegadis chihi*	Platform nests of emergent wetland vegetation in extensive wetlands. Colonial nester.	Ground	May to July; single brood.	Clutch incubated for 20–26 days by both sexes; altricial young fledge at 10–12 days.	400	75–400	50–75

Common Name	Scientific Name	Nest Location, Substrate, and Habitat	Vertical Height	Peak Breeding Season/Number of Broods per Season	Incubation Duration/Chick-rearing Duration	Standard Buffer* (feet)	Medium to High Disturbance Category Buffer (feet)	Low to Medium Disturbance Category Buffer (feet)
Turkey Vulture	*Cathartes aura*	Caves, rock crevices, possibly abandoned buildings, or other dark, secluded sites.	Up to 20 feet	March through June; single brood.	Clutch incubated for 37–41 days by both sexes; semi-altricial young fledge at approximately 77 days.	300	100–300	50–100
California Condor	*Gymnogyps californianus*	Caves on high, remote cliff-faces or in hollow in large redwood snag.	Cliff	Year-round, with egg-laying usually occurring in January or February; single brood.	Clutch incubated for 42–50 days by both sexes; semi-altricial young fledge at 35–49 days.	3,960	CR[a]	CR
White-tailed Kite	*Elanus caeruleus*	Platform nests in tall trees near grasslands, oak savannah, or other open habitats.	12–60 feet	February through July; sometimes double brood.	Clutch incubated for 28–30 days by both sexes; semi-altricial young fledge at 34–40 days.	300	200–300	100–200
Osprey	*Pandion haliaetus*	Platform nests on treetops, rocky outcrops, or utility poles near water.	Up to 60 feet	Mid-March through August; single brood.	Clutch incubated for 32–33 days by both sexes; semi-altricial young fledge at 51–59 days.	300	100–300	50–100
Bald Eagle	*Haliaeetus leucocephalus*	Platform nests in large trees or rocky outcrops close to lakes and large rivers.	50–180 feet	January to August; single brood.	Clutch incubated for 35–46 days by both sexes; semi-altricial young fledge at 70–77 days.	2,640	CR	CR
Northern Harrier	*Circus cyaneus*	Platform nests on ground in grasslands and open marshland with vegetative cover.	Ground	March through August; single brood.	Clutch incubated for 29–39 days by both sexes; altricial young fledge at 37 days.	300	200–300	100–200
Sharp-shinned Hawk	*Accipiter striatus*	Platform nests in trees in riparian woodland or other forested habitat with thick cover.	10–60 feet	April through August; single brood.	Clutch incubated for 30–35 days by both sexes; semi-altricial young fledge at approximately 23 days.	300	100–300	50–100

Common Name	Scientific Name	Nest Location, Substrate, and Habitat	Vertical Height	Peak Breeding Season/Number of Broods per Season	Incubation Duration/Chick-rearing Duration	Standard Buffer* (feet)	Medium to High Disturbance Category Buffer (feet)	Low to Medium Disturbance Category Buffer (feet)
Cooper's Hawk	*Accipiter cooperii*	Platform nests in trees in riparian woodlands or other forested habitat.	20–60 feet	March through July; single brood.	Clutch incubated for 36 days by female while male provisions her; semi-altricial young fledge at 30–34 days.	300	100–300	50–100
Northern Goshawk	*Accipiter gentilis*	Platform nests in top of tall coniferous or deciduous trees in mature forest.	Up to 75 feet	April through August; single brood.	Clutch incubated for 36–41 days by female while male provisions her; semi-altricial young fledge at 45 days old	1,320	200–1,320	100–200
Red-shouldered Hawk	*Buteo lineatus*	Platform nests below canopy in a variety of tree species.	20–60 feet	March through June; single brood.	Clutch incubated for 23–25 days by both sexes; semi-altricial young fledge at 35–42 days.	300	100–300	50–100
Swainson's Hawk	*Buteo swainsoni*	Platform nests in isolated trees in grasslands and agricultural areas.	5–30 feet	April through late June; single brood.	Clutch incubated for approximately 28 days by both sexes; semi-altricial young fledge at 28–35 days.	1,320–2,640	CR	CR
Red-tailed Hawk	*Buteo jamaicensis*	Platform nests in tall trees and other structures in a variety of open habitats.	35–90 feet	February through September; single brood.	Clutch incubated for 28–32 days by both sexes; semi-altricial young fledge at approximately 42 days.	250	100–300	50–100
Ferruginous Hawk	*Buteo regalis*	Nest in substrates ranging from cliffs, trees, utility structures, and farm buildings to haystacks and relatively level ground.	Up to 70 feet	Early March through May; single brood	Clutch incubated for 32–33 days by both sexes; altricial and nidicolous young fledge at 38–50 days.	300	100–300	50–100

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Golden Eagle	*Aquila chrysaetos*	Platform nests on rock ledges of outcrops or cliffs, and occasionally trees, in proximity to grassland, farmland, oak savannah, and other foraging grounds.	10–100 feet or higher on cliffs	February through July; single brood.	Clutch incubated for 43–45 days by female and occasionally male; semi-altricial young fledge at 63–70 days.	2,640	CR	CR
American Kestrel	*Falco sparverius*	Cavities in trees or other structures near grasslands, agricultural areas, oak savannah, or other open areas.	7–80 feet	March through July; may double brood.	Clutch incubated for 29–30 days by female while male provisions her; semi-altricial young fledge at approximately 30 days.	200	50–200	25–50
Prairie Falcon	*Falco mexicanus*	Ledges under overhangs on rock outcrops or cliffs near grassland, farmland, oak savannah, or other foraging habitat.	30–40 feet	March to May; single brood.	Clutch incubated for 29–31 days by female while male provisions her; semi-altricial young fledge at 40 days.	300	100–300	50–100
American Peregrine Falcon	*Falco peregrinus*	Cliff ledges, tall buildings, high bridges, and other high locations near open habitats.	High on cliffs or tall structures	March through June; single brood.	Clutch incubated for 28–29 days by both sexes; semi-altricial young fledge at 35–42 days.	500	CR	CR
Mount Pinos Sooty Grouse	*Dendragapus fuliginosus*	Scrapes near logs, shrubs, or other cover in coniferous forests, shrub-steppe habitat, and subalpine forests.	Ground	April through August; single brood.	Clutch incubated for 26–28 days by female; young are precocial.	100	50–100	25–50
Ruffed Grouse	*Bonasa umbellus*	Scrapes near the base of stumps, trees, or logs in forested habitat.	Ground	February through August; single brood.	Clutch incubated for approximately 24 days by female; young are precocial.	100	50–100	25–50

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Wild Turkey	*Meleagris gallopavo*	Scrapes in thick, low vegetation in oak woodlands and forest edges and clearings.	Ground	March through August; single brood.	Clutch incubated for approximately 28 days by female; young are precocial.	100	30–100	15–30
Gambel's Quail	*Callipepla gambellii*	Scrapes under shrubs in desert habitats.	Ground	April through June; single or (rarely) double brood	Clutch incubated for 21–23 days by female while male guards; young are precocial.	100	50–100	25–50
California Quail	*Callipepla californica*	Scrapes under shrubs in riparian woodland, coastal scrub, chaparral, shrub-steppe, and mixed-hardwood forest.	Ground	March through July; single or double brood.	Clutch incubated for 21–23 days by female; young are precocial.	100	50–100	25–50
Mountain Quail	*Oreortyx pictus*	Scrapes under shrubs in mountain woodland and scrub habitats, usually near water.	Ground	April through June; single brood.	Clutch incubated for 24–25 days by female; young are precocial.	100	50–100	25–50
California Black Rail	*Laterallus jamaicensis coturniculus*	Cup nests on or near ground at upper edges of tidal marshes.	0–1 foot	March through July; single brood.	Clutch incubated for 17–20 days by both sexes; young are semi-precocial.	300–600	CR	CR
Clapper Rail (California, Yuma, Light-footed)	*Rallus longirostris obscurus/yumanensis/levipes*	Platform nests in dense tidal marsh vegetation dominated by cordgrass or gumplant.	0–1 foot	February through August; single or double brood.	Clutch incubated for 23–29 days by both sexes; young are semi-precocial.	700	CR	CR
Virginia Rail	*Rallus limicola*	Platform nests in dense emergent vegetation in freshwater or estuarine marshes.	0–1 foot	April through June; single or double brood.	Clutch incubated for 14–16 days by both sexes; young are precocial.	100	50–100	25–50
Sora	*Porzana carolina*	Cup nests secured to reeds and rushes in freshwater or estuarine marshes.	0–1 foot	April through August; single brood.	Clutch incubated for approximately 14 days by both sexes; young are precocial.	100	50–100	25–50

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Common Gallinule	*Gallinula galeata*	Platform nests in dense vegetation at edge of marshes and other freshwater habitats.	Ground or water level	April through June; single or double brood.	Clutch incubated for 19–22 days by both sexes; young are precocial.	100	50–100	25–50
American Coot	*Fulica americana*	Platform nests in dense vegetation at edge of marshes and other freshwater habitats.	Ground or water level	March through July; single or double brood.	Clutch incubated for 21–24 days by both sexes; young are precocial.	100	30–100	15–30
Greater Sandhill Crane	*Grus canadensis tabida*	Platform nests in wetland vegetation on dry ground or shallow water in extensive marsh systems or grasslands.	Ground	April through August; single brood.	Clutch incubated for approximately 30 days by both sexes; young are precocial.	500	CR	CR
Western Snowy Plover	*Charadrius alexandrinus nivosus*	Scrapes on sand beaches/bars, salt pannes, or dry river beds.	Ground	April through August; double or triple brood.	Clutch incubated for approximately 24 days by both sexes; young are precocial.	600 (coastal) 300 (interior)	CR (coastal) 200–300 (interior)	CR (coastal) 100–200 (interior)
Killdeer	*Charadrius vociferus*	Scrapes in open places usually in areas with short grass, sand, or gravel.	Ground	March through June; sometimes double brood.	Clutch incubated for 24–26 days by both sexes; young are precocial.	75	30–75	15–30
Black-necked Stilt	*Himantopus mexicanus*	Scrapes or plant tufts/ tussocks in fresh, brackish, or salt marshes.	Ground	April through June; single brood.	Clutch incubated for 25–26 days by both sexes; young are precocial.	150	50–150	25–50
American Avocet	*Recurvirostra americana*	Scrapes on salt pannes, dikes, levees, and bare islands.	Ground	April through June; single brood.	Clutch incubated for 22–24 days by both sexes; young are precocial.	150	50–150	25–50

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Spotted Sandpiper	*Actitis macularia*	Scrapes in grasses among rocks, wrack, or driftwood.	Ground	April through August; single brood.	Clutch incubated for approximately 21 days by male; young are precocial.	75	30–75	15–30
Wilson's Snipe	*Gallinago gallinago*	Scrapes in dense, medium to tall marshy or wet meadow vegetation.	Ground	April to August; single brood.	Clutch incubated for 17–20 days by female; young are precocial.	75	30–75	15–30
Lesser Yellowlegs	*Tringa flavipes*	Scrapes on shallow wetlands, trees or shrubs, and open areas.	Ground	Late April to mid-May; single brood.	Clutch incubated for 22–23 days by both sexes; young are precocial.	75	30–75	15–30
Whimbrel	*Numenius phaeopus*	Hummocks or mounds near dwarfed shrub, flat heath tundra, in grass or sedge tussocks, and on gravel.	Ground	Early June to early July; single brood.	Clutch incubated 22–28 days by both sexes; young are precocial.	75	30–75	15–30
Black Skimmer	*Rynchops niger*	Saucer-shaped depressions on beaches, bars, dredge deposition, salt marsh.	Ground	May through August; single brood.	Clutch incubated 21–23 days by both sexes; young are semi-precocial.	300	100–300	50–100
Long-billed Curlew	*Numenius americanus*	Scrapes in short-grass or mixed-prairie habitat with flat to rolling topography.	Ground	Mid-late March to early July; single brood.	Clutch incubated for 27–29 days by both sexes; young are precocial.	75	30–75	15-30
Marbled Godwit	*Limosa fedoa*	Scrapes in short, sparsely to moderately vegetated landscapes that include native grassland and wetland complexes with a variety of wetland classes (ephemeral to semipermanent).	Ground	Mid-May to late June; single brood.	Clutch incubated for 23–26 days by both sexes; young are precocial	75	30–75	15–30

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California Gull	*Larus californicus*	Scrapes on islands in alkali or freshwater lakes and ponds or salt ponds.	Ground	April through August; single brood.	Clutch incubated for 23–27 days by both sexes; young are precocial.	150	50–150	25–50
Western Gull	*Larus occidentalis*	Ledges on cliffs, bluffs, bridges, buildings, and other areas inaccessible to nest predators.	Ground/cliff	April through August; single brood.	Clutch incubated for 30–32 days by both sexes; young are semi-precocial.	150	50–150	25–50
Caspian Tern	*Sterna caspia*	Scrapes on islands, beaches, and levees.	Ground	April through August; single brood.	Clutch incubated for approximately 20 days by both sexes; semi-precocial young fledge at approximately 14 days.	300	100–300	50–100
Forster's Tern	*Sterna forsteri*	Scrapes on open levees, islands, and occasionally reed beds.	Ground	April through September; single brood.	Clutch incubated for approximately 23 days by both sexes; semi-altricial young fledge after approximately 7 days.	300	100–300	50–100
California Least Tern	*Sterna antillarum*	Scrapes on bare sandy or gravelly substrates in undisturbed areas.	Ground	May through June; single brood.	Clutch incubated for 20–25 days by both sexes; young are semi-precocial.	600	CR	CR
Black Tern	*Chlidonias niger*	Platform nests constructed of dead plant stems in freshwater wetlands and flooded rice fields.	Ground	May through August; single brood.	Clutch incubated for 20–22 days by both sexes; semi-precocial young fledge at approximately 14 days.	300	100–300	50–100

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Marbled Murrelet	*Brachyramphus marmoratus*	Horizontal limbs of large, old-growth conifers.	20–250 feet	March through September; likely a single brood.	Clutch incubated for approximately 30 days by both sexes; semi-precocial young fledge at approximately 21 days.	1,320 (high disturbance)[b]	CR	CR
Cassin's Auklet	*Ptychoramphus aleuticus*	Excavates burrows in soft soil, sod or natural cavities such as rock crevices and under trees, cacti or logs. Colonial nester.	Ground/cliff	Varies within November through May; single and double brood.	Clutch incubated 37–42 days by both sexes; altricial young confined to nest for 30 days.	400	75–400	50–75
Band-tailed Pigeon	*Columba fasciata*	Platform nests in trees or shrubs in oak woodlands, mixed hardwood forests, and mixed coniferous forests, usually in areas with oak trees.	5–180 feet	March through November; double or triple brood.	Clutch incubated for 18–20 days by both sexes; altricial young fledge at 25–30 days.	75	50–75	25–50
Mourning Dove	*Zenaida macroura*	Platform nests in a tree or shrub, but also on buildings or on ground, in a variety of habitats.	0–25 feet	February through September; several broods.	Clutch incubated for 14–15 days by both sexes; altricial young fledge at 13–15 days.	50	20–50	10–20
Western Yellow-billed Cuckoo	*Coccyzus americanus*	Platform nests in bushes or trees in dense, wide riparian woodlands.	2–20 feet	June through July; single brood.	Clutch incubated for 9–11 days by both sexes; altricial young fledge at 21 days.	500	CR	CR
Greater Roadrunner	*Geococcyx californianus*	Cup nests in dense, brushy habitats in desert, sagebrush, and chaparral habitats.	3–15 feet	April through June; double brood.	Clutch incubated for 16–20 days by male; altricial young fledge at 18–30 days.	100	50–100	25–50

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Barn Owl	*Tyto alba*	Cavities in trees, buildings, crevices in rocks, outcrops, cliffs and quarries.	1–400 feet	January through May; often double broods.	Clutch incubated for 32–34 days by female while male provisions her; altricial young fledge at 60 days.	150	100–150	50–100
Flammulated Owl	*Otus flammeolus*	Cavities in trees, including aspens, oaks, pines, or other trees in forested areas.	10–40 feet	May through October; single brood.	Clutch incubated for 21–24 days by female while male provisions her; altricial young fledge at 20–26 days	200	100–200	50–100
Western Screech Owl	*Otus kennicottii*	Cavities in trees, particularly cottonwoods, in open woodlands.	10–30 feet	March through June; single brood.	Clutch incubated for 21–30 days by female while male provisions her; altricial young fledge at approximately 28 days.	200	100–200	50–100
Great Gray Owl	*Strix nebulosa*	Near high elevation meadows, on broken top trees or stick nests of other species.	30-50 feet	Late March through early July; single brood	Average clutch incubated for 29.7 days by female, with male provisioning her; semi-precocial young fledge at 21-28 days but can be dependent on nest site and male parent until fall.	1,320	CR	CR
Great Horned Owl	*Bubo virginianus*	Cavities or large nest platforms of other species in trees, rock ledges, or caves.	Uses existing platforms at various heights	January through May; single brood.	Clutch incubated for 26–35 days by female while male provisions her; altricial young fledge at 28–35 days.	300	100–300	50–100

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Northern Pygmy Owl	*Glaucidium gnoma*	Cavities in trees in oak woodlands and coniferous forests.	8–20 feet	April through August; number of broods unknown.	Clutch incubated for 25–30 days by female while male provisions her; semi-altricial young fledge at approximately 23 days.	200	50–200	25–50
Spotted Owl (Northern/California)	*Strix occidentalis caurina/occidentalis*	Cavities or platforms (natural or old nests of other species) in coniferous or mixed hardwood forests.	30–165 feet	March through August; single brood.	Clutch incubated for 29–30 days by female while male provisions her; altricial young fledge at 34–36 days.	1,320 (high disturbance)[b]	CR	CR
Burrowing Owl	*Athene cunicularia*	Small mammal burrows in open grasslands or at the edge of agricultural areas.	Ground	February through August; single brood.	Clutch incubated for 27–30 days by female while male provisions her; altricial young fledge at 40–45 days.	250	CR	CR
Long-eared Owl	*Asio otus*	Platform nests built by other species high in trees in coniferous forests or mixed woodlands.	10–30 feet	February through May; single brood.	Clutch incubated for 25–30 days by female while male provisions her; altricial young fledge at 23–24 days.	300	100–300	50–100
Short-eared Owl	*Asio flammeus*	Scrapes in tall, dense vegetation in grasslands and freshwater or brackish marshes.	Ground	March through July; single or possibly double brood.	Clutch incubated for 21–28 days by female while male provisions her; semi-altricial young leave nest at 31–36 days.	300	100–300	50–100
Northern Saw-whet Owl	*Aegolius acadicus*	Cavities in trees in forested areas.	5–50 feet	March through August; single or double brood.	Clutch incubated for 21–28 days by female; semi-altricial young fledge at approximately 30 days.	200	100–200	50–100

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Lesser Nighthawk	*Chordeiles acutipennis*	Scrapes on bare gravelly or sandy ground in desert and sparsely vegetated habitats.	Ground	April through July; single or double brood.	Clutch incubated for 18–19 days by female; semi-precocial young fledge after 3 weeks.	75	30–75	20–30
Common Nighthawk	*Chordeiles minor*	Scrapes on bare gravelly or sandy ground in open areas within chaparral, grasslands, and forest openings.	Ground	June through July; double brood.	Clutch incubated for 18–20 days by female; semi-precocial young fledge after about 21 days.	75	30–75	20–30
Common Poorwill	*Phalaenoptilus nuttallii*	Scrapes on bare gravelly, sandy, or leaf-litter-covered ground in grasslands and desert habitats.	Ground	March through August; double brood.	Clutch incubated for 20–21 days by both sexes; young are precocial.	75	30–75	20–30
Black Swift	*Cypseloides niger*	Sheltered crevices or ledges on cliff faces on coast or under waterfall.	20–45 feet	May through September; single brood.	Clutch incubated for 21–27 days by both sexes; altricial young fledge at 45–49 days.	75	30–75	15–30
Vaux's Swift	*Chaetura vauxi*	Cavities in redwoods, other conifers, and occasionally sycamores, chimneys, and buildings.	Up to 50 feet	May through August; single brood.	Clutch incubated for 18–20 days; altricial young fledge at approximately 28 days.	75	30–75	15–30
White-throated Swift	*Aeronautes saxatalis*	Rock cracks and crevices on cliffs and tall bridges.	10–195 feet	May through July; single brood.	Clutch incubated for 20–27 days; altricial young fledge at 40–46 days.	75	30–75	15–30
Black-chinned Hummingbird	*Arcgilochus alexandri*	Cup nests in trees and shrubs in woodlands, urban areas, and other habitats with nectar sources.	4–10 feet	April through June; two or three broods.	Clutch incubated for 13–16 days by female; altricial young fledge at approximately 21 days.	50	20–50	15–20

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Anna's Hummingbird	*Calypte anna*	Cup nests in trees and shrubs in woodlands, urban areas, and other habitats with nectar sources.	1–30 feet	December through June; two or three broods.	Clutch incubated for 16–17 days by female; altricial young fledge at 25–26 days.	50	20–50	15–20
Costa's Hummingbird	*Calypte costae*	Cup nests in trees and shrubs in riparian scrub, urban areas, and other habitats with nectar sources.	4–5 feet	April through July; single or occasionally double brood.	Clutch incubated for 15–18 days by female; altricial young fledge at 20–23 days.	50	20–50	15–20
Calliope Hummingbird	*Stellula calliope*	Cup nests in montane or riparian woodlands.	2–70 feet	May through August; single brood.	Clutch incubated for 15–16 days by female; altricial young fledge at 21–23 days.	50	20–50	15–20
Allen's Hummingbird	*Selasphorus sasin*	Cup nests in shrubs, trees, or vines in a variety of forest and woodland types, as well as coastal scrub.	1–10 feet; occasionally as high as 90 feet	February through August; double brood.	Clutch incubated for 16–22 days by female; altricial young fledge at approximately 22 days.	50	20–50	15–20
Belted Kingfisher	*Ceryle alcyon*	Burrow in banks near fresh water.	Ground	April through July; single brood.	Clutch incubated for 23–24 days by both sexes; altricial young fledge at 30–35 days.	100	50–100	25–50
Lewis's Woodpecker	*Melanerpes lewis*	Cavities in snags or dead branches in oak woodlands and mixed hardwood forests.	5–80 feet	May through July; single brood.	Clutch incubated for 13–14 days by both sexes; altricial young fledge at 28–34 days.	50	15–50	10–15
Acorn Woodpecker	*Melanerpes formicivorous*	Cavities in trees or snags in open woodlands, partly wooded areas, or utility poles near a source of acorns.	5–25 feet	April through July; two or three broods.	Clutch incubated for approximately 11 days by both sexes; altricial young fledge at approximately 31 days.	50	15–50	10–15

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Red-breasted Sapsucker	*Sphyrapicus ruber*	Cavities in trees or snags in coniferous or mixed forest.	5–45 feet	May through June; single brood.	Clutch incubated for 12–14 days by both sexes; altricial young fledge at 23–28 days.	50	15–50	10–15
Williamson's Sapsucker	*Sphyrapicus thyroideus*	Tree cavities in conifer and mixed conifer-deciduous forests.	8–52 feet	Late April through late July; single brood.	Clutch incubated 12–14 days by both sexes; altricial young fledge at 31–32 days.	50	15–50	10–15
Ladder-backed Woodpecker	*Picoides scalaris*	Cavities in trees and cactus.	4-20 feet	Unknown in CA; single brood.	Clutch incubated 14 days by both sexes; altricial young with unknown fledging period.	50	15–50	10–15
Nuttall's Woodpecker	*Picoides nuttallii*	Cavities in trees or snags in oak woodlands, or less frequently riparian or other woodlands.	2–60 feet	April through June; single brood.	Clutch incubated for approximately 14 days by both sexes; altricial young fledge at approximately 29 days.	50	15–50	10–15
Downy Woodpecker	*Picoides pubescens*	Cavities in trees or snags in riparian or other deciduous woodlands, or less frequently in coniferous forests.	3–44 feet	April through May; double brood.	Clutch incubated for approximately 12 days by both sexes; altricial young fledge at 20–22 days.	50	15–50	10–15
Hairy Woodpecker	*Picoides villosus*	Cavities in snags or dead branches in woodlands and coniferous forests.	3–102 feet	March through August; single brood.	Clutch incubated for 11–15 days by both sexes; altricial young fledge at 28–30 days.	50	15–50	10–15
White-headed Woodpecker	*Picoides albolarvatus*	Cavities in snags or stumps at least 2 feet in diameter in pine forests.	6–50 feet	April through August; single brood.	Both sexes incubate clutch for 13–15 days; altricial young fledge at approximately 26 days.	50	15–50	10–15

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Northern Flicker	*Colaptes auratus*	Cavities in tree trunks or snags in open or sparsely wooded areas; more often in live wood.	8–45 feet	April through June; single brood.	Clutch incubated for 11–13 days by both sexes; altricial young fledge at 25–28 days.	50	15–50	10–15
Pileated Woodpecker	*Dryocopus pileatus*	Cavities in snags or dead branches in mature forests.	15–70 feet	March to July; single brood	Clutch incubated for approximately 18 days by both sexes; altricial young fledge at 26–28 days.	50	15–50	10–15
Olive-sided Flycatcher	*Contopus cooperi*	Cup nest in trees in open conifer forest or mixed woodland.	5–70 feet	June through July; single brood.	Clutch incubated for 16–17 days by female; altricial young fledge at 15–19 days.	75	30–75	15–30
Western Wood-Pewee	*Contopus sordidulus*	Cup nests in trees, mainly coniferous but sometimes deciduous woodlands near watercourses.	15–30 feet	May through July; single brood.	Clutch incubated for approximately 12 days by female; altricial young fledge at 14–18 days.	75	30–75	15–30
Willow Flycatcher (Southwestern, Little, *adastus*)	*Empidonax traillii extimus/brewsteri/adastus*	Cup nests in densely vegetated riparian associations of cottonwoods and willows.	5–20 feet	May through July; single brood.	Clutch incubated for 12–13 days by female; altricial young fledge at 14 days.	300	CR	CR
Vermilion Flycatcher	*Pyrocephalus rubinus*	Loosely constructed nest in wooded riparian areas.	8-55 feet	Mid-March through mid-July; single or double brood.	Clutch incubated for 14-15 days by female; altricial young fledge at 14-16 days.	75	30–75	15–30
Hammond's Flycatcher	*Empidonax hammondii*	Cup nests in trees in forests and woodlands.	6–65 feet	May through July; single brood.	Clutch incubated for 12–15 days by female; altricial young fledge at 17–18 days .	75	30–75	15–30

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Dusky Flycatcher	*Empidonax oberholseri*	Cup nests in small trees or shrubs pine forests	3–20 feet	May through July; single brood.	Clutch incubated for 12–15 days by female; altricial young fledge at approximately 18 days.	75	30–75	15–30
Western (Pacific-slope and Cordilleran) Flycatcher	*Empidonax difficilis/occidentalis*	Cup nests in cavities or tree stumps or on ledges or crevices in woodlands and forests often in riparian areas.	0–30 feet	April through July; sometimes double brood.	Clutch incubated for 14–15 days by female; altricial young fledge at 15–18 days.	75	30–75	15–30
Black Phoebe	*Sayornis nigricans*	Cup nests of mud cemented to vertical structures, often under an overhang.	3–10 feet	March through June; double brood.	Clutch incubated for 15–18 days by female; altricial young fledge at approximately 21 days.	75	30–75	15–30
Say's Phoebe	*Sayornis saya*	Cup nests on ledges with overhang or under a bridge; nest not made of mud like black phoebe.	0–79 feet	March through June; double brood.	Clutch incubated for 12–14 days by female; altricial young fledge at 14–18 days.	75	30–75	15–30
Ash-throated Flycatcher	*Myiarchus cinerascens*	Cavities in trees and other structures in open deciduous woodland.	2–70 feet	May through July; single brood.	Clutch incubated for approximately 15 days by female; altricial young fledge at 16–17 days.	50	15–50	10–15
Cassin's Kingbird	*Tyrannus vociferans*	Cup nests in trees in savannahs and other open habitats.	25–74 feet	April through June; double brood.	Clutch incubated for 12–14 days by female; altricial young fledge at 14 days.	75	30–75	15–30
Western Kingbird	*Tyrannus verticalis*	Cup nests in trees and artificial structures (e.g., power poles) in variety of open habitats.	13–55 feet	April through June; double brood.	Clutch incubated for 12–14 days by both sexes; altricial young fledge at 13–19 days.	75	30–75	15–30

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Loggerhead Shrike	*Lanius ludovicianus*	Cup nests in dense shrubs near grasslands and other open habitats.	3–8 feet	February through June; two or three broods.	Clutch incubated for 14–16 days by female while male provisions her; altricial young fledge at 17–21 days.	75	30–75	15–30
Least Bell's Vireo	*Vireo bellii pusillus*	Cup nests in dense shrubs and small trees in dense riparian areas.	1–3 feet	April through August; double brood.	Clutch incubated for approximately 14 days by both sexes; altricial young fledge at 10–12 days.	500	CR	CR
Arizona Bell's Vireo	*Vireo bellii arizonae*	Cup nests in dense shrubs and small trees in dense riparian areas.	1–3 feet	April through August; double brood.	Clutch incubated for approximately 14 days by both sexes; altricial young fledge at 10–12 days.	500	CR	CR
Cassin's Vireo	*Vireo cassinii*	Cup nests in a trees or shrubs in oak or oak-coniferous or mixed riparian woodland.	5–35 feet	April through July; single brood.	Clutch incubated for approximately 15 days by both sexes; altricial young fledge at 13 days.	75	30–75	15–30
Hutton's Vireo	*Vireo huttoni*	Cup nests on a twig forks in oaks and other trees along streams and canyons.	3–45 feet	March thorugh June; single or double brood.	Clutch incubated for 14–16 days by both sexes; altricial young fledge at approximately 14 days.	75	30–75	15–30
Warbling Vireo	*Vireo gilvus*	Cut nests high in trees in mature oak woodlands and mixed deciduous forests.	20–60 feet	May through July; double brood.	Clutch incubated for 12–13 days by both sexes; altricial young fledge at approximately 14 days.	75	30–75	15–30
Gray Vireo	*Vireo vicinior*	Nests in thorn scrub or pinyon-juniper woodland, low in thorny or twiggy shrub or tree.	2–8 feet	Mid-April through mid-August	Clutch incubated 13-14 days by both sexes; altricial young fledge at 13-14 days.	75	30–75	15–30

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Gray Jay	*Perisoreus canadensis*	Cup nests in shrubs or trees in coniferous forests and sometimes oak woodlands.	5–30 feet	March through July; single brood.	Clutch is incubated for 16–18 days; altricial young fledge at approximately 15 days.	75	30–75	15–30
Steller's Jay	*Cyanocitta stelleri*	Cup nests in trees or shrubs in coniferous or mixed hardwood forests or other woodlands.	7–16 feet	April through June; likely single brood.	Clutch incubated for approximately 16 days by female while male provisions her; altricial young fledge at 18 days.	75	30–75	15–30
Western Scrub-jay	*Aphelocoma californica*	Platform nests in shrubs, trees, bushes or vine tangles in a wide variety of habitats, including oak woodlands, savannah, agricultural, and suburban.	2–50 feet	March through June; single brood.	Clutch incubated for 15–17 days by female while male provisions her; altricial young fledge at 18 days.	75	30–75	15–30
Pinyon Jay	*Gymnorhinus cyanocephalus*	Cup nests in trees in ponderosa-pine forest.	3–115 feet	Mid-March through late June; single brood.	Clutch incubated 17 days by female, male provisions female; altricial young fledge at 21–22 days.	75	30–75	15–30
Clark's Nutcracker	*Nucifraga columbiana*	Cup nests in pines, junipers, and firs in mountain coniferous forests.	8–45 feet	February through August; single brood.	Clutch incubated for 16–18 days by both sexes; altricial young fledge at approximately 22 days.	75	30–75	15–30
Yellow-billed Magpie	*Pica nuttallii*	Platform nests in oak trees and occasionally other trees in savannah.	30–80 feet	February through July; single brood.	Clutch incubated for 16–18 days by female while male provisions her; altricial young fledge at approximately 30 days.	75	30–75	15–30

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American Crow	*Corvus brachyrhynchos*	Platform nests in variety of large trees, usually near the trunk, and artificial structures in a wide variety of habitats.	10–70 feet	February through July; single brood.	Clutch incubated for approximately 18 days by female and possibly helpers; altricial young fledge at 35 days.	50	30–50	15–30
Common Raven	*Corvus corax*	Platform nests on sheltered rock ledges or in forks of large trees and artificial structures in a wide variety of habitats.	45–80 feet	February through July; single brood.	Clutch incubated for 20–21 days by female while male provisions her; altricial young fledge at 35–42 days.	50	30–50	15–30
Western Bluebird	*Sialia mexicana*	Cavities in woodland clearings, savannahs, and other open habitats.	4–48 feet	April through June; double brood.	Clutch incubated for 13–14 days by female; altricial young fledge at approximately 20 days.	50	15–50	10–15
Townsend's Solitaire	*Myadestes townsendi*	Cup nests on ground usually on cutbanks and other slopes in mountain coniferous forests.	0–12 feet	April through June; single or double brood.	Clutch incubated for 11–14 days by female; altricial young fledge at 10–14 days.	75	30–75	15–30
Swainson's Thrush	*Catharus ustulatus*	Cup nests in dense shrubs, often in riparian woodlands and mixed coniferous forests.	2–20 feet	April through August; single or (rarely) double brood.	Clutch incubated for 10–13 days by female; altricial young fledge after 10–12 days.	75	30–75	15–30
Hermit Thrush	*Catharus guttatus*	Cup nests in dense shrubs variety of forests and woodlands.	2–10 feet	June through July; single or double brood.	Clutch incubated for 12–13 days by female; altricial young fledge at 12–13 days.	75	30–75	15–30
American Robin	*Turdus migratorius*	Cup nests in trees or shrubs, ledges of buildings, or in a tree forks in variety of open habitats.	3–25 feet	May through July; two or three broods.	Clutch incubated for 11–14 days by female; altricial young fledge at 14–16 days.	75	30–75	15–30

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Varied Thrush	*Ixoreus maevius*	Cup nests on horizontal branches of trees in moist coniferous forests.	5–20 feet	April through August; double brood.	Clutch incubated for approximately 14 days by female; altricial young fledge at 13–15 days.	75	30–75	15–30
Horned Lark	*Eremophila alpestris*	Scrapes in a small hollow usually sheltered by plant tufts in grasslands and other open habitats.	Ground	February through August; two or three broods.	Clutch incubated for 10–14 days by female; altricial young fledge at 9–12 days.	75	30–75	15–30
Purple Martin	*Progne subis*	Cavities in trees in mountain forests, particularly burned areas with snags.	10–34 feet	April through August; single brood	Clutch incubated for 15–18 days by the female; altricial young fledge at 24–31 days.	75	30–75	15–30
Tree Swallow	*Tachycineta bicolor*	Cavities in open habitats, such as grasslands or wetlands with dead standing trees; usually near water.	10–16 feet	April through August; double brood.	Clutch is incubated for 13–16 days; altricial young fledge at 16–20 days.	50	30–50	15–30
Violet-green Swallow	*Tachycineta thalassina*	Cavities or occasionally on cliffs or banks in deciduous, coniferous, and mixed woodlands.	9–17 feet	April through August; single brood.	Clutch is incubated for 13–15 days; altricial young fledge at 16–24 days.	50	30–50	15–30
Northern Rough-winged Swallow	*Stelgidopteryx serripennis*	Cavities on a steep slope or use crevices and holes in bridges and buildings.	Ground/cliff	April through June; single brood.	Clutch incubated for 15–16 days by female; altricial young fledge at 18–21 days.	75	30–75	15–30
Bank Swallow	*Riparia riparia*	Cavities in sandy banks or cliffs along rivers.	Ground/cliff	May through July; single brood.	Clutch incubated for 12–16 days by both sexes; altricial young fledge at 18–24 days.	100	CR	CR

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Barn Swallow	*Hirundo rustica*	Cup nests often on buildings and bridges in open habitats near water.	6–40 feet	April through July; double brood.	Clutch incubated for 14–16 days by both sexes; altricial young fledge at 17–24 days.	50	30–50	15–30
Cliff Swallow	*Petrochelidon pyrrhonota*	Closed mud nests often on cliff faces, buildings, or bridges in open habitats near water.	5 feet and higher	April through June; double brood.	Clutch incubated for 12–14 days by both sexes; altricial young fledge at approximately 23 days.	50	30–50	15–30
Mountain Chickadee	*Poecile gambeli*	Cavities in trees in coniferous mountain forests.	16–50 feet	April through August; single or double brood.	Clutch is incubated for 14 days; altricial young fledge at 20 days.	50	15–50	10–15
Chestnut-backed Chickadee	*Poecile rufescens*	Cavities trees in coniferous forests and deciduous woodlands.	0–80 feet	March through July; single or (rarely) double brood.	Clutch is incubated for 12–14 days by female; altricial young fledge at 18–21 days.	50	15–50	10–15
Oak Titmouse	*Baeolophus inornatus*	Cavities in trees in oak woodlands.	2–40 feet	March through June; single brood.	Clutch incubated for 14–16 days by female; altricial young fledge at 17 days.	50	15–50	10–15
Bushtit	*Psaltriparus minimus*	Pendulous nests in trees and shrubs in a variety of habitats.	3–98 feet	February through June; double brood.	Clutch incubated for 12–13 days by both sexes; altricial young fledge at 14–15 days.	50	30–50	15–30
Red-breasted Nuthatch	*Sitta canadensis*	Cavities in trees in coniferous forests and mixed woodlands.	5–40 feet	April through July; single or (rarely) double brood.	Clutch incubated for approximately 12 days by female while male provisions her; altricial young fledge at 18–21 days.	75	30–75	15–30
White-breasted Nuthatch	*Sitta carolinensis*	Cavities in trees in deciduous woodlands and mixed coniferous forests.	1–50 feet	March through June; single brood.	Clutch incubated for 12–14 days by female while male provisions her; altricial young fledge at 14–16 days.	50	15–50	10–15

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Pygmy Nuthatch	*Sitta pygmaea*	Cavities in dead trees or dead portions of trees in long-needled pine forests.	20–70 feet	May through July; single or double brood.	Clutch incubated for 15–16 days by female while male provisions her; altricial young fledge at 20–21 days.	75	30–75	15–30
Brown Creeper	*Certhia americana*	Cup nests concealed behind loose bark, in crevices on a trees in coniferous forests and mixed coniferous forests..	5–15 feet	May through July; single brood.	Clutch incubated for 15–18 days by female while male provisions her; altricial young fledge at 21 days.	75	30–75	15–30
Rock Wren	*Salpinctes obsoletus*	Cavities on rocky slopes	Ground/cliff	March through June; double or triple brood.	Clutch incubated for 12–14 days by female; altricial young fledge at 14–16 days.	75	30–75	15–30
Canyon Wren	*Catherpes mexicanus*	Cup nests in rock crevices or ledges in rocy habitats.	Ground/cliff	March through July; double brood.	Clutch incubated for 12–18 days by female; altricial young fledge at approximately 15 days.	75	30–75	15–30
Bewick's Wren	*Thryomanes bewickii*	Cavities in trees, brush, or between rocks in open woodlands and shrubby areas.	0–20 feet	March through July; double or triple brood.	Clutch incubated for approximately 14 days by female while male provisions her; altricial young fledge at approximately 14 days.	75	30–75	15–30
House Wren	*Troglodytes aedon*	Cavities in shrubby cover and thickets in open woodlands and hedgerows.	0–20 feet	April through July; double brood.	Clutch incubated for 13–15 days by female; altricial young fledge at 12–18 days.	50	30–50	15–30
Pacific Wren	*Troglodytes pacificus*	Cavities or crevices in logs, stumps, root balls, or trees in variety of forests.	0–10 feet	March through August; single or double brood.	Clutch is incubated for 14–17 days by female; altricial young fledge at approximately 19 days.	75	30–75	15–30

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Marsh Wren	*Cistothorus palustris*	Domed nests over the water in tall rushes and marsh grasses in wetland habitats.	1–5 feet	March through July; double or triple brood.	Clutch incubated for 12–14 days by female; altricial young fledge at 13–15 days.	75	30–75	15–30
American Dipper	*Cinclus mexicanus*	Domed nests in crevices in rocks, logs, bridges, or other protected areas immediately adjacent to water.	0–30 feet	March through August; single or double brood.	Clutch is incubated for approximately 16 days by female; altricial young fledge at 18–25 days.	75	30–75	15–30
Golden-crowned Kinglet	*Regulus satrapa*	Hanging nests woven onto conifer twigs in coniferous forests and mixed woodlands.	6–50 feet	May through August; single or double brood.	Clutch is incubated for 14–15 days by female; altricial young fledge at 16–19 days.	75	30–75	15–30
Ruby-crowned Kinglet	*Regulus calendula*	Cup nests in trees in coniferous woodlands.	4–100 feet	May through July; single brood.	Clutch incubated for 12–14 days by female; altricial young fledge at 16 days.	75	30–75	15–30
Blue-gray Gnatcatcher	*Polioptila caerulea*	Cup nests in trees or shrubs in a variety of habitats from shrublands to mature forests.	3–80 feet	April through July; double brood.	Clutch incubated for approximately 15 days by both sexes; altricial young fledge at 12–13 days.	75	30–75	15–30
Coastal California Gnatcatcher	*Polioptila californica californica*	Cup nests in coastal sage scrub and chaparral.	2–3 feet	February through August; double brood.	Clutch incubated for approximately 14 days by both sexes; altricial young fledge at 15–16 days.	500	CR	CR
Wrentit	*Chamaea fasciata*	Cup nests in coastal sage scrub and chaparral.	1–4 feet	March through July; double brood.	Clutch incubated for 15–16 days by both sexes; altricial young fledge at 15–16 days.	75	30–75	15–30

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Northern Mockingbird	*Mimus polyglottos*	Cup nests in shrubs and trees in variety of habitats, including woodlands and in developed areas.	3–10 feet	March through July; double or triple brood.	Clutch incubated for 11–14 days by female; altricial young fledge at 12–14 days.	75	30–75	15–30
Sage Thrasher	*Oreoscoptes montanus*	Cup nests in low shrubs in sagebrush habitat.	2–3 feet	April through August; single or double brood.	Clutch is incubated for 13–17 days; altricial young fledge at approximately 11 days.	75	30–75	15–30
Le Conte's Thrasher	*Toxostoma lecontei*	Cup nests in cholla or a low tree, in desert areas with shrubby growth.	2–8 feet	February through June; double or triple brood.	Clutch incubated for 14–20 days by both sexes; altricial young fledge at 14–17 days.	75	30–75	15–30
California Thrasher	*Toxostoma redivivum*	Cup nests in low trees or shrubs in sage scrub and chaparral.	2–4 feet	February through July; double brood.	Clutch incubated for approximately 14 days by both sexes; altricial young fledge at 12–14 days.	75	30–75	15–30
Bendire's Thrasher	*Toxostoma bendirei*	Cup nests in shrubs, cacti, or trees.	2–5 feet	Late February through April; single, double, or triple brood.	Clutch incubated 12–14 days by both parents; altricial young fledge at 12–13 days.	75	30–75	15–30
Cedar Waxwing	*Bombycilla cedrorum*	Cup nests in forks of trees in riparian or redwood forests.	5–50 feet	June through August; single or double brood.	Clutch is incubated for 12–14 days; altricial young fledge at 16–18 days	75	30–75	15–30
Phainopepla	*Phainopepla nitens*	Cup nests in trees in desert scrub and coastal chaparral.	6–11 feet	Late February—desert; April through June—coastal; double brood.	Clutch incubated for 14–15 days by both sexes; altricial young fledge at 18–19 days.	75	30–75	15–30

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Orange-crowned Warbler	*Oreothlypis celata*	Cup nests on the ground or in crevices near ground in a variety of habitats, often where woodland and chaparral habitats meet.	Ground	April through July; single or double brood.	Clutch incubated for 12–14 days by female; altricial young fledge at 12–13 days.	75	30–75	15–30
Nashville Warbler	*Oreothlypis ruficapilla*	Cup nests on ground concealed in bushes or small trees in woodland edges or shrubby areas.	Ground	May through July; single brood.	Clutch incubated for 11–12 days by female; altricial young fledge at 11 days.	75	30–75	15–30
Yellow Warbler	*Setophaga petechia*	Cup nests in trees or shrubs in shrubby growth in riparian areas.	2–12 feet	April through July; single brood.	Clutch incubated for 11–12 days by female; altricial young fledge at days.	75	30–75	15–30
Yellow-rumped Warbler	*Setophaga coronata*	Cup nests in trees in coniferous woodlands.	4–50 feet	April through July; single or (rarely) double brood.	Clutch incubated for 12–13 days by female; altricial young fledge at 12–14 days.	75	30–75	15–30
Black-throated Gray Warbler	*Setophaga nigrescens*	Cup nests in trees or shrubs in open woodlands in mountainous areas.	8–35 feet	May through July; single or double brood.	Clutch incubated by female; young are altricial. Length of incubation period and age at fledging undocumented.	75	30–75	15–30
Hermit Warbler	*Setophaga occidentalis*	Cup nests high in trees in coniferous forests	20–40 feet	May through July; single brood.	Clutch incubated for approximately 12 days by both sexes; altricial young fledge at 8–10 days.	75	30–75	15–30

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MacGillivray's Warbler	*Geothlypis tolmiei*	Cup nests in low thick shrub in riparian woodlands and coniferous or mixed forests.	1–5 feet	May through July; single brood.	Clutch incubated for 11–13 days by female; altricial young fledge at 8–10 days.	75	30–75	15–30
Common Yellowthroat	*Geothlypis trichas*	Cup nests in reeds and other wetland vegetation over water or near water.	1–3 feet	April through July; single brood.	Clutch incubated for approximately 12 days by female; altricial young fledge at 9–10 days.	75	30–75	15–30
Wilson's Warbler	*Cardellina pusilla*	Cup nests on ground, hidden by vegetation in shrub habitats in forests and chaparral.	Ground	April through June; single or (rarely) double brood.	Clutch incubated for 11–13 days by female; altricial young fledge at 10–11 days.	75	30–75	15–30
Yellow-breasted Chat	*Icteria virens*	Cup nests in a dense shrub or tangle in thick riparian vegetation.	1–8 feet	April through July; single or (rarely) brood.	Clutch incubated for 11–12 days by female; altricial young fledge at 8–11 days.	75	30–75	15–30
Western Tanager	*Piranga ludoviciana*	Cup nests high in trees on outer branches in coniferous and mixed hardwood forests.	8–75 feet	May through July; single brood.	Clutch incubated for approximately 13 days by female; altricial young fledge at 10–11 days.	75	30–75	15–30
Green-tailed Towhee	*Pipilo chlorulus*	Cup nests in or at base of low shrubs in chaparral and disturbed (low growth) forest habitats.	0–2 feet	April through August; single or double brood.	Clutch incubated for 11–13 days by female; altricial young fledge at 11–14 days.	75	30–75	15–30
Spotted Towhee	*Pipilo maculatus*	Cup nests usually on the ground or very low in bushes shrubby habitats.	2–12 feet	April through July; single or double brood.	Clutch incubated for 12–13 days by female; altricial young fledge at approximately 9 days.	75	30–75	15–30

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California Towhee	*Melozone crissalis*	Cup nests in shrubs or small trees in brushy habitats.	4–12 feet	March through July; double or triple brood.	Clutch incubated for approximately 14 days by female; altricial young fledge at approximately 10 days.	75	30–75	15–30
Rufous-crowned Sparrow	*Aimophila ruficeps*	Cup nests at the base of a grass clumps, in dry rocky areas with sparse undergrowth.	0–2 feet	April through June; single or double brood.	Clutch incubated for 11–13 days by female; altricial young fledge at 9 days.	75	30–75	15–30
Chipping Sparrow	*Spizella passerina*	Cup nests in trees or shrubs in open woodlands.	3–20 feet	April through July; double brood.	Clutch incubated for 11–14 days by female; altricial young fledge at 9–12 days.	75	30–75	15–30
Black-chinned Sparrow	*Spizella atrogularis*	Cup nests in shrubs in chaparral habitat.	1–3 feet	April through August; single brood.	Clutch incubated for 12–13 days by female; altricial young fledge at approximately 10 days.	75	30–75	15–30
Lark Sparrow	*Chondestes grammacus*	Cup nests usually in scrapes on ground in open grasslands, or cup nests in herbaceous or woody shrubs.	0–9 feet	April through July; double brood.	Clutch incubated for 11–13 days by female; altricial young fledge at 9–10 days.	75	30–75	15–30
Black-throated Sparrow	*Amphispiza bilineata*	Cup nests in thorny shrubs or cactus in chaparral or desert habitats.	1 foot	April through June; single or double brood.	Clutch incubated for 12–13 days by female; altricial young fledge at approximately 9.5 days.	75	30–75	15–30
Sage Sparrow	*Artemisiospiza belli*	Cup nests in thick bushes in chaparral and desert habitats.	1 foot	March through June; double brood.	Clutch incubated for 10–16 days by female; altricial young fledge at 9–10 days.	75	30–75	15–30

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Bryant's Savannah Sparrow	*Passerculus sandwichensis alaudinus*	Cup nests on ground in dense, moist grasslands, ruderal vegetation, or saltmarsh vegetation.	Ground	April through July; single or double brood.	Clutch incubated for 10–13 days; altricial young fledge at 7–14 days.	75	30–75	15–30
Belding's Savannah Sparrow	*Passerculus sandwichensis beldingi*	Cup nests on ground in dense, moist grasslands, ruderal vegetation, or saltmarsh vegetation.	Ground	April through July; single or double brood.	Clutch incubated for 10–13 days; altricial young fledge at 7–14 days.	75	CR	CR
Grasshopper Sparrow	*Ammodramus savannarum*	Ground nest at the base of bunchgrass or other vegetation in grasslands.	Ground	April through July; double or triple brood.	Clutch incubated for 11–12 days by female; altricial young fledge after 9 days.	75	30–75	15–30
Song Sparrow	*Melospiza melodia*	Cup nests in low grass and shrubs or thickets in a variety of forest, shrub, grassland, marsh, and riparian habitats.	1–3 feet	March through July; double, triple, or quadruple brood.	Clutch incubated for 12–14 days by female; altricial young fledge at 10 days.	75	30–75	15–30
Suisun Song Sparrow	*Melospiza melodia maxillaris*	Cup nests in low grass and shrubs or thickets in a variety of forest, shrub, grassland, marsh, and riparian habitats.	1–3 feet	March through July; double, triple, or quadruple brood.	Clutch incubated for 12–14 days by female; altricial young fledge at 10 days.	75	30–75	15–30
Alameda Song Sparrow	*Melospiza melodia pusillula*	Cup nests in low grass and shrubs or thickets in a variety of forest, shrub, grassland, marsh, and riparian habitats.	1–3 feet	March through July; double, triple, or quadruple brood.	Clutch incubated for 12–14 days by female; altricial young fledge at 10 days.	75	30–75	15–30

Common Name	Scientific Name	Nest Location, Substrate, and Habitat	Vertical Height	Peak Breeding Season/Number of Broods per Season	Incubation Duration/Chick-rearing Duration	Standard Buffer* (feet)	Medium to High Disturbance Category Buffer (feet)	Low to Medium Disturbance Category Buffer (feet)
San Pablo Song Sparrow	*Melospiza melodia samuelis*	Cup nests in low grass and shrubs or thickets in a variety of forest, shrub, grassland, marsh, and riparian habitats.	1–3 feet	March through July; double, triple, or quadruple brood.	Clutch incubated for 12–14 days by female; altricial young fledge at 10 days.	75	30–75	15–30
Lincoln's Sparrow	*Melospiza lincolnii*	Cup nests in depressions on the ground in shrubby growth at forest edges, clearings; often near wet areas	Ground	May through July; double brood.	Clutch incubated for 13–14 days by female; altricial young fledge at 10–12 days.	75	30–75	15–30
White-crowned Sparrow	*Zonotrichia leucophrys*	Cup nests on ground or in shrubs or small trees in coastal or mountain chaparral and mountain forests.	0–5 feet	May through September; double or triple brood.	Clutch incubated for 9–15 days; altricial young fledge at 9–11 days	50	30–50	15–30
Dark-eyed Junco	*Junco hyemalis*	Cup nests in depressions on the ground among tree roots or brush in variety of woodland habitats; also on building ledges or in trees.	Ground, but up to 8 feet on ledges or trees	April through July; double or triple brood.	Clutch incubated for 12–13 days by female; altricial young fledge at 10–13 days.	50	30–50	15–30
Black-headed Grosbeak	*Pheucticus melanocephalus*	Cup nests in trees or shrubs in thickets, under trees along streams in riparian woodlands or coniferous or mixed forests near edges.	6–12 feet	April through July; single brood.	Clutch incubated for 12–13 days by both sexes; altricial young fledge at 12 days.	75	30–75	15–30

Common Name	Scientific Name	Nest Location, Substrate, and Habitat	Vertical Height	Peak Breeding Season/Number of Broods per Season	Incubation Duration/Chick-rearing Duration	Standard Buffer* (feet)	Medium to High Disturbance Category Buffer (feet)	Low to Medium Disturbance Category Buffer (feet)
Blue Grosbeak	*Guiraca caerulea*	Cup nests small trees, shrubs, or other low vegetation, usually near open areas in desert, chaparral, savannah, and forest edge habitats.	<1–16 feet	April through August; single or double brood.	Clutch incubated for 11–12 days by female; altricial young fledge at 9–13 days.	75	30–75	15–30
Lazuli Bunting	*Passerina amoena*	Cup nests in low thick shrubby riparian or chaparral habitat.	1–10 feet	May through July; double brood.	Clutch incubated for approximately 12 days by female; altricial young fledge at 10–15 days.	75	30–75	15–30
Red-winged Blackbird	*Agelaius phoeniceus*	Cup nests in cattails, bulrushes, and other marsh vegetation or in shrubs in grasslands and shrubby habitats.	1–13 feet	March through June; double brood.	Clutch incubated for 10–12 days by female; altricial young fledge at 10–11 days.	75 350 (Kern Red-winged Blackbird)	30–75 200–350 (Kern Red-winged Blackbird)	15–30 100–200 (Kern Red-winged Blackbird)
Tricolored Blackbird	*Agelaius tricolor*	Cup nests in cattails and bulrushes in marshes and shrubby areas in uplands and agricultural areas. Colonial nester.	1–5 feet	April through June; double brood.	Clutch incubated for approximately 11 days by female; altricial young fledge at 13 days.	350	CR	CR
Yellow-headed Blackbird	*Xanthocephalus xanthocephalus*	Cup nests cattails or other emergent vegetation over water in marshes with thick vegetative growth. Colonial nester.	2–3 feet	May through June; single brood.	Clutch incubated for 10–13 days by female; altricial young fledge at 9–12 days old	350	200–350	100–200
Brewer's Blackbird	*Euphagus cyanocephalus*	Cup nests high in trees or shrubs near water in agricultural or suburban/urban areas.	8–43 feet	March through July; single or double brood.	Clutch incubated for 12–13 days by female; altricial young fledge at approximately 13 days.	50	30–50	15–30

Common Name	Scientific Name	Nest Location, Substrate, and Habitat	Vertical Height	Peak Breeding Season/Number of Broods per Season	Incubation Duration/Chick-rearing Duration	Standard Buffer* (feet)	Medium to High Disturbance Category Buffer (feet)	Low to Medium Disturbance Category Buffer (feet)
Western Meadowlark	*Sturnella neglecta*	Domed nests on ground in open grasslands.	Ground	March through June; double brood.	Clutch incubated for 13–15 days by female; altricial young fledge at 10–12 days.	75	30–75	15–30
Hooded Oriole	*Icterus cucullatus*	Closed cup nests high in trees (often palm treets) or shrubs, often in riparian habitat and in suburban areas.	10–45 feet	April through August; double or triple brood.	Clutch incubated for 12–14 days by female; altricial young fledge at approximately 14 days.	75	30–75	15–30
Bullock's Oriole	*Icterus bullockii*	Pensile cup nests in twig fork of trees in riparian and oak woodlands.	6–15 feet	April through July; single brood.	Clutch incubated for approximately 14 days by female; altricial young fledge at approximately 14 days.	75	30–75	15–30
Pine Grosbeak	*Pinicola enucleator*	Cup nests near the end of horizontal tree branches in coniferous forests.	16–35 feet	May through August; single brood.	Clutch incubated for 13–14 days by female; altricial young fledge at approximately 14 days.	75	30–75	15–30
Purple Finch	*Haemorhous purpureus*	Cup nests high in trees well hidden by foliage, in coniferous forests and woodlands.	5–60 feet	April through June; double brood.	Clutch incubated for approximately 13 days by female; altricial young fledge at approximately 14 days.	75	30–75	15–30
House Finch	*Haemorhous mexicanus*	Cup nests in trees, building ledges, and other locations in urban/suburban, agriculture, woodlands, desert, and chaparral habitats.	5–7 feet	March through July; double or triple brood.	Clutch incubated for 12–14 days by female; altricial young fledge at 14–16 days.	50	15–30	10–15
Red Crossbill	*Loxia curvirostra*	Loose cup constructed near the end of horizontal branch in coniferous forests.	6–60 feet	February through June; single brood.	Clutch incubated for 12–16 days by female; altricial young fledge at 17–22 days.	75	30–75	15–30

Common Name	Scientific Name	Nest Location, Substrate, and Habitat	Vertical Height	Peak Breeding Season/Number of Broods per Season	Incubation Duration/Chick-rearing Duration	Standard Buffer* (feet)	Medium to High Disturbance Category Buffer (feet)	Low to Medium Disturbance Category Buffer (feet)
Pine Siskin	*Spinus pinus*	Cup nest constructed on conifer or hardwood in coniferous or mixed hardwood forests.	3–50 feet	April through July; single or double brood.	Clutch incubated for approximately 13 days; altricial young fledge at 14–15 days.	75	30–75	15–30
Lesser Goldfinch	*Spinus psaltria*	Cup nests in trees and shrubs in a variety of open habitats including oak woodlands, mixed coniferous forests, riparian woodlands, chaparral, agricultural and suburban habitats.	3–36 feet	April through July; single or double brood.	Clutch incubated for approximately 12 days by female; altricial young fledge at 11 days.	75	30–75	15–30
Lawrence's Goldfinch	*Spinus lawrencei*	Cup nests in scattered trees in oak woodlands and savannahs.	3–40 feet	April through July; single or (rarely) double brood	Clutch incubated for 12–13 days by female; altricial young fledge at approximately 11 days.	75	30–75	15–30
American Goldfinch	*Spinus tristis*	Cup nests in a variety of shrubs in variety of open habitats including ruderal fields and grasslands with shrub component nearby.	3–10 feet	April through August; single or double brood.	Clutch incubated for 12–14 days by female; altricial young fledge at 11–17 days.	75	30–75	15–30
Evening Grosbeak	*Coccothraustes vespertinus*	Cup nests in fir or other conifers in coniferous forests.	30–60 feet	June through August; single or (rarely) double brood.	Clutch incubated for 12–14 days by female; altricial young fledge at 13–14 days.	75	30–75	15–30

[a] Consultation recommended to perform work within the standard buffer. Confer internally on avoidance and minimization approach.

[b] The 1,320-foot (0.25-mile) buffer applies to the highest noise level category (90 dB or greater measured at 50 feet). Smaller buffers may be appropriate based on the noise levels of the project. Biologists should follow the methodology found in *Estimating the Effects of Auditory and Visual Disturbance to Northern Spotted Owls and Marbled Murrelets in Northwestern California* (U.S. Fish and Wildlife Service 2006) to determine the noise level and appropriate buffer for their specific project.

State Water Resources Control Board

WATER QUALITY ORDER NO. WQ 2023-0022-DWQ WASTE DISCHARGE REQUIREMENTS AND CLEAN WATER ACT SECTION 401 WATER QUALITY CERTIFICATION

Effective Date:	April 4, 2023	**Reg. Meas. ID:**	428347
		Place ID:	855396
Program Type:	Fill/Excavation	**WDID No:**	SB21039IN
Project Type:	Utilities	**USACE No:**	SPN-2018-00490

Project: Pacific Gas and Electric Company Bay Area Operations and Maintenance Program (Project)

Applicant: Pacific Gas and Electric Company

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Water Board Contact Person: If you have any questions, please call State Water Resources Control Board (State Water Board) Staff listed above or (916) 341-5478 and ask to speak with the Water Quality Certification Unit Supervisor.

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I. Summary

This Order for Waste Discharge Requirements and Clean Water Act section 401 Water Quality Certification (Order), which includes Attachments A through G, provides Clean Water Act Section 401 Water Quality Certification for projects that require authorization from the U.S. Army Corps of Engineers (Corps) under Clean Water Act Section 404 and Rivers and Harbors Act of 1899 Section 10 and Section 14 (33 U.S.C. § 408, known as "Section 408") and is issued at the request of Pacific Gas and Electric Company (hereinafter Permittee).

This Order covers operations and maintenance activities conducted by the Permittee related to natural gas pipelines and electric transmission and distribution line dredge, fill, excavation and associated activities that directly and indirectly discharge waste into waters and or impact water quality and beneficial uses in the nine counties surrounding the San Francisco Bay (Project Area Map—Attachment A). The categories of eligible operations and maintenance activities covered under this Order are listed in section V.

This Order is for the purpose described in application and supplemental information submitted by the Permittee. The application was received on January 10, 2019, and determined complete on December 20, 2021. Prior to receiving a complete application, State Water Board staff issued multiple incomplete application notices and the Permittee provided supplemental information that clarified and modified the original application. Additionally, State Water Board staff issued a Denial Without Prejudice on July 2, 2019.

II. Findings

A. This Order is adopted pursuant to section 401 of the Clean Water Act and the California Porter-Cologne Water Quality Control Act (Wat. Code §§ 13000, et seq.). Notwithstanding any determinations made by the Corps or other federal agency pursuant to 40 C.F.R. section 121.9, dischargers must comply with the entirety of this Order because the Order also serves as waste discharge requirements. Discharges to waters of the state are prohibited except when authorized in accordance with Water Code section 13264.

B. Failure to comply with any condition in this Order shall constitute a violation of the Porter-Cologne Water Quality Control Act and the Clean Water Act. The discharger may then be subject to administrative and/or civil liability pursuant to Water Code section 13385.

C. In the event of any violation or threatened violation of the conditions of this Order, the violation or threatened violation shall be subject to any remedies, penalties, process, or sanctions as provided for under state and federal law.

D. In response to a suspected violation of any condition of this Order, the State Water Board or Regional Water Quality Control Board (collectively the Water

Board) may require the Permittee to furnish, under penalty of perjury, any technical or monitoring reports the Water Board deems appropriate, provided that the burden, including costs, of the reports shall bear a reasonable relationship to the need for the reports and the benefits to be obtained from the reports. The additional monitoring requirements ensure that the permitted dischargers and activities comport with any applicable effluent limitations, water quality standards, and/or other appropriate requirement of state law.

E. This Order and all of its conditions contained herein continue to have full force and effect regardless of the expiration or revocation of any license or permit issued for the project.

F. This Order does not provide coverage under the National Pollutant Discharge Elimination System (NPDES) General Permit for Storm Water Discharges Associated with Construction and Land Disturbance Activities (Order No. 2009-0009-DWQ or 2022-0057-DWQ; NPDES No. CAS000002) (Construction General Permit).

G. This Order does not authorize any act which results in the taking of a threatened, endangered or candidate species, which is now prohibited, or becomes prohibited in the future, under either the California Endangered Species Act (Fish and G. Code, §§ 2050-2097) or the Federal Endangered Species Act (16 U.S.C. §§ 1531-1544). If a “take” will result from any act authorized under this Order, the Permittee must obtain authorization for the take prior to any construction or operation of the portion of the project that may result in a take. The Permittee is responsible for meeting all requirements of the applicable endangered species act for the project authorized under this Order.

H. This Order includes monitoring and reporting requirements pursuant to Water Code sections 13383 and 13267. The burden of preparing these reports, including costs, is reasonable to the need and benefits of obtaining the reports. The reports are intended to ensure that the best management practices required under this Order are sufficient to protect beneficial uses and water quality objectives. The reports related to accidental discharges also ensure that corrective actions that are necessary to prevent and minimize the impact of the discharge are taken as soon as possible. The anticipated costs are minimal as the reporting obligations require only visual monitoring and notification reporting.

I. Consistent with Water Code section 189.7, the Water Board conducted outreach in affected disadvantaged and tribal communities.

J. This Order authorizes future operation and maintenance activities throughout nine Bay Area counties. These activities may impact water quality in disadvantaged and tribal communities. Pursuant to Water Code section

13149.2, the Water Board makes the following findings regarding anticipated water quality impacts and environmental justice concerns within the Board's authority in disadvantaged or tribal communities resulting from the issuance of this Order:

1. Based on readily available information, the Water Board anticipates that the issuance of this Order will result in limited water quality impacts and environmental justice concerns within the scope of the Board's authority. This Order authorizes work near and within Bay Area surface waters, including wetlands, tidal waters, and stream channels. The activities covered by this Order are limited to operation and maintenance of existing facilities, and most impacts will be temporary and last for less than one year. The temporary impacts will generally be related to site access and staging areas. For example, there could be temporary impacts to water quality where a staging area is adjacent to a water or when a project is located in waters (e.g., a utility pole replacement) and the area must be dewatered to conduct maintenance activities. The types of wastes associated with temporary impacts are largely the same as the wastes associated with construction: sediment and oil and grease. Permanent impacts, with a permanent loss of a portion or all of a water, may be authorized under this Order. Only permanent impacts related to an existing facility are covered by this Order and permanent impacts are expected to be small. For example, an existing culvert may be replaced with a larger culvert.

2. The Water Board identified several conditions within the scope of its authority to address the permitted activity impacts. Those conditions are set forth in Order section IX. Even work within waters for a short duration can impact water quality in disadvantaged and tribal communities. For example, stream channel access may be temporarily blocked during utility pole replacement. To reduce impacts, this Order requires PG&E to restore impact sites as soon as possible after work occurs. Additionally, a sequence of actions much be taken before any impacts to waters may occur: impacts must be avoided (moved away from waters), minimized (through implementation of best management practices and design alternatives) and mitigated (with a beneficial project). Before any work is authorized under this Order, Water Board staff will review site-specific information to confirm that this sequence of actions has been taken. Implementation of these measures will ensure that impacts will be minimal. For permanent impacts, compensatory mitigation is required. Generally, mitigation should be provided within the impacted watershed. Compensatory mitigation shall provide a minimum of a one-to-one mitigation to impact ratio, and this ratio is subject to increase at Water Boards staff discretion depending on factors such as distance between the impact site and mitigation site; uncertainty associated with the successful

creation of a mitigation site; temporal loss; and whether the mitigation is in-kind or out-of-kind from the impacted aquatic resource(s).

III. Pacific Gas and Electric Company's Bay Area Operation and Maintenance Program

The Pacific Gas and Electric Company's Bay Area Operation and Maintenance Program consists of activities required to maintain safe and operable electrical and gas utility infrastructure, including operation and maintenance of the Permittee's gas and electrical transmission and distribution systems and minor new construction (e.g., inspecting and testing valves, enclosures, and other components; repairing and replacing facilities, structures, and access roads; electrical transmission and distribution reconductoring projects; gas pipeline replacement; and emergency repair and replacement). Notification shall be provided to the appropriate Regional Water Board before commencement of each activity.

IV. Project Location and Receiving Waters Information

An individual project authorized under this Order may occur at any of the Permittee's gas and electric transmission and distribution facilities, facility rights-of-way, access to the facilities, and mitigation areas located within the Operations and Maintenance Program Area, including all or portions of the nine Bay Area counties of Alameda, Contra Costa, Marin, Napa, San Francisco, San Mateo, Santa Clara, Sonoma, and Solano. A map showing the Project area is found in Attachment A of this Order.

The nine-county service area is within the jurisdiction of the San Francisco Bay Regional Water Quality Control Board, the Central Valley Regional Water Quality Control Board, the Central Coast Regional Water Quality Control Board, and the North Coast Regional Water Quality Control Board (collectively Regional Water Boards). Surface waters and groundwater potentially impacted by this Project are protected in accordance with the applicable water quality control plan or policy. Statewide and regional water quality control plans and policies may be accessed at the State Water Resources Control Board's Plans and Policies Web page (http://www.waterboards.ca.gov/plans_policies/). Water quality control plans and policies, including water quality standards which consist of existing and potential beneficial uses of waters of the state, water quality objectives to protect those uses, and the state and federal antidegradation policies, are issued in accordance with Water Code sections 13140, 13240 and 13170.

It is the policy of the State of California that every human being has the right to safe, clean, affordable, and accessible water adequate for human consumption, cooking, and sanitary purposes. This Order promotes that policy by requiring discharges not to exceed maximum contaminant levels designed to protect human health and ensure that water is safe for domestic use.

V. Description of Direct Impacts to Waters of the State

Individual projects eligible for coverage under this Order include a wide variety of activities that require a permit and may result in temporary impacts to waters of the state or may result in a permanent loss of waters of the state, including:

A. Internal pipeline inspection and repair: Inspection of pipelines for anomalies in accordance with the Pipeline Safety Act. If an anomaly is found, vegetation will be removed, the pipeline will be excavated, repaired and backfilled. Typical repairs include sleeve repairs involving sandblasting and welding.

B. Valve recoating and replacement: Replacement or recoating of malfunctioning or worn valves. To coat the entire valve to the connection point, vegetation will be removed, the valve must be excavated to expose the pipe and then backfilled once work is complete.

C. Pipeline cathodic protection: Installation of a type of anode (e.g., horizontal anode bed, flex anode, deep well anode) parallel and adjacent to the existing pipeline. The anode installation involves vegetation removal, trenching, backfilling, and recontouring upon completion.

D. Pipeline lowering and replacement: Replacement of pipeline segments due to damage caused by construction projects, acts of nature, or aging and corrosion. Replacement involves clearing vegetation and grading the rights-of-way, trenching and excavating the existing pipeline, and installing the new pipeline parallel and adjacent to the existing pipeline. The minimum length of pipe replaced is typically 40 feet (for one joint of pipe), though up to 1 mile could be replaced.

E. Pipeline recoating and replacement: Pipeline to be recoated is excavated (after vegetation is removed) and old coating is removed from the pipeline by jetting, scraping, or sandblasting. The surface of the pipe is prepared for the new coating by running a self-contained grit or shot-blasting machine over the area. Following repairs, the area is backfilled.

F. Substation maintenance: Accessing substations to perform maintenance tasks, which may require use of station property or adjacent property for construction staging and materials storage, which might require vegetation removal and/or fill to develop safe temporary work areas for equipment and crews, which may affect waters of the state.

G. Transmission tower maintenance: Conducting routine tower replacement and tower foundation repair, which involves work on tower foundations located in waters of the state. Depending on the topography of the site, any of the following methods may be used to gain access to the site and/or stage materials: vegetation removal, rubber mats placed at footings, temporary boardwalk constructed, barges or helicopter. Cofferdams are installed for repairs to foundations submerged in water.

H. Boardwalk maintenance: Repairs and maintenance related to boardwalks that service transmission facilities in the vegetated margins, mudflats, and open water around San Francisco Bay. All repair and replacement activities are completed manually and require the use of generators and handheld equipment. Access and staging to support boardwalk maintenance may require vegetation removal. Some work may be completed from barges and/or from the mudflat during low tide.

I. Site-specific erosion solutions: Installation and maintenance of site-specific solutions such as biodegradable jute netting, riprap, or rock fill to remediate scouring and erosion that occurs within waterways resulting in pipe exposure and prevent further damage to the pipeline. Site preparation for site-specific erosion solutions may include vegetation removal.

J. Water diversion techniques: Installation of a diversion structure (e.g., a dam or weir and a pump or headgate) to divert water through a temporary ditch or pipe to convey the water around a section of pipeline to be repaired. These techniques are employed to repair pipeline crossings within water features that have flowing water to minimize impacts to water quality and create a safe work area. Site preparation for water diversion may include vegetation removal.

K. Power pole maintenance: Reinforce poles by installing trusses to existing poles, or fiber-wrapping the pole with preservative material to reduce rate of deterioration. Steel trusses are driven to pre-defined depths and secured with high-strength steel banding. Remove poles that cannot be repaired and replace with new wood poles or light-duty steel poles, which may require the installation of guy wires and anchors, which could consist of a screw or a concrete structure, and the removal of vegetation.

L. Line reconductoring: Replacing existing conductors with new conductors along the line. This may require staging areas, work areas, temporary guard structures, and pull sites (temporary construction areas) within waters of the state. Reconductoring is typically completed in 2- to 3-mile sections with the use of pull sites. Vegetation mowing and minor grading may be required to prepare pull sites. Mats or gravel may also be used in wet locations. Guard structures are typically standard wood poles across which temporary netting is strung; in some cases, specifically equipped boom trucks are used instead of poles.

M. Site access development and maintenance: Routine operations and maintenance activities may require routine access road maintenance such as blading, moving or establishing berms, vegetation or debris clearing and making functional drain inlets to culverts, culvert repair, establishing waterbars, repairing over-side drains, and the repair or replacement of storm water diversion devices. Protective security fencing is sometimes installed around pipeline facilities, which requires digging holes to install fence posts using an auger.

N. Minor New Construction: Construction of facilities adjacent to existing facilities and/or in utility or road rights-of-way would be limited to new gas pressure limiting stations with an impact of up to 1 acre of natural vegetation, electrical substation expansions with up to 3 acres of impacts on natural vegetation, and underground electric lines.

O. Other Activities: Additional operation and maintenance activities include natural gas line and electrical patrols and inspections, compressor station upgrades and maintenance, pipeline electric test system installations, telecom site maintenance, insulator washing or replacement, outage repairs, facility installations, and others. In the course of conducting these other activities, vegetation impacts may occur.

P. Restoration and Mitigation Activities: In the course of implementing on-site permittee responsible mitigation for impacts resulting from activities covered under this Order, additional impacts to waters of the state may occur. This Order covers restoration and mitigation activities (e.g. native plantings, water crossing removal and restoration, and wetland enhancement) that result in up to one half (0.5) acre of aquatic resource impacts associated with the habitat management, monitoring, and enhancement activities carried out by the Permittee or by independent land managers providing mitigation for the Permittee to offset enrolled project impacts. This Order does not cover large scale, multi-acre, mitigation projects that offset impacts from several impact sites. Site-specific restoration or mitigation plans must comply with Order section IX. G and H conditions and be approved by the Water Board before any discharge may occur; remaining applicable Order conditions also apply.

The Permittee should describe all proposed project features, including those potentially offsite and/or adjacent to waters of the state which could result in impacts to waters of the state, in the Notice of Intent (NOI- Attachment B), which must be completed for authorization under this Order.

VI. Description of Indirect Impacts to Waters of the State

The Water Board recognizes the potential for indirect impacts to waters of the state associated with the Project. Indirect impacts may include, but are not limited to, sediment-laden stormwater runoff from bare surfaces exposed by operation and maintenance projects, spills of chemicals (fuels, lubricants, paints, etc.) used in operation and maintenance projects, and loss of shade to streams associated with impacts to riparian habitat. Impacts to waters of the state and their designated beneficial uses could potentially result from Project activities that are within or adjacent to the Project area. These potential indirect impacts are expected to be short term, and the expected severity of these impacts are adequately reduced through adherence to this Order and the Mitigation Measures described in the Pacific Gas and Electric Company Bay Area Operations and Maintenance Incidental Take Permit Environmental Impact Report.

VII. Avoidance and Minimization

Projects that receive Water Board authorization must demonstrate that impacts to waters of the state are first avoided, and then minimized, to the greatest extent practicable. The avoidance and minimization measures in the Permittee's Bay Area Operations and Maintenance Habitat Conservation Plan and the Permittee's most current "Good Housekeeping Activity Specific Erosion and Sediment Control Plan" are incorporated by reference and shall be conducted during project activities. Additional activity-specific avoidance and minimization measures will be required for each project authorized by this Order.

VIII. Compensatory Mitigation

As determined by the appropriate Regional Water Board, the Permittee is required to provide compensatory mitigation to compensate for permanent, temporary, direct and/or indirect impacts as described in sections IX.G and H.

IX. Conditions

Compliance with conditions of this Order provides reasonable assurance that projects authorized under this Order will comply with state and federally approved water quality requirements. The Water Boards will review any project proposed for authorization under this Order to analyze impacts to water quality and designated beneficial uses within the applicable watershed(s). If the eligibility requirements set forth in this Order are not met, the Water Boards will not authorize the proposed project under this Order and instead require the project proponent to apply for an individual authorization or authorization under another order. In accordance with this Order, the Permittee may proceed with an authorized project under the following terms and conditions:

A. Reporting and Notification Requirements

The following section details the reporting and notification types and timing of submittals. Requirements for the content of these reporting and notification types are detailed in Attachment C, including specifications for photo and map documentation during the Project. Written reports and notifications must be submitted using the Reporting and Notification Cover Sheet located in Attachment C, which must be signed by the Permittee or an authorized representative.

1. **Request for Authorization:** The Permittee shall submit a complete NOI for authorization under this Order at least 45 days before any project activity. The NOI shall describe all proposed project impacts to waters of the state and project design steps taken to first avoid, and then minimize, impacts to waters of the state to the maximum extent practicable. The NOI shall also include a delineation of waters of the state within impact sites. The NOI must provide all information requested in NOI Attachment B. The NOI must be provided on the NOI form found in Attachment B until an electronic application form is available on the State Water Board's webpage, at which time electronic

submission will be required. An application fee must be provided with each NOI. The application fee amount is determined as required by the California Code of Regulations, title 23, sections 3833(b)(3) and 2200(a)(3).

2. The Water Boards shall determine whether the activity is eligible for Order coverage. The Water Boards will require the Permittee to apply for individual or general authorization where the activity would not comply with an applicable water quality control plan or policy even if coverage would otherwise be authorized by this Order. The Permittee may choose to apply for an individual water quality authorization.

3. **Project Status Notifications**

   a. **Commencement of Construction:** The Permittee shall submit a Commencement of Construction Report at least seven (7) days prior to start of initial ground disturbance activities and, if applicable, corresponding Waste Discharge Identification Number (WDID) issued under the NPDES General Permit for Storm Water Discharges Associated with Construction and Land Disturbance Activities (Order No. 2009-0009-DWQ or 2022-0057-DWQ; NPDES No. CAS000002).

   b. **Project Reporting:** The Permittee shall submit an Annual Report unless a Quarterly Report is required by Water Board staff in the project's Notice of Applicability. Project reporting shall continue until the Water Board issues a Notice of Project Complete Letter to the Permittee.

   c. **Request for Notice of Project Complete Letter:** The Permittee shall submit a Request for Notice of Project Complete Letter when construction and any post-construction monitoring is complete, mitigation performance criteria have been achieved, and no further project activities will occur; this request may be provided using the Request for Notice of Project Complete Letter Form (Attachment G). This request shall be submitted to Water Board staff within thirty (30) days following completion of all project activities. Upon approval of the request, the Water Board staff shall issue a Notice of Project Complete Letter (written notice, email, or other verifiable means) to the Permittee which will end associated annual fees. Completion of post-construction monitoring shall be determined by Water Board staff and shall be contingent on successful attainment of restoration and mitigation performance criteria.

4. Conditional Notifications and Reports:

The following notifications and reports are required as applicable.

a. Accidental Discharges of Hazardous Materials[1]

Following an accidental discharge of a reportable quantity of a hazardous material, sewage, or an unknown material, the following applies (Water Code, Section 13271):

i. As soon as (A) Permittee has knowledge of the discharge or noncompliance, (B) notification is possible, and (C) notification can be provided without substantially impeding cleanup or other emergency measures then:

1. First call – 911 (to notify local response agency)

2. Then call – Office of Emergency Services (OES) State Warning Center at: (800) 852-7550 or (916) 845-8911

3. Lastly, follow the required OES procedures as set forth in the Office of Emergency Services' Accidental Discharge Notification Web Page (https://www.caloes.ca.gov/FireRescueSite/Documents/CalOES-Spill_Booklet_Feb2014_FINAL_BW_Acc.pdf)

ii. Following notification to OES, the Permittee shall notify the appropriate Water Board, as soon as practicable (ideally within 24 hours). Notification may be delivered via written notice, email, or other verifiable means.

iii. Within five (5) working days of notification to the Water Board, the Permittee must submit an Accidental Discharge of Hazardous Material Report.

b. Violation of Compliance with Water Quality Standards:

i. The Permittee shall notify the Water Board of any event causing a violation of compliance with water quality standards. Notification may be delivered via written notice, email, or other verifiable means.

[1] "Hazardous material" means any material that, because of its quantity, concentration, or physical or chemical characteristics, poses a significant present or potential hazard to human health and safety or to the environment if released into the workplace or the environment. "Hazardous materials" include, but are not limited to, hazardous substances, hazardous waste, and any material that a handler or the administering agency has a reasonable basis for believing that it would be injurious to the health and safety of persons or harmful to the environment if released into the workplace or the environment. (Health & Saf. Code, § 25501.)

ii. This notification must be followed within three (3) working days by submission of a Violation of Compliance with Water Quality Standards Report.

c. **In-Water Work and Diversions:**

i. If required by the Water Board, the Permittee shall notify the Water Board at least forty-eight (48) hours prior to initiating work in water or installation of stream diversions. Notification may be delivered via written notice, email, or other verifiable means.

ii. If required by the Water Board, within seven (7) working days following completion of in-stream water work or stream diversions, an In-Water Work/Diversions Water Quality Monitoring Report must be submitted to Water Board staff.

d. **Modifications to Project:**

The Permittee shall give advance notice to Water Board staff if project implementation as described in the NOI is altered in any way or by the imposition of subsequent permit conditions by any local, state or federal regulatory authority by submitting a Modifications to Project Report. Project modifications that may prevent compliance with this Order are prohibited.

e. **Transfer of Long-Term BMP Maintenance:**

If maintenance responsibility for post-construction BMPs is legally transferred, the Permittee must submit to the Water Board a copy of such documentation and must provide the transferee with a copy of a long-term BMP maintenance plan that complies with manufacturer or designer specifications. The Permittee must provide such notification to the Water Board with a Transfer of Long-Term BMP Maintenance Report at least 10 days prior to the transfer of BMP maintenance responsibility.

B. Water Quality Monitoring

1. **General:** If surface water is present, continuous visual monitoring shall be conducted during active construction to detect accidental discharge of construction related pollutants (e.g., oil and grease, turbidity plume, or uncured concrete).

2. **In-Water Work or Diversions:** For projects involving planned in-stream water work or stream diversions, an in-water work/stream diversion and water quality monitoring plan shall be submitted with the NOI. Water quality monitoring shall be conducted in accordance with the approved plan.

3. **Accidental Discharges/Noncompliance:** If an accidental discharge occurs, the Permittee shall determine whether the discharge includes hazardous materials or will cause or contribute to an exceedance of water quality

objectives, and if so, notify the Water Board in accordance with IX.A.4.a. Water Board staff may require additional water quality monitoring based on the discharge constituents and/or related water quality objectives and beneficial uses.

4. **Post-Construction:** For activities that result in exposed soil in or on the banks of waters and that have not received a Notice of Project Complete Letter, the Permittee will visually inspect the project site between October 30 and April 15 or as required in the approved restoration plan following each rain event that results in 0.5 inch of rainfall or more within a 48 hour period, until the Permittee demonstrates that applicable erosion control Best Management Practices are properly installed and the site is stabilized to prevent future erosion. The Permittee must demonstrate that excessive erosion, stream instability, and other water quality pollution is not occurring in or downstream of the project site. If water quality pollution is occurring, contact the Water Board staff member overseeing the project within three (3) working days. The Water Board may require the submission of a Violation of Compliance with Water Quality Standards Report.

C. Standard Conditions

1. This action is subject to modification or revocation upon administrative or judicial review, including review and amendment pursuant to Water Code section 13330, and California Code of Regulations, title 23, chapter 28, Article 6 commencing with section 3867.

2. This Order is not intended and shall not be construed to apply to any activity involving hydroelectric facility requiring a Federal Energy regulatory Commission (FERC) license or an amendment to a FERC license, unless pertinent certification application was filed pursuant to subsection 2855(b) of chapter 28, title 23 of the California Code of Regulations, and that application specifically identified that a FERC license or amendment to a FERC license for a hydroelectric facility was being sought.

3. This Order is conditioned upon total payment of any fee required under title 23 of the California Code of Regulations.

D. General Conditions

1. Permitted actions must not cause a violation of any applicable water quality standards, including impairment of designated beneficial uses for receiving waters as adopted in the Basin Plans by any applicable Regional Water Board, or any applicable Water Board water quality control plan or policy. The source of any such discharge must be eliminated as soon as practicable.

2. The Permittee must conform to the engineering plans, specifications, and technical reports submitted with the application materials. Water Code section 13264 prohibits any discharge that is not specifically authorized in this Order.

3. The Permittee shall adhere to all requirements in the mitigation monitoring and reporting program (MMRP) (Pacific Gas and Electric Bay Area Operation and Maintenance Incidental Take Permit Mitigation Monitoring and Reporting Program, July 2022) which is incorporated herein by reference and any additional measures as outlined in Attachment E, CEQA Findings of Fact.

4. **Avoidance and Minimization:** Projects authorized under this Order shall be designed to avoid and minimize impacts to waters of the state to greatest practicable extent.

E. Administrative

1. Signatory requirements for all document submittals required by this Order are presented in Attachment D of this Order.

2. **Site Access:** The Permittee shall grant Water Board staff, Regional Water Board staff or an authorized representative (including an authorized contractor acting as a Water Board representative), upon presentation of credentials and other documents as may be required by law, permission to:

   a. Enter upon the project or compensatory mitigation site(s) premises where a regulated facility or activity is located or conducted, or where records are kept.

   b. Have access to and copy any records that are kept and are relevant to the Project or the requirements of this Order.

   c. Inspect any facilities, equipment (including monitoring and control equipment), practices, or operations regulated or required under this Order.

   d. Sample or monitor for the purposes of assuring compliance.

3. The Permittee shall be responsible for work conducted by its consultants, contractors, and any subcontractors. A copy of this Order shall be provided to any consultants, contractors, and subcontractors working on the project. Copies of this Order and the project's Notice of Applicability shall remain at the project site for the duration of the project. All personnel performing work on the project shall be familiar with the content of this Order and the project's Notice of Applicability and its posted location at the project site.

4. **Lake and Streambed Alteration Agreement:** The Permittee shall submit a signed copy of the California Department of Fish and Wildlife's Lake or Streambed Alteration Agreement (LSAA) to the Water Board prior to any discharge to waters of the state that requires an LSAA.

F. Construction Conditions

1. All materials and supplies necessary for implementing these construction conditions must be on site and ready for use at the start of the construction activity and must remain in supply and ready for implementation throughout the construction process. All non-structural best management practice materials (e.g., training documents, compliance tracking procedures) must be ready for use at the start of construction.

2. All personnel who engage in construction activities or their oversight at the Project site (superintendent, construction manager, foreman, crew, contractor, biological monitor, etc.) must attend trainings on the conditions of this Order and how to perform their duties in compliance with those conditions. Every person shall attend an initial training within five working days of their start date at the Project site. Trainings shall be conducted by a qualified individual with expertise in 401 Water Quality Certification conditions and compliance.

3. Construction material, debris, rubbish, spoils, soil, silt, sawdust, rubbish, steel, welding slag, welding rods, waste material, waste containers, other organic or earthen material, or any other substances which could be detrimental to water quality or hazardous to aquatic life that is discharged as a result of project related activities shall be prevented from entering waters of the state. Spoils from excavations shall not be stored in waters of the state.

4. Environmentally sensitive areas and environmentally restricted areas, including any avoided waters of the state, must be clearly identified in the field for exclusion prior to the start of construction. Such identification must be properly maintained until construction is completed and the soils have been stabilized. Equipment, materials, or any other substances or activities that may impact waters of the state outside of the limits of project disturbance are prohibited.

5. Bridges, culverts, dip crossings, or other structures must be installed so that water and in-stream sediment flow is not impeded. Project design practices and materials which appropriately minimize impacts to waters must be used in areas where access roads intersect waters of the state.

6. Temporary materials placed in any water of the state must be removed as soon as construction is completed at that location, and all temporary roads must be removed or re-contoured and restored according to approved re-vegetation and restoration plans.

7. A method of containment must be used below any temporary bridge, trestle, boardwalk, and/or other stream crossing structure to prevent any debris or spills from falling into the waters of the state. Containment must be maintained and kept clean for the life of the temporary crossing structure.

8. Vegetation removal shall be limited to the minimum necessary to complete the proposed operation and maintenance activities as listed in this section. This Order does not allow vegetation management removal as a standalone activity.

9. Unless authorized for restoration, material excavated to prepare a site for placement of the permitted fill material must be properly disposed of in an upland area. The disposal site must be located at a sufficient distance away from flowing or standing water such that the excavated material does not erode or move in any way into any water of the state. The disposal area shall be identified in the project NOI.

10. **Topsoil:** For any excavation, including utility line trenches, the top 6 to 12 inches of topsoil shall be removed and stockpiled separately during construction. Following installation, the topsoil shall be replaced and restored to preexisting conditions.

11. Any structure, including but not limited to, culverts, pipes, piers, and coffer dams, placed within a stream where fish (as defined in Fish and Game Code section 45) exist or may exist, must be designed, constructed, and maintained such that it does not constitute a barrier to upstream or downstream movement of aquatic life, or cause an avoidance reaction by fish due to impedance of their upstream or downstream movement. This includes, but is not limited to, maintaining the supply of water and maintaining flows at an appropriate depth, temperature, and velocity to facilitate upstream and downstream fish migration. If any structure results in a long-term reduction in fish movement, the discharger shall be responsible for restoration of conditions as necessary (as determined by the Water Board) to secure passage of fish across the structure.

12. **Dust Abatement:** Dust abatement chemicals added to water can be hazardous to wildlife and, if allowed to enter streams, detrimental to water quality. Therefore, dust abatement activities shall be conducted so that sediment or dust abatement chemicals are not discharged into waters of the state. Dust abatement products or additives that are known to be detrimental to water quality or wildlife shall not be used, unless specific management needs are documented, and product-specific application plans are approved by Water Board staff.

13. **Use of Mechanized Equipment:** Activities permitted under this Order shall be conducted in a manner that minimizes ground disturbance, soil compaction, rutting and other mechanical impacts. Equipment shall be operated and maintained in a manner that reduces the risk of spills or the accidental exposure of fuels or hazardous materials to water bodies or wetlands.

14. **Piers or Piles:** Piers or piles placed in the stream channel to support a linear transportation structure over a creek channel must be aligned parallel with the direction of flow to prevent erosive eddies.

15. **Access Routes**

    a. The number of access routes, number, and size of staging areas, and the total area of the ground disturbance shall be limited to the minimum necessary to achieve the project goal.

    b. Access routes that are intended for seasonal deactivation[2] or permanent decommissioning[3] shall be decommissioned as soon after use as possible, as follows:

        i. Access routes shall be in a condition that enables long-term, disconnected and maintenance-free drainage.

        ii. Drainages shall be fortified to endure the duration of planned decommissioning and prevent direct flows into waters.

        iii. Where feasible, a permanently decommissioned stream crossing shall be excavated to exhume the original, stable, stream bed and channel side-slopes, and then banks must be stabilized with materials including, but not limited to, mulch, seeding, replanting, and rock armoring, if anticipated flows may erode vegetated creek banks.

        iv. Soils exposed during seasonal deactivation or permanent decommissioning shall be stabilized or removed to prevent spoils erosion and sedimentation.

        v. Permanent access route decommissioning requires the restoration of natural drainage patterns and implementation of the approved restoration plan.

    c. Access routes shall be constructed using full bench construction and incorporate drainage structures with enough frequency to prevent saturated soils and erosion of access routes at the spacings specified in Table 1. If the spacings specified in Table 1 are infeasible for the

[2] "Seasonal deactivation" is the temporary decommissioning of a road to encourage disconnected drainage, stabilized soils, and prevent vehicle travel during the rainy season.

[3] "Permanent decommissioning" is the decommissioning of a road, in a location is no longer intended for vehicle travel, soils are stabilized, watercourse crossings are removed or stabilized, and the area's natural drainage patterns are restored.

work area, an explanation of the infeasibility must be provided, and an alternative means to preventing erosive discharges to waters of the state must be provided within the NOI.

Table 1. Drainage Structure Spacing Requirements (in feet) Depending on Road Grade and Erosion Hazard Rating[4]

Estimated Erosion Hazard Rating	Road Grade Less Than 10 % Feet	Road Grade 11-25% Feet	Road Grade 25-50% Feet	Road Grade Greater than 50% Feet
Extreme	100	75	50	50
High	150	100	75	50
Moderate	200	150	100	75
Low	300	200	150	100
Note: Estimated Erosion Hazard Rating evaluation procedures specified in California Code of Regulations, title 14, § 912.5.				

16. Road Surface Drainages

a. To the extent feasible, road surfaces and ditches shall be hydrologically disconnected from streams and stream crossings. Road surface runoff must be designed to disperse flows to appropriate upland areas, rather than concentrating flows to waters of the state.

b. Sediment contributions from roads, cutbanks, and ditches shall be minimized by utilizing the appropriate closures depending on site activity and incorporating the following surface drainage structures: berm removal, road surface shaping (outsloping, insloping or crowning), rolling dips, ditch relief culverts, waterbars and other designs. Where feasible, access route construction and reconstruction shall outslope the access route to facilitate natural drainage patterns.

c. Disconnected drainage structures shall be installed upslope of and in close proximity to watercourse crossings. The disconnected drainage

[4] California Department of Forestry and Fire Protection Resource Management, Forest Practice Program. 2021. California Forest Practice Rules

structure should be installed according to the spacing requirements in Table 1.

d. Dischargers shall prioritize locating the outflow of the road surface drainage structures towards stable areas with effective filter strips containing a high infiltration capacity, dense vegetation, or obstructions. Road surface drainage structure outflow shall not directly discharge to waters of the state or significant existing or potential erosion sites. Road surface drainage shall be managed to prevent erosion.

e. Functional ditch relief, including culverts, rolling dips, and crossroad drains, shall be spaced with enough frequency to prevent saturated soils and erosion of access routes.

f. All sediment and other material disturbed during blading and other road construction activities shall be contained and removed or stabilized with effective engineered sediment and erosion control practices. Cut or bladed sediment or other material shall not be pushed off the roadway and left uncontrolled and un-stabilized.

17. Watercourse Crossings

a. Rock ford or rock armored fill crossings shall be installed instead of culverts on watercourses in locations where watercourse crossings have a higher risk of failure due to their landscape position (e.g., in areas prone to debris flows or landslides) or in areas that lack seasonal access or in remote areas.

b. Remove or stabilize watercourse crossings as follows:

i. Fills shall be excavated to form a channel as close as feasible to the natural watercourse grade, and that is wider than the natural channel upstream and downstream of the crossing to be removed;

ii. Any resulting cut bank shall not exceed a grade of 65 percent from the outside edge of the channel to prevent slumping and prevent erosion; and

iii. Where it is not feasible to remove a watercourse crossing on a road proposed for abandonment, the NOI must identify how erosion and sedimentation will be avoided and minimized.

18. Culvert Construction or Maintenance

a. Cured in Place Pipe (CIPP) is prohibited in the absence of formulation specific toxicity data that establishes that it will not cause detrimental

physiological responses to human, plant, animal, or aquatic life, or cause discharges to waters of the state that do not comply with water quality objectives or goals.

b. Replacement of culverts acting as grade control structures is not authorized under this Order. A vertical gap between the culvert and the immediate downstream stream channel indicates that the culvert likely functions as a grade control structure.

c. Projects proposing to replace culverts must design and implement a fluvial geomorphically appropriate channel stabilization project to prevent any existing scour or headcutting from migrating upstream. Repairs may include, but are not limited to, fill of scour holes with appropriately sized rock riprap or the construction of rock weirs with appropriately sized rock that are keyed well into the channel banks to minimize the risk of flanking.

d. The replaced or maintained culvert shall be in alignment with the stream channel upstream and downstream of the culvert.

e. Any replacement culvert or culvert that is to be left in place by a repair or maintenance project must be placed at a gradient and orientation that will not result in erosional scour at the outlet.

f. Replacement of a culvert with a similarly sized culvert is allowable only where there is no visual indication that the existing culvert is undersized. Visual indications of undersized culverts include, but are not limited to: sediment aggradation upstream of the culvert; evidence of flow over the top of the culvert (e.g., erosional rills in dirt road surfaces or erosion of shoulders adjacent to paved road surfaces), erosion of the fill between the culvert and the road surface, scour pools at the culvert outlet, or erosion of creek banks immediately downstream of the culvert.

g. Unless infeasible, replacement culverts must be sized to convey a 100-year flow event with debris, without pressurizing flow passing through the culvert. The 100-year flow event should be modeled under climate change projections, if available.

h. Deep fills (deeper than a backhoe can reach from the roadbed) with undersized culverts or culverts with high plugging potential must be fitted with an emergency overflow structure to accommodate 100-year floods.

i. Culvert inlets shall have low plug potential (debris barriers or deflectors are installed where needed, as long as they will not create a barrier to passage in fish bearing creeks).

j. Culverts shall be installed at the base of the fill and in line with the natural channel.

k. Replaced or maintained culverts shall be in upstream and downstream alignment with the stream channel.

l. Extend culvert outlets to length that prevents erosion and sediment discharges into waters of the state at levels that exceed water quality objectives or impairs beneficial uses.

m. The Permittee shall first consider using arch culverts or free-span bridge alternatives to solid bottom culverts (e.g., cylindrical culverts or box culverts) during culvert installation and replacement.

n. New culverts must not be located in a meander bend of the stream channel. If a failed culvert is within a meander bend of the stream, the replacement culvert should be placed away from the meander bend.

o. Plastic culverts are prohibited from being installed in high-threat fire areas as mapped by CAL FIRE's Fire and Resource Protection Program[5].

19. Toxic and Hazardous Materials

a. Activities permitted under this Order shall not discharge toxic substances in concentrations that produce detrimental physiological responses to human, plant, animal, or aquatic life. CIPP formulations that have not been appropriately tested to demonstrate that they are not toxic to aquatic life that is likely to be present in the local watershed shall not be used in culvert rehabilitation projects.

b. Discharge of unset cement, concrete, grout, slurry, damaged concrete spoils, concrete dust, or water that has contacted uncured concrete or cement, or related washout to surface waters, ground waters, or land is prohibited. If concrete washout is necessary at the site, washout containment shall be used to prevent any discharge. Wastewater may only be disposed by delivery to a sanitary wastewater collection system/facility (with authorization from the facility's owner or operator) or a properly licensed disposal or reuse facility.

c. Appropriate BMPs must be implemented throughout project activities to prevent and control potential leaks/spills/drainage of potentially hazardous materials such as: non-petroleum hydraulic fluid; epoxies; paints and other protective coating materials; cement concrete or asphalt concrete; and washings and cuttings thereof.

[5] California Department of Forestry and Fire Protection. 2022. Fire and Response Assessment Program (FRAP). Accessed May 2022. Available at: https://frap.fire.ca.gov/

d. Activities permitted under this Order shall not discharge waste classified as "hazardous" as defined in California Code of Regulations title 22, section 66261 and Water Code section 13173. These BMPs shall include, at a minimum:

i. All personnel handling fuels and other hazardous materials shall be properly trained.

ii. Adequate spill prevention and cleanup equipment and materials shall be present on site at all times during project implementation.

iii. All mechanized equipment shall be maintained in good operating order and inspected on a regular basis.

iv. All on-site fuel trucks or fuel containers shall be stored in an area where risk of contamination of water bodies by leaks or spills is minimized.

v. All equipment shall be fueled, maintained, and/or parked overnight in an upland area at least 100 feet from any delineated waters of the state.

vi. Hazardous materials, including chemicals, fuels, and lubricating oils, shall not be stored within 100 feet of any delineated waters of the state, and shall be stored in appropriate containers with appropriate secondary containment.

vii. Pumps or other stationary equipment operating within 100 feet of a waterbody or wetland shall utilize appropriate secondary containment systems to prevent spills.

viii. Any spills or leaks of hazardous materials, chemicals, fuels, lubricants or any other potential pollutants shall be promptly and completely treated using appropriate materials and equipment.

ix. Spill containment supplies shall be on site in all work areas in sufficient quantities to allow immediate remediation of fuel, oil, hydraulic fluid or similar leaks and spills.

x. Staging area for equipment and vehicle fueling and storage shall be designated at least one-hundred (100) feet away from waters of the state, in a location where accidental discharges of fluids or fuels cannot flow into waters of the state. Whenever not feasible, as when staging is from barges, secondary containment around fuels and other fluids, such as lubricants and secondary fuels, shall be implemented.

e. Projects that create new wetlands or affect existing wetlands shall be designed to include features or management measures that reduce the production of methylmercury in the wetland, including minimizing the repeated wetting and drying of soils by keeping wetlands flooded. In addition, sediment control measures shall be implemented to reduce the transport of total mercury or methylmercury out of the wetland.

20. Invasive Species and Soil Borne Pathogens

a. The Permittee is responsible for ensuring that all project personnel follow proper weed control practices, and that appropriate weed prevention measures are included in project plans.

b. Any straw, hay or other unprocessed plant material used for any purpose must be certified or documented as being weed free.

c. To prevent the spread of soil borne pathogens[6], equipment must be cleaned prior to entering the site. Any equipment leaving the project area shall be thoroughly cleaned using methods appropriate for the known pathogen before leaving the project area, unless the Permittee documents that no known soil borne pathogen infestations are present within the project area. If equipment is to be cleaned on site, the cleaning station must be identified in the NOI and cannot be located within one-hundred feet of any waters of the state.

21. Work in Delineated Waters of the State

a. Work in waters of the state must not cause or contribute to an exceedance of water quality objectives in the receiving waters. Work in delineated waters commences at the onset of the regulated activity and continues until the activity is finished and all restoration of the affected work area is complete. The term “work” means any ground disturbing activities in any delineated waters of the state that are permitted under this Order, regardless of the presence or absence of flowing or standing water.

b. All temporary dewatering activities are subject to the work-in-water reporting and monitoring conditions presented in the Water Quality Monitoring Section of this Order.

[6] Soil borne pathogens are any nematodes, or any bacterial, protozoan, viral or fungal pathogens that can cause disease or death to native plants, agricultural crops or ornamental plants (e.g., Phytophthora ramorum, the cause of sudden oak syndrome, and Phytophthora lateralis, the cause of Port Orford cedar root disease). The fungus that causes Valley Fever, Coccidioides spp., is not considered a soil borne pathogen in this Order.

c. Temporary diversions or impoundments of water, cofferdams, or similar structures installed for the purpose of temporarily dewatering work areas shall be performed according to the In-water Work/Stream Diversion and Water Quality Monitoring Plan provided by the Permittee, and approved by the appropriate Regional Water Board, including appropriate monitoring for water quality upstream and downstream of diversion structures as required in the Water Quality Monitoring section of this Order.

d. All surface waters, including ponded waters, shall be diverted away from areas undergoing grading, construction, excavation, vegetation removal, and/or any other activity which may result in a discharge to waters of the state.

e. Equipment may not be operated in standing or flowing waters unless implementing the following conditions:

i. All construction activities must be effectively isolated from water flows to the greatest extent possible. This may be accomplished by working in the dry season or dewatering the work area. When work in standing or flowing water is required, structures for isolating the in-water work area and/or diverting the water flow must not be contaminated by construction activities. All open flow temporary diversion channels must be lined with filter fabric or other appropriate liner material to prevent erosion. Structures used to isolate the in-water work area and/or diverting the water (e.g., coffer dam, geotextile silt curtain) must not be removed until all disturbed areas are stabilized.

ii. If groundwater dewatering is required for the project, the Permittee shall comply with applicable existing PG&E NPDES permit requirements. If additional Water Board dewatering permits are required, the designated Water Board staff contact must be notified and copied on pertinent correspondence pertaining to those other required permits.

iii. All temporary dewatering and stream diversion methods shall be designed to have the minimum necessary impacts to waters of the state. All stream diversion methods shall be installed such that natural flow is maintained upstream and downstream of the diversion area. Any temporary dams or diversions shall be installed such that the diversion does not cause sedimentation, siltation, or erosion upstream or downstream of the diversion area. Diverted flows must be of sufficient quality and quantity, and of appropriate temperature, to support existing fish and other aquatic life both above and below the diversion. Pre-project flows must be restored to the affected surface water body upon completion of work at that

location. All dewatering and stream diversion methods shall be removed immediately upon completion of activities for which dewatering or diversions are needed.

22. Stormwater

If the project is required to obtain coverage under the NPDES General Permit for Storm Water Discharges Associated with Construction and Land Disturbance Activities (Order No. 2009-0009-DWQ or 2022-0057-DWQ; NPDES No. CAS000002) (Construction General Permit), the Permittee shall comply with the requirements in the Construction General Permit. Generally, coverage under the Construction General Permit is required for construction activity resulting in a land disturbance of one acre or more, or less than one acre but is part of a larger common plan of development or sale that results in a land disturbance of one acre or more. Covered activities are described with additional detail in the Construction General Permit.

Compliance with the Construction General Permit constitutes compliance with Erosion and Sediment Control Conditions a and b below.

a. Erosion and Sediment Control

i. No later than 24 hours prior to the start of a likely precipitation event, the Permittee shall ensure that disturbed areas that drain to waters of the state are protected with correctly installed erosion and sediment control measures (e.g., jute, straw, coconut fiber erosion control fabric, coir logs, straw wattles, silt fence) or revegetated with propagules (e.g., seeds, cuttings, divisions) of locally collected native plants. Erosion control measures that contain monofilament mesh shall not be used. The likely precipitation event is defined as any weather pattern that is forecast to have a 50 percent or greater probability of producing precipitation in the project area. The Permittee shall maintain a daily record of precipitation forecast information which can be provided to the Water Board upon request.

ii. The timing for installation of the post-construction stormwater BMP subdrains, soils, mulch, and plants shall be scheduled to ensure that the installed bioretention areas do not receive runoff from exposed or disturbed areas that have not been landscaped. The constructed post-project stormwater BMPs shall not receive site runoff until all project landscaping is planted, and effective erosion control measures implemented to ensure that the stormwater features are protected from sediment accumulation.

b. Storm Water Management

i. Disturbed areas in delineated waters of the state and adjacent areas that drain to waters of the state must be temporarily stabilized to prevent erosion and accidental discharges into waters of the state at least 24 hours prior to any likely precipitation event. A likely precipitation event is any weather pattern that is forecast to have a 50 percent probability of producing precipitation in the project area, as predicted by a reliable weather forecast. If commencement of a precipitation event is predicted to begin less than 24 hours after the forecast is issued, temporary stabilization of the disturbed in-water work areas must begin immediately.

ii. No individual construction activity that could discharge sediment or other pollutants may be initiated if that activity and its associated erosion control measures cannot be completed prior to the onset of precipitation. After any rain event, the discharger shall inspect all sites currently under construction and all sites scheduled to begin construction within the next 72 hours for erosion and sedimentation problems and take corrective action as needed.

23. Directional Drilling

Because Horizontal Directional Drilling (HDD) and similar drilling operations may affect water quality, the following conditions shall apply to all drilling operations under waters of the state:

a. The discharge of bentonite, drilling muds, lubricants, or any drilling compounds into waters of the state is prohibited. A draft HDD or drilling plan shall be prepared and submitted to the Water Board for review at least 30 days before drilling activities under waters of the state.

b. Release of bentonite, drilling muds, lubricants, or any drilling compounds through fractures in the streambed or bank substrate during drilling is referred to as a “frack-out.” Because of the potential for frack-outs to occur, the HDD drilling plan shall include a frack-out response plan. The frack-out response plan shall specify all measures to be initiated if frack-outs should occur during HDD operations.

c. For all HDD and other drilling sites, a means of containment (e.g., damming, fluming) or screen capable of capturing all of the potential discharge shall be described in the HDD drilling plan. The downstream end of any such containment structure shall be capable of containing all bentonite or other drilling muds or debris that may be released during boring or drilling. Any drilling mud, spoils, etc. must be completely

removed from the streambed prior to removal of the containment structures (e.g., dam, flume, and screen).

d. An environmental monitor shall provide monitoring for compliance with the HDD or drilling plan throughout drilling operations under waters of the state.

e. Any HDD or other drilling operation shall be designed and directed in such a way as to minimize the risk of discharging spoils or other materials, including the frack-out release of drilling lubricants through fractures in the streambed or bank substrates, to waters of the state. In substrates where frack-outs are likely to occur, HDD contractors shall employ all reasonable means and methods available to minimize potential for frack-out.

f. All drilling muds or compounds will be contained and properly disposed of after drilling activities are completed.

g. If bore pits are excavated to support drilling operations, spoils shall be stored a minimum of 25 feet from the top of the bank of streams or wetland/riparian boundary, where feasible; if site specific conditions warrant storing spoils less than 25 feet from the top of the bank of streams or wetland/riparian boundary this request must be provided in the HDD or drilling plan submitted to the Water Board prior to any drilling activities with potential impacts to waters of the state. Spoils shall be stored behind a sediment barrier and covered with plastic or otherwise stabilized (e.g., tackifiers, mulch, or detention).

G. Restoration and Mitigation for Temporary Impacts

1. The Permittee shall restore all areas of temporary impacts to waters of the state and all project site upland areas of temporary disturbance which could result in a discharge to waters of the state as described in a restoration plan approved by the appropriate Regional Water Board.

The restoration plan shall be submitted to the appropriate Regional Water Board for review and approval with the NOI. The restoration plan shall provide the following: a schedule; plans for grading of disturbed areas to pre-project contours; a planting palette with plant species native to the project area; seed collection location; invasive species management; performance standards; and maintenance requirements (e.g., watering, weeding, and replanting).

2. In cases where implementation actions in the restoration plan cannot be reasonably conducted within one year of impacts to waters of the state, or where the adverse temporary impacts result in temporary loss of aquatic resource function(s), the Permittee may be required to provide compensatory mitigation to offset temporal loss of waters of the state. Examples of additional mitigation include, but are not limited to, enhancement activities

such as increasing the presence of native species and reducing dominance of non-native/invasive species, native willow staking, planting of native riparian vegetation, and trash removal.

3. The Water Board may extend the monitoring period beyond requirements of the restoration plan upon a determination by Water Board staff that the performance standards have not been met or are not likely to be met within the monitoring period.

H. Mitigation for Permanent Impacts

1. Compensatory mitigation is required to offset permanent impacts to waters of the state, unless the Permittee has demonstrated that the project authorized by this Order will restore or improve the ecological function of the impacted aquatic resource. Generally, compensatory mitigation shall take place within the same watershed as the impact site, but the permitting Water Board may approve compensatory mitigation in a different watershed or programmatic mitigation across one or multiple watersheds. Mitigation that occurs outside of the impacted watershed may require additional mitigation. When compensatory mitigation is required, the Permittee shall provide the following:

a. A draft compensatory mitigation plan at a level of detail sufficient to accurately evaluate whether compensatory mitigation offsets the adverse impacts attributed to the project considering the overall size and scope of impact.

b. Compensatory mitigation shall provide a minimum of a one-to-one mitigation to impact ratio, measured in area and length for mitigation banks, advanced mitigation, and in-lieu fee programs. Mitigation is required to ensure compliance with Executive Order W-59-93 that requires no net loss of the structure or function of California's wetland resources.[7] Mitigation should be in kind as much as is feasible. If mitigation is out-of-kind, the amount of mitigation should be increased. When mitigation is constructed, enhanced, or preserved offsite, the amount of mitigation should be increased to account for the distance between the impact site and the mitigation site. The amount of mitigation should also account for the uncertainty associated with the successful creation of a mitigation site. The Water Board will require a higher overall mitigation ratio where necessary to ensure replacement of lost aquatic resource functions and

[7] Includes temporary direct impacts to waters of the state and does not include upland areas of temporary disturbance which could result in a discharge to waters of the state. Temporary impacts, by definition, are restored to pre-project conditions and therefore do not include a physical loss of area or permanent degradation of ecological condition.

for permittee responsible mitigation conducted concurrently with impacts, subject to approval by the appropriate Regional Water Board.

c. Subject to approval by the appropriate Water Board, mitigation may be satisfied using any of the following compensatory mitigation methods: restoration, enhancement, and/or establishment.

d. No discharge of dredged or fill material to waters of the state shall occur prior to Water Board approval of a final mitigation plan covering the impacted site. The mitigation plan may be provided in advance of the identification of specific projects subject to Regional Water Board approval.

X. Public Notice

The State Water Board provided public notice of the application and draft certification pursuant to California Code of Regulations, title 23, section 3861 from July 12, 2022, to August 26, 2022. The State Water Board did not receive any comments during that comment period. In addition, the State Water Board noticed the draft order in accordance with Water Code section 13167.5 beginning on February 7, 2023 and ending on March 9, 2023. The State Water Board did not receive any comments during that comment period.

XI. California Environmental Quality Act (CEQA)

On June 21, 2022, the California Department of Fish and Wildlife, as lead agency, certified an environmental impact report State Clearinghouse No. 2017122028 for the Project and filed a Notice of Determination at the State Clearinghouse on July 7, 2022. Pursuant to CEQA, the Water Board has made Findings of Facts (Findings) which support the issuance of this Order and are included in Attachment E.

XII. Petitions for Reconsideration

Any person aggrieved by this action may petition the Water Board to reconsider this Order in accordance with California Code of Regulations, title 23, section 3867. A petition for reconsideration must be submitted in writing and received within 30 calendar days of the issuance of this Order.

XIII. Water Quality Certification and Waste Discharge Requirements

I hereby issue the Order for the Pacific Gas and Electric Company Bay Area Operations and Maintenance Program, SB21039IN, certifying that as long as all of the conditions listed in this Order are met, any discharge from the referenced Project will comply with the applicable provisions of Clean Water Act sections 301 (Effluent Limitations), 302 (Water Quality Related Effluent Limitations), 303 (Water Quality Standards and Implementation Plans), 306 (National Standards of Performance), and 307 (Toxic and Pretreatment Effluent Standards).

All Order actions are contingent on: (a) the discharge being limited and all proposed mitigation being completed in strict compliance with the conditions of this Order and the attachments to this Order; and (b) compliance with all applicable requirements of Statewide Water Quality Control Plans and Policies and the Regional Water Boards' Water Quality Control Plans.

Karen Mogus Digitally signed by Karen Mogus
Date: 2023.04.04 09:28:28 -07'00'

Date

Karen Mogus, Deputy Director
Division of Water Quality

DEPARTMENT OF THE ARMY
SAN FRANCISCO DISTRICT, U.S. ARMY CORPS OF ENGINEERS
450 GOLDEN GATE AVENUE
SAN FRANCISCO, CALIFORNIA 94102

DEPARTMENT OF THE ARMY PERMIT
REGIONAL GENERAL PERMIT 40
Pacific Gas and Electric Bay Area Operations and Maintenance Program

PERMITTEE: Jon Wilcox, Pacific Gas and Electric Company (PG&E)

PERMIT NO.: SPN-2018-00490

ISSUING OFFICE: San Francisco District

NOTE: The term "you" and its derivatives, as used in this permit, means the permittee or any future transferee. The term "this office" refers to the appropriate District or Division office of the Corps of Engineers having jurisdiction over the permitted activity or the appropriate official of that office acting under the authority of the commanding officer.

This Regional General Permit (RGP) will be used to authorize projects in accordance with the terms and conditions specified below:

PROJECT DESCRIPTION:

RGP 40 will be used to authorize routine activities under PG&E's Bay Area Operation and Maintenance (O&M) Program to maintain safe and operable electrical and gas utility infrastructure, including maintenance and repair of PG&E's gas and electrical transmission and distribution systems. Activities include inspecting and testing valves, enclosures, and other components; repairing and replacing facilities, structures, and access roads; electrical transmission and distribution reconductoring projects; and gas pipeline replacement. All proposed activities shall be submitted to the U.S. Army Corps of Engineers (USACE) for authorization under this RGP. Individual O&M projects eligible for coverage under this RGP include a variety of maintenance and related activities that may result in minor temporary or permanent impacts to waters of the United States. Covered projects will generally fall within the following categories (letter codes correspond with activity categories described in the 401 certification):

Natural Gas Infrastructure

A. Internal pipeline inspection and repair: Inspection of pipelines for anomalies in accordance with the Pipeline Safety Act. If an anomaly is found, vegetation will be removed, the pipeline will be excavated, repaired and backfilled. Typical repairs include sleeve repairs involving sandblasting and welding.
B. Valve recoating and replacement: Replacement or recoating of malfunctioning or worn valves. To coat the entire valve to the connection point, vegetation will be removed, the valve must be excavated to expose the pipe and then backfilled once work is complete.
C. Pipeline cathodic protection: Installation of a type of anode (e.g., horizontal anode bed, flex anode, deep well anode) parallel and adjacent to the existing pipeline. The anode installation involves vegetation removal, trenching, backfilling, and recontouring upon completion.
D. Pipeline lowering and replacement: Replacement of pipeline segments due to damage caused by construction projects, acts of nature, or aging and corrosion. Replacement involves clearing vegetation and grading the rights-of-way, trenching and excavating the existing pipeline, and installing the new pipeline parallel and adjacent to the existing pipeline. The minimum length of pipe replaced is typically 40 feet (for one joint of pipe), though up to 1 mile could be replaced.
E. Pipeline recoating: Pipeline to be recoated is excavated (after any vegetation is removed) and old coating is removed from the pipeline by jetting, scraping, or sandblasting. The surface of the pipe is prepared for the new coating of epoxy by running a self-contained grit or shot-blasting machine over the area. Following repairs, the area is backfilled.
I. Site-specific erosion solutions: Installation and maintenance of site-specific solutions such as biodegradable jute netting, riprap, or rock fill to remediate scouring and erosion within waterways resulting in pipe exposure and prevent further damage to the pipeline. Site preparation for site-specific erosion solutions may include vegetation removal. **RGP 40 does not cover installation of riprap or other hardscape in waters with salmonids or their designated critical habitat listed under the Endangered Species Act (ESA).**

J. Water diversion (limited to freshwater features with no ESA-listed fish): Installation of diversion structures (e.g., dam/weir, pump, or headgate) to divert water through a temporary ditch or pipe to convey the water around a section of pipeline to be repaired. These techniques are employed to repair pipeline crossings within water features that have flowing water to minimize impacts to water quality and create a safe work area. Site preparation for water diversion may include vegetation removal. **RGP 40 does not cover dewatering/diversion for gas line activities in waters where ESA listed salmonids or green sturgeon may be present** – gas line maintenance in these waters can only be covered if all work can be conducted when the site is naturally dry (e.g. in high marsh areas which are typically only inundated during extreme high tides, or in seasonal stream reaches which have no surface flow during the summer dry season).

Electrical Infrastructure

G. Transmission tower maintenance: Conducting routine repair of replacement of towers and tower foundations located in waters of the U.S. Depending on the topography of the site, any of the following methods may be used to access the site and/or stage materials: vegetation removal, rubber mats placed at footings, temporary boardwalk constructed, barges or helicopter. Pile installation may be required, and temporary cofferdams may be used to dewater areas around foundation work in estuarine or lacustrine waters.

H. Boardwalk maintenance: Repairs and maintenance related to boardwalks that service transmission facilities in the vegetated margins, mudflats, and open water around San Francisco Bay. All repair and replacement activities are completed manually and require the use of generators and handheld equipment. Access and staging to support boardwalk maintenance may require vegetation removal. Some work may be completed from barges and/or from the mudflat during low tide.

K. Power pole maintenance: Reinforce poles by installing trusses to existing poles, or fiber-wrapping the pole with preservative material to reduce rate of deterioration. Steel trusses are driven to pre-define depths and secured with high-strength steel banding. Remove poles that cannot be repaired and replace with new wood poles or light-duty steel poles, which may require the installation of guy wires and anchors, which could consist of a screw or a concrete structure, and the removal of vegetation.

L. Line reconductoring: Replacing existing conductors with new conductors along the line. This may require staging areas, work areas, temporary guard structures, and pull sites (temporary construction areas) within waters of the U.S. Reconductoring is typically completed in 2- to 3-mile sections with the use of pull sites. Vegetation mowing and minor grading may be required to prepare pull sites. Mats or gravel may also be used in wet locations. Guard structures are typically standard wood poles across which temporary netting is strung; in some cases, specifically equipped boom trucks are used instead of poles.

General Maintenance and Mitigation

F. Substation maintenance: Accessing substations to perform maintenance tasks, which may require use of station property or adjacent property for construction staging and materials storage, which might require vegetation removal and/or fill to develop safe temporary work areas for equipment and crews, which may affect waters of the U.S.

M. Site access development and maintenance: Routine operations and maintenance activities may require access road maintenance such as blading, moving or establishing berms, vegetation or debris, clearing and making functional drain inlets to culverts, culvert repair or replacement, establishing waterbars, repairing over-side drains, and the repair or replacement of storm water diversion devices. Protective security fencing is sometimes installed around pipeline facilities, which requires digging holes to install fence posts using an auger. **RGP 40 does not cover dewatering for culvert repair/replacement in waters where ESA listed salmonids may be present** – culvert maintenance in these waters can only be covered if all work can be conducted when the site is naturally dry, and the finished culvert meets the most current NMFS guidelines for fish passage at stream crossings.

N. Minor New Construction: Construction adjacent to existing facilities and/or in utility or road rights-of-way would be limited to new gas pressure limiting stations (with an impact of up to 1 acre of natural vegetation), electrical substation minor expansions (with up to 3 acres of impacts on natural vegetation), or underground electric lines.

O. Other Activities: Additional operation and maintenance activities include natural gas line and electrical patrols and inspections, compressor station upgrades and maintenance, pipeline electric test system installations, telecom site maintenance, insulator washing or replacement, outage repairs, facility installations, and others. In the course of conducting these other activities, vegetation impacts may occur.

P. Restoration and Mitigation Activities: Implementing approved compensatory mitigation associated with this permit (creation, reestablishment, restoration, or enhancement), with impacts to waters of the U.S. This RGP will cover compensatory mitigation activities by PG&E or by independent land managers in jurisdictional waters associated with habitat management, monitoring, and enhancement activities. These activities shall be consistent with all measures included in this permit and site-specific mitigation plans as approved by USACE and other agencies.

PROJECT LOCATION: Projects to be authorized under this RGP may occur at any of PG&E's gas and electric transmission and distribution facilities, facility rights-of-way and access routes, and mitigation areas which intersect waters of the U.S. within the O&M Program Area, consisting of the nine Bay Area counties of Alameda, Contra Costa, Marin, Napa, San Francisco, San Mateo, Santa Clara, Sonoma, and Solano (enclosure 1). The O&M program area totals approximately 288,495 acres and coincides with the PG&E Bay Area Habitat Conservation Plan (HCP) established in 2017. Most of the nine-county program area is within the USACE San Francisco District. Portions of the program area in eastern Solano and Contra Costa Counties and northeastern Alameda County are within the USACE Sacramento District, but O&M projects in these areas may be authorized by San Francisco District under this RGP.

PERMIT CONDITIONS:

GENERAL CONDITIONS:

1. The time limit for completing the work authorized ends on December 31, 2027. If you find that you need more time to complete the authorized activity, submit your request for a time extension to this office for consideration at least one month before the above date is reached.

2. You must maintain the activity authorized by this permit in good condition and in conformance with the terms and conditions of this permit. You are not relieved of this requirement if you abandon the permitted activity, although you may make a good faith transfer to a third party in compliance with General Condition 4 below. Should you wish to cease to maintain the authorized activity or should you desire to abandon it without a good faith transfer, you must obtain a modification of this permit from this office, which may require restoration of the area.

3. If you discover any previously unknown historic or archeological remains while accomplishing the activity authorized by this permit, you must immediately notify this office of what you have found. We will initiate the Federal and State coordination required to determine if the remains warrant a recovery effort or if the site is eligible for listing in the National Register of Historic Places.

4. If you sell the property associated with this permit, you must obtain the signature of the new owner in the space provided and forward a copy of the permit to this office to validate the transfer of this authorization.

5. For your convenience, a copy of the water quality certification or waiver is attached (enclosure 2). If a conditioned water quality certification has been issued for your project, you must comply with the conditions specified in the certification as special conditions to this permit.

6. You must allow representatives from this office to inspect the authorized activity at any time deemed necessary to ensure that it is being or has been accomplished in accordance with the terms and conditions of your permit.

7. You understand and agree that, if future operations by the United States require the removal, relocation or other alteration of the structure or work authorized herein, or if, in the opinion of the Secretary of the Army or his

authorized representative, said structure or work shall cause unreasonable obstruction to the free navigation of the navigable waters, you will be required, upon due notice from the Corps of Engineers, to remove, relocate, or alter the structural work or obstructions caused thereby, without expense to the United States. No claim shall be made against the United States on account of any such removal or alteration.

SPECIAL CONDITIONS:

1. To remain exempt from the prohibitions of Section 9 of the Endangered Species Act, the non-discretionary terms and conditions for incidental take of federally-listed species shall be fully implemented as stipulated in the Biological Opinions from US Fish and Wildlife Service (USFWS) titled "*Final Programmatic Formal Consultation for the Pacific Gas and Electric Company's (PG&E) Bay Area Operation and Maintenance (O&M) Program in Alameda, Contra Costa, Marin, Napa, Santa Clara, San Francisco, San Mateo, Solano, and Sonoma Counties, California*" (USFWS file # 08FBDT00-2020-F-0197), dated August 6, 2021 (enclosure 3), and from National Marine Fisheries Service (NMFS) titled "*Endangered Species Act Section 7(a)(2) Biological Opinion and Magnuson–Stevens Fishery Conservation and Management Act Essential Fish Habitat Response for the Pacific Gas and Electric Company's Bay Area Operation and Maintenance Program*" (NMFS file # WCRO-2021-028), dated April 6, 2023 (enclosure 4). Projects shall also follow all applicable provisions of the 2017 Habitat Conservation Plan (HCP) and associated Incidental Take Permit (ITP) for the PG&E Bay Area O&M Program. Project authorization under this permit is conditional upon compliance with the mandatory terms and conditions associated with incidental take. Failure to comply with the terms and conditions for incidental take, where a take of a federally-listed species occurs, would constitute an unauthorized take and non-compliance with the authorization for your project. The USFWS and or NMFS are, however, the authoritative federal agency for determining compliance with their incidental take statements and for initiating appropriate enforcement actions or penalties under the Endangered Species Act.

2. NMFS and USFWS concurred with the determination that the program is not likely to adversely affect federally listed South-Central California Coast steelhead *(Oncorhynchus mykiss)*, California Coastal Chinook salmon (*O. tshawystsha*), Central California Coast coho salmon (*O. kisutch*), or designated critical habitat for these species or for the soft bird's-beak (*Chloropyron molle* ssp. *molle*). Their concurrences were premised, in part, on avoidance and minimization measures, conservation measures, and proposed mitigation listed on pages 19-25 of the April 6, 2023 NMFS BO (enclosure 4), and on pages 13-17 of the August 6, 2021 USFWS BO (enclosure 3). A complete list of avoidance and minimization measures and conservation measures for NMFS species and critical habitat are included in PG&E's September 2022 Biological Assessment (section 2.1 and attachment A), and revised and expanded in PG&E's March 2023 Supplemental Biological Assessment (section 4). All the above measures are incorporated as special conditions to this RGP to ensure unauthorized incidental take of species and loss of critical habitat does not occur.

3. USACE initiated consultation with NMFS to address project related impacts to Essential Fish Habitat (EFH). The conservation recommendations listed on page 85 of the NMFS Biological Opinion (enclosure 4) shall be implemented as follows:

a. EFH recommendations 1 and 2 shall be fully implemented by following all non-discretionary terms and conditions for incidental take of federally-listed species, as required in special condition 1.

b. To be consistent with EFH recommendation 3, PG&E shall perform hydroacoustic monitoring at a minimum of 2 sites per calendar year, on a minimum of 8 total piles when an impact hammer is utilized on steel piles between 20 inches and 60 inches diameter in water depths greater than 3 feet at MLLW, and when a coffer dam is not used to dewater the site prior to piledriving. If PG&E uses an impact hammer to install 20-60 inch piles at only one site and/or less than 8 total piles in a calendar year, then all piles installed under these conditions shall be hydro-acoustically monitored. Monitoring results shall be included along with other required hydroacoustic monitoring results in PG&E's annual report to NMFS and USFWS.

4. For all projects proposed for authorization under this RGP, PG&E shall submit digital copies of project information to USACE, USFWS, and NMFS at least 45 days prior to any planned project activities. The project submissions shall include copies of the pre-construction notification/notice of intent (PCN-NOI) form for the PG&E Bay Area O&M Program (enclosure 5), detailing the types of activities planned, anticipated dates of commencement and completion, locations and descriptions of the proposed projects, project drawings or design plans, and summary of impacts to streams, wetlands, or other waters including proposed dewatering, grading, or other temporary or permanent fill discharge for each project. The project information submitted to USACE shall also include the latest version of the USACE ORM Aquatic Resources and Consolidated Upload Spreadsheet, using the Aquatic Resources tab and Impacts tab to provide required information for all proposed projects, including details on the aquatic resources and proposed fill impacts for each project.

5. PG&E shall provide a summary of cultural resource information for each project area, including surrounding archaeological sensitivity, and any known or suspected historic property, tribal cultural property, or other cultural resource within project areas. For any proposed project with the potential to affect a historic property, PG&E shall include sufficient information for USACE to initiate consultation with the State Historic Preservation Officer under section 106 of the National Historic Preservation Act. In the event any previously unknown historic, cultural or archeological remains or artifacts are discovered while conducting an activity authorized by this RGP, PG&E must immediately notify USACE of the discovery and avoid further activities that may affect the resource until the required section 106 coordination has been completed.

6. Proposed projects within the coastal zone must comply with Coastal Zone Management Act (CZMA) requirements. PG&E shall submit appropriate documentation of CZMA compliance to USACE, including current copies of any required permits from the San Francisco Bay Conservation and Development Commission (BCDC) or California Coastal Commission (CCC).

7. Compensatory mitigation compliant with the 2008 mitigation rule shall be provided for the expansion of hardscape or armoring within waters of the U.S., increasing culvert length, converting waters of the U.S. to upland, or permanent impacts to wetland waters of the U.S. Compensatory mitigation would not be required by USACE for replacement of existing hardscape that does not increase the footprint of the existing hardscape within waters of the U.S.; vegetation and sediment removal activities that do not permanently impact wetland waters of the U.S.; or biotechnical bank stabilization activities that do not result in a loss of wetland or other waters of the U.S.

8. For purposes of compensatory mitigation required by USACE under this RGP, the program area is divided into 4 mitigation regions: North Bay (Marin, Sonoma, Napa, and Solano Counties); East Bay (Contra Costa and Alameda Counties); Peninsula (San Francisco and San Mateo Counties); and South Bay (Santa Clara County). If the overall permanent impacts within any one mitigation region exceeds 0.1 acre within the 5- year period of this RGP, compensatory mitigation shall be required for all permanent impacts to waters of the U.S. within that mitigation region. Should the overall permanent impacts to waters of the U.S. within any mitigation region be anticipated to exceed 0.1 acre, a mitigation plan compliant with the 2008 mitigation rule shall be submitted for all impacts cumulatively greater than 0.1 acre in that mitigation region. Proposed compensatory mitigation shall ensure no overall net loss in quantity or quality of waters of the U.S., and shall occur within the same region as the impacts.

9. Compensatory mitigation for permanent impacts to waters of the U.S. may include enhancement, rehabilitation, establishment, or reestablishment of waters of the U.S. Preservation of particularly rare or threatened aquatic resources may only be considered if proposed in combination with other forms of mitigation. Compensatory mitigation for permanent impacts to waters of the U.S. shall be commensurate with the amount and type of impacts that have occurred/are proposed to occur under the O&M Program. Invasive plant removal and native plant establishment alone may not be considered acceptable mitigation for permanent impacts to waters of the U.S. but may be included as part of a larger mitigation plan.

10. PG&E shall be responsible for monitoring any permittee-responsible mitigation for a minimum of 5 years depending on the mitigation project. Mitigation sites involving revegetation shall be monitored by a qualified biologist or vegetation specialist to evaluate successful establishment and survival of plantings. Monitoring and reporting will be compliant with the 2008 mitigation rule. Any mitigation required by USACE will not be considered fulfilled until you have submitted documentation of final mitigation success, and have received written verification from USACE.

FURTHER INFORMATION:

1. Congressional Authorities: You have been authorized to undertake the activity described above pursuant to:

(x) Section 10 of the Rivers and Harbors Act of 1899 (33 U.S.C. Section 403).

(x) Section 404 of the Clean Water Act (33 U.S.C. Section 1344).

( ) Section 103 of the Marine Protection, Research and Sanctuaries Act of 1972 (33 U.S.C. Section 1413).

2. Limits of this authorization:

a. This permit does not obviate the need to obtain other Federal, State, or local authorizations required by law.

b. This permit does not grant any property rights or exclusive privileges.

c. This permit does not authorize any injury to the property or rights of others.

d. This permit does not authorize interference with any existing or proposed Federal project.

3. Limits of Federal Liability: In issuing this permit, the Federal Government does not assume any liability for the following:

a. Damages to the permitted project or uses thereof as a result of other permitted or unpermitted activities or from natural causes.

b. Damages to the permitted project or uses thereof as a result of current or future activities undertaken by or on behalf of the United States in the public interest.

c. Damages to persons, property, or to other permitted or unpermitted activities or structures caused by the activity authorized by this permit.

d. Design or construction deficiencies associated with the permitted work.

e. Damage claims associated with any future modification, suspension, or revocation of this permit.

4. Reliance on Applicant's Data: The determination of this office that issuance of this permit is not contrary to the public interest was made in reliance on the information you provided.

5. Reevaluation of Permit Decision: This office may reevaluate its decision on this permit at any time the circumstances warrant. Circumstances that could require a reevaluation include, but are not limited to, the following:

a. You fail to comply with the terms and conditions of this permit.

b. The information provided by you in support of your permit application proves to have been false, incomplete, or inaccurate. (See Item 4 above.)

c. Significant new information surfaces which this office did not consider in reaching the original public interest decision.

Such a reevaluation may result in a determination that it is appropriate to use the suspension, modification, and revocation procedures contained in 33 C.F.R. § 325.7 or enforcement procedures such as those contained in 33 C.F.R. §§ 326.4 and 326.5. The referenced enforcement procedures provide for the issuance of an administrative order requiring you to comply with the terms and conditions of your permit and for the initiation of legal action where appropriate. You will be required to pay for any corrective measures ordered by this office, and if you fail to comply with such directive, this office may in certain situations (such as those specified in 33 C.F.R. § 209.170) accomplish the corrective measures by contract or otherwise and bill you for the cost.

6. Extensions: General Condition 1 establishes a time limit for the completion of the activity authorized by this permit. Unless there are circumstances requiring either a prompt completion of the authorized activity or a reevaluation of the public interest decision, USACE will normally give favorable consideration to a request for an extension of this time limit.

Your signature below, as permittee, indicates that you accept and agree to comply with the terms and conditions of this permit.

Jon Wilcox Digitally signed by Jon Wilcox
Date: 2023.06.22 14:15:01 -07'00'

(PERMITTEE) (DATE)

This permit becomes effective when the Federal official, designated to act for the Secretary of the Army, has signed below.

Digitally signed by James Mazza
Date: 2023.06.22 16:31:38 -07'00'

James Mazza
Chief, Regulatory Division

(DATE)

When the structures or work authorized by this permit are still in existence at the time the property is transferred, the terms and conditions of this permit will continue to be binding on the new owner(s) of the property. To validate the transfer of this permit and the associated liabilities associated with compliance with its terms and conditions, have the transferee sign and date below.

(TRANSFEREE) (DATE)

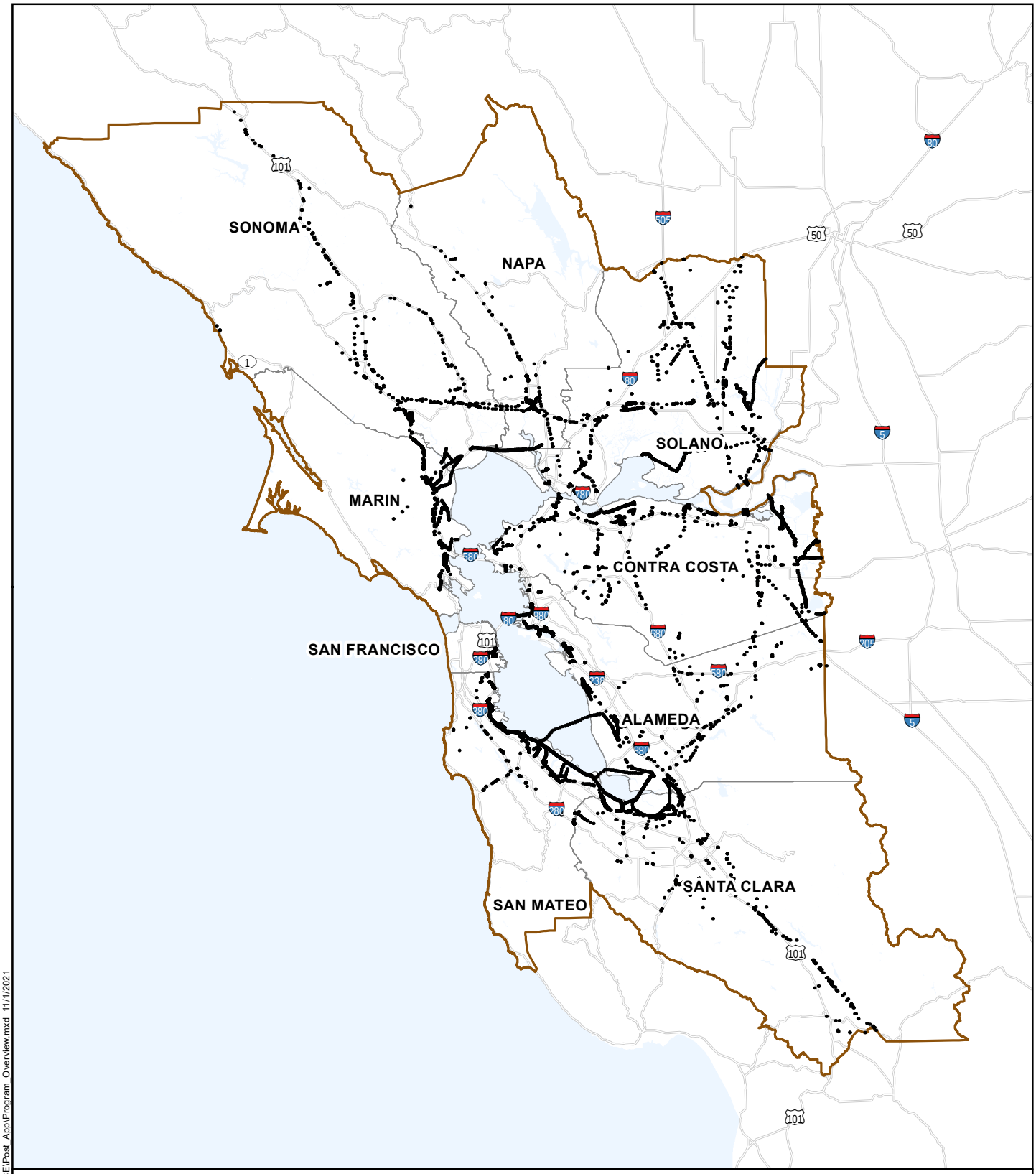


Figure 2: Program Overview Map

PG&E Bay Area Regional General Permit

Facilities within Waters of the U.S. and/or Waters of the State in the Program Area

Nine-county Area

County Boundary

Major Road

1 inch = 19 miles

Miles

0 5 10

Pacific Gas and Electric Company®

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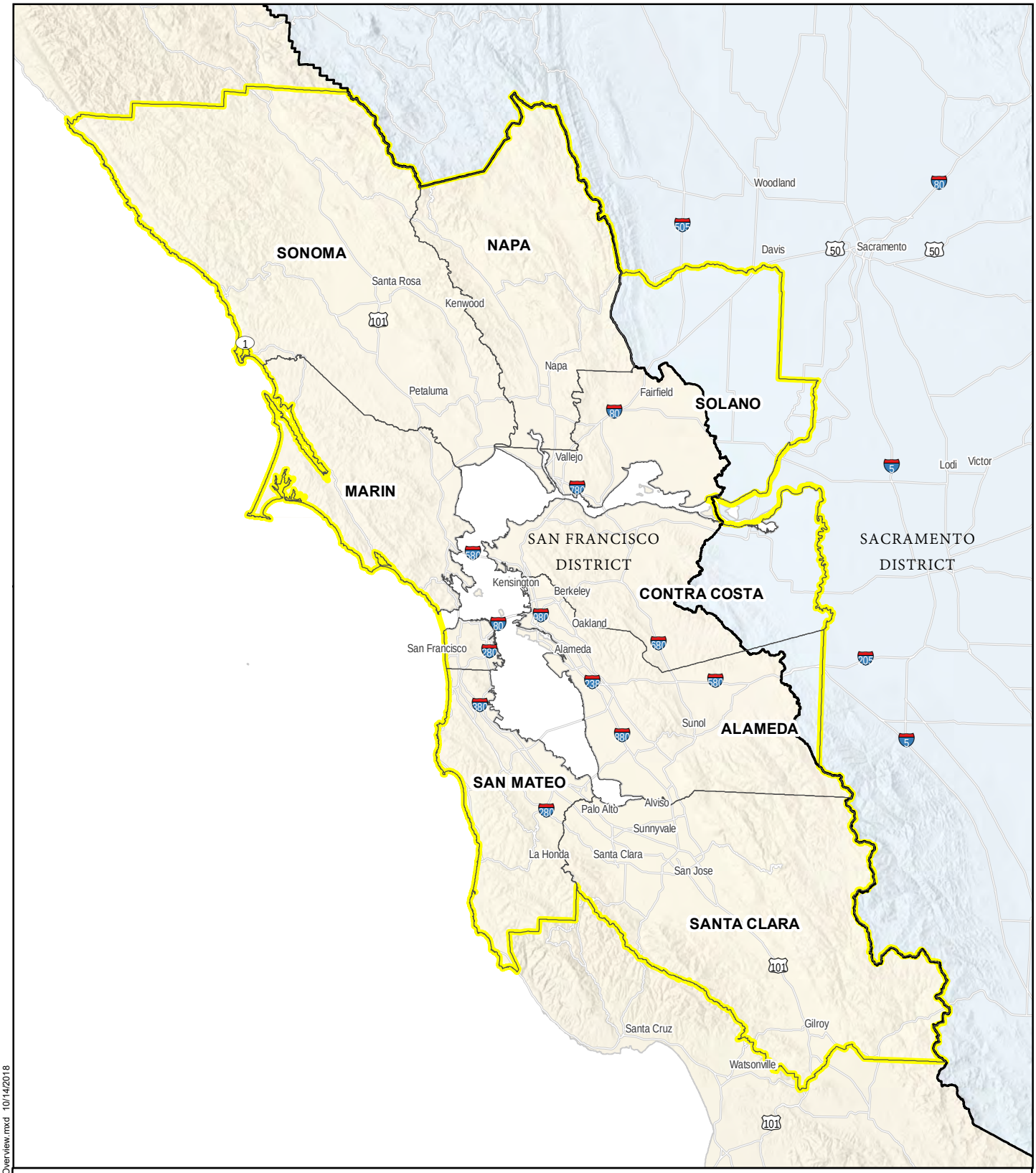


Figure 1: Program Area Overview Map **PG&E Bay Area Regional General Permit**

Bay Area Habitat Conservation Plan Boundary/Program Area

County Boundary

United States Army Corps of Engineers Regulatory Boundary

Major Road

San Francisco District (88% of Program Area)

Sacramento District (12% of Program Area)

1 inch = 19 miles

Miles

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State Water Resources Control Board

WATER QUALITY ORDER NO. WQ 2023-0022-DWQ WASTE DISCHARGE REQUIREMENTS AND CLEAN WATER ACT SECTION 401 WATER QUALITY CERTIFICATION

Effective Date:	April 4, 2023	**Reg. Meas. ID:**	428347
		Place ID:	855396
Program Type:	Fill/Excavation	**WDID No:**	SB21039IN
Project Type:	Utilities	**USACE No:**	SPN-2018-00490

Project: Pacific Gas and Electric Company Bay Area Operations and Maintenance Program (Project)

Applicant: Pacific Gas and Electric Company

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Water Board Contact Person: If you have any questions, please call State Water Resources Control Board (State Water Board) Staff listed above or (916) 341-5478 and ask to speak with the Water Quality Certification Unit Supervisor.

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I. Summary

This Order for Waste Discharge Requirements and Clean Water Act section 401 Water Quality Certification (Order), which includes Attachments A through G, provides Clean Water Act Section 401 Water Quality Certification for projects that require authorization from the U.S. Army Corps of Engineers (Corps) under Clean Water Act Section 404 and Rivers and Harbors Act of 1899 Section 10 and Section 14 (33 U.S.C. § 408, known as "Section 408") and is issued at the request of Pacific Gas and Electric Company (hereinafter Permittee).

This Order covers operations and maintenance activities conducted by the Permittee related to natural gas pipelines and electric transmission and distribution line dredge, fill, excavation and associated activities that directly and indirectly discharge waste into waters and or impact water quality and beneficial uses in the nine counties surrounding the San Francisco Bay (Project Area Map—Attachment A). The categories of eligible operations and maintenance activities covered under this Order are listed in section V.

This Order is for the purpose described in application and supplemental information submitted by the Permittee. The application was received on January 10, 2019, and determined complete on December 20, 2021. Prior to receiving a complete application, State Water Board staff issued multiple incomplete application notices and the Permittee provided supplemental information that clarified and modified the original application. Additionally, State Water Board staff issued a Denial Without Prejudice on July 2, 2019.

II. Findings

A. This Order is adopted pursuant to section 401 of the Clean Water Act and the California Porter-Cologne Water Quality Control Act (Wat. Code §§ 13000, et seq.). Notwithstanding any determinations made by the Corps or other federal agency pursuant to 40 C.F.R. section 121.9, dischargers must comply with the entirety of this Order because the Order also serves as waste discharge requirements. Discharges to waters of the state are prohibited except when authorized in accordance with Water Code section 13264.

B. Failure to comply with any condition in this Order shall constitute a violation of the Porter-Cologne Water Quality Control Act and the Clean Water Act. The discharger may then be subject to administrative and/or civil liability pursuant to Water Code section 13385.

C. In the event of any violation or threatened violation of the conditions of this Order, the violation or threatened violation shall be subject to any remedies, penalties, process, or sanctions as provided for under state and federal law.

D. In response to a suspected violation of any condition of this Order, the State Water Board or Regional Water Quality Control Board (collectively the Water

Board) may require the Permittee to furnish, under penalty of perjury, any technical or monitoring reports the Water Board deems appropriate, provided that the burden, including costs, of the reports shall bear a reasonable relationship to the need for the reports and the benefits to be obtained from the reports. The additional monitoring requirements ensure that the permitted dischargers and activities comport with any applicable effluent limitations, water quality standards, and/or other appropriate requirement of state law.

E. This Order and all of its conditions contained herein continue to have full force and effect regardless of the expiration or revocation of any license or permit issued for the project.

F. This Order does not provide coverage under the National Pollutant Discharge Elimination System (NPDES) General Permit for Storm Water Discharges Associated with Construction and Land Disturbance Activities (Order No. 2009-0009-DWQ or 2022-0057-DWQ; NPDES No. CAS000002) (Construction General Permit).

G. This Order does not authorize any act which results in the taking of a threatened, endangered or candidate species, which is now prohibited, or becomes prohibited in the future, under either the California Endangered Species Act (Fish and G. Code, §§ 2050-2097) or the Federal Endangered Species Act (16 U.S.C. §§ 1531-1544). If a “take” will result from any act authorized under this Order, the Permittee must obtain authorization for the take prior to any construction or operation of the portion of the project that may result in a take. The Permittee is responsible for meeting all requirements of the applicable endangered species act for the project authorized under this Order.

H. This Order includes monitoring and reporting requirements pursuant to Water Code sections 13383 and 13267. The burden of preparing these reports, including costs, is reasonable to the need and benefits of obtaining the reports. The reports are intended to ensure that the best management practices required under this Order are sufficient to protect beneficial uses and water quality objectives. The reports related to accidental discharges also ensure that corrective actions that are necessary to prevent and minimize the impact of the discharge are taken as soon as possible. The anticipated costs are minimal as the reporting obligations require only visual monitoring and notification reporting.

I. Consistent with Water Code section 189.7, the Water Board conducted outreach in affected disadvantaged and tribal communities.

J. This Order authorizes future operation and maintenance activities throughout nine Bay Area counties. These activities may impact water quality in disadvantaged and tribal communities. Pursuant to Water Code section

13149.2, the Water Board makes the following findings regarding anticipated water quality impacts and environmental justice concerns within the Board's authority in disadvantaged or tribal communities resulting from the issuance of this Order:

1. Based on readily available information, the Water Board anticipates that the issuance of this Order will result in limited water quality impacts and environmental justice concerns within the scope of the Board's authority. This Order authorizes work near and within Bay Area surface waters, including wetlands, tidal waters, and stream channels. The activities covered by this Order are limited to operation and maintenance of existing facilities, and most impacts will be temporary and last for less than one year. The temporary impacts will generally be related to site access and staging areas. For example, there could be temporary impacts to water quality where a staging area is adjacent to a water or when a project is located in waters (e.g., a utility pole replacement) and the area must be dewatered to conduct maintenance activities. The types of wastes associated with temporary impacts are largely the same as the wastes associated with construction: sediment and oil and grease. Permanent impacts, with a permanent loss of a portion or all of a water, may be authorized under this Order. Only permanent impacts related to an existing facility are covered by this Order and permanent impacts are expected to be small. For example, an existing culvert may be replaced with a larger culvert.

2. The Water Board identified several conditions within the scope of its authority to address the permitted activity impacts. Those conditions are set forth in Order section IX. Even work within waters for a short duration can impact water quality in disadvantaged and tribal communities. For example, stream channel access may be temporarily blocked during utility pole replacement. To reduce impacts, this Order requires PG&E to restore impact sites as soon as possible after work occurs. Additionally, a sequence of actions much be taken before any impacts to waters may occur: impacts must be avoided (moved away from waters), minimized (through implementation of best management practices and design alternatives) and mitigated (with a beneficial project). Before any work is authorized under this Order, Water Board staff will review site-specific information to confirm that this sequence of actions has been taken. Implementation of these measures will ensure that impacts will be minimal. For permanent impacts, compensatory mitigation is required. Generally, mitigation should be provided within the impacted watershed. Compensatory mitigation shall provide a minimum of a one-to-one mitigation to impact ratio, and this ratio is subject to increase at Water Boards staff discretion depending on factors such as distance between the impact site and mitigation site; uncertainty associated with the successful

creation of a mitigation site; temporal loss; and whether the mitigation is in-kind or out-of-kind from the impacted aquatic resource(s).

III. Pacific Gas and Electric Company's Bay Area Operation and Maintenance Program

The Pacific Gas and Electric Company's Bay Area Operation and Maintenance Program consists of activities required to maintain safe and operable electrical and gas utility infrastructure, including operation and maintenance of the Permittee's gas and electrical transmission and distribution systems and minor new construction (e.g., inspecting and testing valves, enclosures, and other components; repairing and replacing facilities, structures, and access roads; electrical transmission and distribution reconductoring projects; gas pipeline replacement; and emergency repair and replacement). Notification shall be provided to the appropriate Regional Water Board before commencement of each activity.

IV. Project Location and Receiving Waters Information

An individual project authorized under this Order may occur at any of the Permittee's gas and electric transmission and distribution facilities, facility rights-of-way, access to the facilities, and mitigation areas located within the Operations and Maintenance Program Area, including all or portions of the nine Bay Area counties of Alameda, Contra Costa, Marin, Napa, San Francisco, San Mateo, Santa Clara, Sonoma, and Solano. A map showing the Project area is found in Attachment A of this Order.

The nine-county service area is within the jurisdiction of the San Francisco Bay Regional Water Quality Control Board, the Central Valley Regional Water Quality Control Board, the Central Coast Regional Water Quality Control Board, and the North Coast Regional Water Quality Control Board (collectively Regional Water Boards). Surface waters and groundwater potentially impacted by this Project are protected in accordance with the applicable water quality control plan or policy. Statewide and regional water quality control plans and policies may be accessed at the State Water Resources Control Board's Plans and Policies Web page (http://www.waterboards.ca.gov/plans_policies/). Water quality control plans and policies, including water quality standards which consist of existing and potential beneficial uses of waters of the state, water quality objectives to protect those uses, and the state and federal antidegradation policies, are issued in accordance with Water Code sections 13140, 13240 and 13170.

It is the policy of the State of California that every human being has the right to safe, clean, affordable, and accessible water adequate for human consumption, cooking, and sanitary purposes. This Order promotes that policy by requiring discharges not to exceed maximum contaminant levels designed to protect human health and ensure that water is safe for domestic use.

V. Description of Direct Impacts to Waters of the State

Individual projects eligible for coverage under this Order include a wide variety of activities that require a permit and may result in temporary impacts to waters of the state or may result in a permanent loss of waters of the state, including:

A. Internal pipeline inspection and repair: Inspection of pipelines for anomalies in accordance with the Pipeline Safety Act. If an anomaly is found, vegetation will be removed, the pipeline will be excavated, repaired and backfilled. Typical repairs include sleeve repairs involving sandblasting and welding.

B. Valve recoating and replacement: Replacement or recoating of malfunctioning or worn valves. To coat the entire valve to the connection point, vegetation will be removed, the valve must be excavated to expose the pipe and then backfilled once work is complete.

C. Pipeline cathodic protection: Installation of a type of anode (e.g., horizontal anode bed, flex anode, deep well anode) parallel and adjacent to the existing pipeline. The anode installation involves vegetation removal, trenching, backfilling, and recontouring upon completion.

D. Pipeline lowering and replacement: Replacement of pipeline segments due to damage caused by construction projects, acts of nature, or aging and corrosion. Replacement involves clearing vegetation and grading the rights-of-way, trenching and excavating the existing pipeline, and installing the new pipeline parallel and adjacent to the existing pipeline. The minimum length of pipe replaced is typically 40 feet (for one joint of pipe), though up to 1 mile could be replaced.

E. Pipeline recoating and replacement: Pipeline to be recoated is excavated (after vegetation is removed) and old coating is removed from the pipeline by jetting, scraping, or sandblasting. The surface of the pipe is prepared for the new coating by running a self-contained grit or shot-blasting machine over the area. Following repairs, the area is backfilled.

F. Substation maintenance: Accessing substations to perform maintenance tasks, which may require use of station property or adjacent property for construction staging and materials storage, which might require vegetation removal and/or fill to develop safe temporary work areas for equipment and crews, which may affect waters of the state.

G. Transmission tower maintenance: Conducting routine tower replacement and tower foundation repair, which involves work on tower foundations located in waters of the state. Depending on the topography of the site, any of the following methods may be used to gain access to the site and/or stage materials: vegetation removal, rubber mats placed at footings, temporary boardwalk constructed, barges or helicopter. Cofferdams are installed for repairs to foundations submerged in water.

H. Boardwalk maintenance: Repairs and maintenance related to boardwalks that service transmission facilities in the vegetated margins, mudflats, and open water around San Francisco Bay. All repair and replacement activities are completed manually and require the use of generators and handheld equipment. Access and staging to support boardwalk maintenance may require vegetation removal. Some work may be completed from barges and/or from the mudflat during low tide.

I. Site-specific erosion solutions: Installation and maintenance of site-specific solutions such as biodegradable jute netting, riprap, or rock fill to remediate scouring and erosion that occurs within waterways resulting in pipe exposure and prevent further damage to the pipeline. Site preparation for site-specific erosion solutions may include vegetation removal.

J. Water diversion techniques: Installation of a diversion structure (e.g., a dam or weir and a pump or headgate) to divert water through a temporary ditch or pipe to convey the water around a section of pipeline to be repaired. These techniques are employed to repair pipeline crossings within water features that have flowing water to minimize impacts to water quality and create a safe work area. Site preparation for water diversion may include vegetation removal.

K. Power pole maintenance: Reinforce poles by installing trusses to existing poles, or fiber-wrapping the pole with preservative material to reduce rate of deterioration. Steel trusses are driven to pre-defined depths and secured with high-strength steel banding. Remove poles that cannot be repaired and replace with new wood poles or light-duty steel poles, which may require the installation of guy wires and anchors, which could consist of a screw or a concrete structure, and the removal of vegetation.

L. Line reconductoring: Replacing existing conductors with new conductors along the line. This may require staging areas, work areas, temporary guard structures, and pull sites (temporary construction areas) within waters of the state. Reconductoring is typically completed in 2- to 3-mile sections with the use of pull sites. Vegetation mowing and minor grading may be required to prepare pull sites. Mats or gravel may also be used in wet locations. Guard structures are typically standard wood poles across which temporary netting is strung; in some cases, specifically equipped boom trucks are used instead of poles.

M. Site access development and maintenance: Routine operations and maintenance activities may require routine access road maintenance such as blading, moving or establishing berms, vegetation or debris clearing and making functional drain inlets to culverts, culvert repair, establishing waterbars, repairing over-side drains, and the repair or replacement of storm water diversion devices. Protective security fencing is sometimes installed around pipeline facilities, which requires digging holes to install fence posts using an auger.

N. Minor New Construction: Construction of facilities adjacent to existing facilities and/or in utility or road rights-of-way would be limited to new gas pressure limiting stations with an impact of up to 1 acre of natural vegetation, electrical substation expansions with up to 3 acres of impacts on natural vegetation, and underground electric lines.

O. Other Activities: Additional operation and maintenance activities include natural gas line and electrical patrols and inspections, compressor station upgrades and maintenance, pipeline electric test system installations, telecom site maintenance, insulator washing or replacement, outage repairs, facility installations, and others. In the course of conducting these other activities, vegetation impacts may occur.

P. Restoration and Mitigation Activities: In the course of implementing on-site permittee responsible mitigation for impacts resulting from activities covered under this Order, additional impacts to waters of the state may occur. This Order covers restoration and mitigation activities (e.g. native plantings, water crossing removal and restoration, and wetland enhancement) that result in up to one half (0.5) acre of aquatic resource impacts associated with the habitat management, monitoring, and enhancement activities carried out by the Permittee or by independent land managers providing mitigation for the Permittee to offset enrolled project impacts. This Order does not cover large scale, multi-acre, mitigation projects that offset impacts from several impact sites. Site-specific restoration or mitigation plans must comply with Order section IX. G and H conditions and be approved by the Water Board before any discharge may occur; remaining applicable Order conditions also apply.

The Permittee should describe all proposed project features, including those potentially offsite and/or adjacent to waters of the state which could result in impacts to waters of the state, in the Notice of Intent (NOI- Attachment B), which must be completed for authorization under this Order.

VI. Description of Indirect Impacts to Waters of the State

The Water Board recognizes the potential for indirect impacts to waters of the state associated with the Project. Indirect impacts may include, but are not limited to, sediment-laden stormwater runoff from bare surfaces exposed by operation and maintenance projects, spills of chemicals (fuels, lubricants, paints, etc.) used in operation and maintenance projects, and loss of shade to streams associated with impacts to riparian habitat. Impacts to waters of the state and their designated beneficial uses could potentially result from Project activities that are within or adjacent to the Project area. These potential indirect impacts are expected to be short term, and the expected severity of these impacts are adequately reduced through adherence to this Order and the Mitigation Measures described in the Pacific Gas and Electric Company Bay Area Operations and Maintenance Incidental Take Permit Environmental Impact Report.

VII. Avoidance and Minimization

Projects that receive Water Board authorization must demonstrate that impacts to waters of the state are first avoided, and then minimized, to the greatest extent practicable. The avoidance and minimization measures in the Permittee's Bay Area Operations and Maintenance Habitat Conservation Plan and the Permittee's most current "Good Housekeeping Activity Specific Erosion and Sediment Control Plan" are incorporated by reference and shall be conducted during project activities. Additional activity-specific avoidance and minimization measures will be required for each project authorized by this Order.

VIII. Compensatory Mitigation

As determined by the appropriate Regional Water Board, the Permittee is required to provide compensatory mitigation to compensate for permanent, temporary, direct and/or indirect impacts as described in sections IX.G and H.

IX. Conditions

Compliance with conditions of this Order provides reasonable assurance that projects authorized under this Order will comply with state and federally approved water quality requirements. The Water Boards will review any project proposed for authorization under this Order to analyze impacts to water quality and designated beneficial uses within the applicable watershed(s). If the eligibility requirements set forth in this Order are not met, the Water Boards will not authorize the proposed project under this Order and instead require the project proponent to apply for an individual authorization or authorization under another order. In accordance with this Order, the Permittee may proceed with an authorized project under the following terms and conditions:

A. Reporting and Notification Requirements

The following section details the reporting and notification types and timing of submittals. Requirements for the content of these reporting and notification types are detailed in Attachment C, including specifications for photo and map documentation during the Project. Written reports and notifications must be submitted using the Reporting and Notification Cover Sheet located in Attachment C, which must be signed by the Permittee or an authorized representative.

1. **Request for Authorization:** The Permittee shall submit a complete NOI for authorization under this Order at least 45 days before any project activity. The NOI shall describe all proposed project impacts to waters of the state and project design steps taken to first avoid, and then minimize, impacts to waters of the state to the maximum extent practicable. The NOI shall also include a delineation of waters of the state within impact sites. The NOI must provide all information requested in NOI Attachment B. The NOI must be provided on the NOI form found in Attachment B until an electronic application form is available on the State Water Board's webpage, at which time electronic

submission will be required. An application fee must be provided with each NOI. The application fee amount is determined as required by the California Code of Regulations, title 23, sections 3833(b)(3) and 2200(a)(3).

2. The Water Boards shall determine whether the activity is eligible for Order coverage. The Water Boards will require the Permittee to apply for individual or general authorization where the activity would not comply with an applicable water quality control plan or policy even if coverage would otherwise be authorized by this Order. The Permittee may choose to apply for an individual water quality authorization.

3. **Project Status Notifications**

   a. **Commencement of Construction:** The Permittee shall submit a Commencement of Construction Report at least seven (7) days prior to start of initial ground disturbance activities and, if applicable, corresponding Waste Discharge Identification Number (WDID) issued under the NPDES General Permit for Storm Water Discharges Associated with Construction and Land Disturbance Activities (Order No. 2009-0009-DWQ or 2022-0057-DWQ; NPDES No. CAS000002).

   b. **Project Reporting:** The Permittee shall submit an Annual Report unless a Quarterly Report is required by Water Board staff in the project's Notice of Applicability. Project reporting shall continue until the Water Board issues a Notice of Project Complete Letter to the Permittee.

   c. **Request for Notice of Project Complete Letter:** The Permittee shall submit a Request for Notice of Project Complete Letter when construction and any post-construction monitoring is complete, mitigation performance criteria have been achieved, and no further project activities will occur; this request may be provided using the Request for Notice of Project Complete Letter Form (Attachment G). This request shall be submitted to Water Board staff within thirty (30) days following completion of all project activities. Upon approval of the request, the Water Board staff shall issue a Notice of Project Complete Letter (written notice, email, or other verifiable means) to the Permittee which will end associated annual fees. Completion of post-construction monitoring shall be determined by Water Board staff and shall be contingent on successful attainment of restoration and mitigation performance criteria.

4. Conditional Notifications and Reports:

The following notifications and reports are required as applicable.

a. Accidental Discharges of Hazardous Materials[1]

Following an accidental discharge of a reportable quantity of a hazardous material, sewage, or an unknown material, the following applies (Water Code, Section 13271):

i. As soon as (A) Permittee has knowledge of the discharge or noncompliance, (B) notification is possible, and (C) notification can be provided without substantially impeding cleanup or other emergency measures then:

1. First call – 911 (to notify local response agency)

2. Then call – Office of Emergency Services (OES) State Warning Center at: (800) 852-7550 or (916) 845-8911

3. Lastly, follow the required OES procedures as set forth in the Office of Emergency Services' Accidental Discharge Notification Web Page (https://www.caloes.ca.gov/FireRescueSite/Documents/CalOES-Spill_Booklet_Feb2014_FINAL_BW_Acc.pdf)

ii. Following notification to OES, the Permittee shall notify the appropriate Water Board, as soon as practicable (ideally within 24 hours). Notification may be delivered via written notice, email, or other verifiable means.

iii. Within five (5) working days of notification to the Water Board, the Permittee must submit an Accidental Discharge of Hazardous Material Report.

b. Violation of Compliance with Water Quality Standards:

i. The Permittee shall notify the Water Board of any event causing a violation of compliance with water quality standards. Notification may be delivered via written notice, email, or other verifiable means.

[1] "Hazardous material" means any material that, because of its quantity, concentration, or physical or chemical characteristics, poses a significant present or potential hazard to human health and safety or to the environment if released into the workplace or the environment. "Hazardous materials" include, but are not limited to, hazardous substances, hazardous waste, and any material that a handler or the administering agency has a reasonable basis for believing that it would be injurious to the health and safety of persons or harmful to the environment if released into the workplace or the environment. (Health & Saf. Code, § 25501.)

ii. This notification must be followed within three (3) working days by submission of a Violation of Compliance with Water Quality Standards Report.

c. **In-Water Work and Diversions:**

i. If required by the Water Board, the Permittee shall notify the Water Board at least forty-eight (48) hours prior to initiating work in water or installation of stream diversions. Notification may be delivered via written notice, email, or other verifiable means.

ii. If required by the Water Board, within seven (7) working days following completion of in-stream water work or stream diversions, an In-Water Work/Diversions Water Quality Monitoring Report must be submitted to Water Board staff.

d. **Modifications to Project:**

The Permittee shall give advance notice to Water Board staff if project implementation as described in the NOI is altered in any way or by the imposition of subsequent permit conditions by any local, state or federal regulatory authority by submitting a Modifications to Project Report. Project modifications that may prevent compliance with this Order are prohibited.

e. **Transfer of Long-Term BMP Maintenance:**

If maintenance responsibility for post-construction BMPs is legally transferred, the Permittee must submit to the Water Board a copy of such documentation and must provide the transferee with a copy of a long-term BMP maintenance plan that complies with manufacturer or designer specifications. The Permittee must provide such notification to the Water Board with a Transfer of Long-Term BMP Maintenance Report at least 10 days prior to the transfer of BMP maintenance responsibility.

B. Water Quality Monitoring

1. **General:** If surface water is present, continuous visual monitoring shall be conducted during active construction to detect accidental discharge of construction related pollutants (e.g., oil and grease, turbidity plume, or uncured concrete).

2. **In-Water Work or Diversions:** For projects involving planned in-stream water work or stream diversions, an in-water work/stream diversion and water quality monitoring plan shall be submitted with the NOI. Water quality monitoring shall be conducted in accordance with the approved plan.

3. **Accidental Discharges/Noncompliance:** If an accidental discharge occurs, the Permittee shall determine whether the discharge includes hazardous materials or will cause or contribute to an exceedance of water quality

objectives, and if so, notify the Water Board in accordance with IX.A.4.a. Water Board staff may require additional water quality monitoring based on the discharge constituents and/or related water quality objectives and beneficial uses.

4. **Post-Construction:** For activities that result in exposed soil in or on the banks of waters and that have not received a Notice of Project Complete Letter, the Permittee will visually inspect the project site between October 30 and April 15 or as required in the approved restoration plan following each rain event that results in 0.5 inch of rainfall or more within a 48 hour period, until the Permittee demonstrates that applicable erosion control Best Management Practices are properly installed and the site is stabilized to prevent future erosion. The Permittee must demonstrate that excessive erosion, stream instability, and other water quality pollution is not occurring in or downstream of the project site. If water quality pollution is occurring, contact the Water Board staff member overseeing the project within three (3) working days. The Water Board may require the submission of a Violation of Compliance with Water Quality Standards Report.

C. Standard Conditions

1. This action is subject to modification or revocation upon administrative or judicial review, including review and amendment pursuant to Water Code section 13330, and California Code of Regulations, title 23, chapter 28, Article 6 commencing with section 3867.

2. This Order is not intended and shall not be construed to apply to any activity involving hydroelectric facility requiring a Federal Energy regulatory Commission (FERC) license or an amendment to a FERC license, unless pertinent certification application was filed pursuant to subsection 2855(b) of chapter 28, title 23 of the California Code of Regulations, and that application specifically identified that a FERC license or amendment to a FERC license for a hydroelectric facility was being sought.

3. This Order is conditioned upon total payment of any fee required under title 23 of the California Code of Regulations.

D. General Conditions

1. Permitted actions must not cause a violation of any applicable water quality standards, including impairment of designated beneficial uses for receiving waters as adopted in the Basin Plans by any applicable Regional Water Board, or any applicable Water Board water quality control plan or policy. The source of any such discharge must be eliminated as soon as practicable.

2. The Permittee must conform to the engineering plans, specifications, and technical reports submitted with the application materials. Water Code section 13264 prohibits any discharge that is not specifically authorized in this Order.

3. The Permittee shall adhere to all requirements in the mitigation monitoring and reporting program (MMRP) (Pacific Gas and Electric Bay Area Operation and Maintenance Incidental Take Permit Mitigation Monitoring and Reporting Program, July 2022) which is incorporated herein by reference and any additional measures as outlined in Attachment E, CEQA Findings of Fact.

4. **Avoidance and Minimization:** Projects authorized under this Order shall be designed to avoid and minimize impacts to waters of the state to greatest practicable extent.

E. Administrative

1. Signatory requirements for all document submittals required by this Order are presented in Attachment D of this Order.

2. **Site Access:** The Permittee shall grant Water Board staff, Regional Water Board staff or an authorized representative (including an authorized contractor acting as a Water Board representative), upon presentation of credentials and other documents as may be required by law, permission to:

   a. Enter upon the project or compensatory mitigation site(s) premises where a regulated facility or activity is located or conducted, or where records are kept.

   b. Have access to and copy any records that are kept and are relevant to the Project or the requirements of this Order.

   c. Inspect any facilities, equipment (including monitoring and control equipment), practices, or operations regulated or required under this Order.

   d. Sample or monitor for the purposes of assuring compliance.

3. The Permittee shall be responsible for work conducted by its consultants, contractors, and any subcontractors. A copy of this Order shall be provided to any consultants, contractors, and subcontractors working on the project. Copies of this Order and the project's Notice of Applicability shall remain at the project site for the duration of the project. All personnel performing work on the project shall be familiar with the content of this Order and the project's Notice of Applicability and its posted location at the project site.

4. **Lake and Streambed Alteration Agreement:** The Permittee shall submit a signed copy of the California Department of Fish and Wildlife's Lake or Streambed Alteration Agreement (LSAA) to the Water Board prior to any discharge to waters of the state that requires an LSAA.

F. Construction Conditions

1. All materials and supplies necessary for implementing these construction conditions must be on site and ready for use at the start of the construction activity and must remain in supply and ready for implementation throughout the construction process. All non-structural best management practice materials (e.g., training documents, compliance tracking procedures) must be ready for use at the start of construction.

2. All personnel who engage in construction activities or their oversight at the Project site (superintendent, construction manager, foreman, crew, contractor, biological monitor, etc.) must attend trainings on the conditions of this Order and how to perform their duties in compliance with those conditions. Every person shall attend an initial training within five working days of their start date at the Project site. Trainings shall be conducted by a qualified individual with expertise in 401 Water Quality Certification conditions and compliance.

3. Construction material, debris, rubbish, spoils, soil, silt, sawdust, rubbish, steel, welding slag, welding rods, waste material, waste containers, other organic or earthen material, or any other substances which could be detrimental to water quality or hazardous to aquatic life that is discharged as a result of project related activities shall be prevented from entering waters of the state. Spoils from excavations shall not be stored in waters of the state.

4. Environmentally sensitive areas and environmentally restricted areas, including any avoided waters of the state, must be clearly identified in the field for exclusion prior to the start of construction. Such identification must be properly maintained until construction is completed and the soils have been stabilized. Equipment, materials, or any other substances or activities that may impact waters of the state outside of the limits of project disturbance are prohibited.

5. Bridges, culverts, dip crossings, or other structures must be installed so that water and in-stream sediment flow is not impeded. Project design practices and materials which appropriately minimize impacts to waters must be used in areas where access roads intersect waters of the state.

6. Temporary materials placed in any water of the state must be removed as soon as construction is completed at that location, and all temporary roads must be removed or re-contoured and restored according to approved re-vegetation and restoration plans.

7. A method of containment must be used below any temporary bridge, trestle, boardwalk, and/or other stream crossing structure to prevent any debris or spills from falling into the waters of the state. Containment must be maintained and kept clean for the life of the temporary crossing structure.

8. Vegetation removal shall be limited to the minimum necessary to complete the proposed operation and maintenance activities as listed in this section. This Order does not allow vegetation management removal as a standalone activity.

9. Unless authorized for restoration, material excavated to prepare a site for placement of the permitted fill material must be properly disposed of in an upland area. The disposal site must be located at a sufficient distance away from flowing or standing water such that the excavated material does not erode or move in any way into any water of the state. The disposal area shall be identified in the project NOI.

10. **Topsoil:** For any excavation, including utility line trenches, the top 6 to 12 inches of topsoil shall be removed and stockpiled separately during construction. Following installation, the topsoil shall be replaced and restored to preexisting conditions.

11. Any structure, including but not limited to, culverts, pipes, piers, and coffer dams, placed within a stream where fish (as defined in Fish and Game Code section 45) exist or may exist, must be designed, constructed, and maintained such that it does not constitute a barrier to upstream or downstream movement of aquatic life, or cause an avoidance reaction by fish due to impedance of their upstream or downstream movement. This includes, but is not limited to, maintaining the supply of water and maintaining flows at an appropriate depth, temperature, and velocity to facilitate upstream and downstream fish migration. If any structure results in a long-term reduction in fish movement, the discharger shall be responsible for restoration of conditions as necessary (as determined by the Water Board) to secure passage of fish across the structure.

12. **Dust Abatement:** Dust abatement chemicals added to water can be hazardous to wildlife and, if allowed to enter streams, detrimental to water quality. Therefore, dust abatement activities shall be conducted so that sediment or dust abatement chemicals are not discharged into waters of the state. Dust abatement products or additives that are known to be detrimental to water quality or wildlife shall not be used, unless specific management needs are documented, and product-specific application plans are approved by Water Board staff.

13. **Use of Mechanized Equipment:** Activities permitted under this Order shall be conducted in a manner that minimizes ground disturbance, soil compaction, rutting and other mechanical impacts. Equipment shall be operated and maintained in a manner that reduces the risk of spills or the accidental exposure of fuels or hazardous materials to water bodies or wetlands.

14. **Piers or Piles:** Piers or piles placed in the stream channel to support a linear transportation structure over a creek channel must be aligned parallel with the direction of flow to prevent erosive eddies.

15. **Access Routes**

    a. The number of access routes, number, and size of staging areas, and the total area of the ground disturbance shall be limited to the minimum necessary to achieve the project goal.

    b. Access routes that are intended for seasonal deactivation[2] or permanent decommissioning[3] shall be decommissioned as soon after use as possible, as follows:

        i. Access routes shall be in a condition that enables long-term, disconnected and maintenance-free drainage.

        ii. Drainages shall be fortified to endure the duration of planned decommissioning and prevent direct flows into waters.

        iii. Where feasible, a permanently decommissioned stream crossing shall be excavated to exhume the original, stable, stream bed and channel side-slopes, and then banks must be stabilized with materials including, but not limited to, mulch, seeding, replanting, and rock armoring, if anticipated flows may erode vegetated creek banks.

        iv. Soils exposed during seasonal deactivation or permanent decommissioning shall be stabilized or removed to prevent spoils erosion and sedimentation.

        v. Permanent access route decommissioning requires the restoration of natural drainage patterns and implementation of the approved restoration plan.

    c. Access routes shall be constructed using full bench construction and incorporate drainage structures with enough frequency to prevent saturated soils and erosion of access routes at the spacings specified in Table 1. If the spacings specified in Table 1 are infeasible for the

[2] "Seasonal deactivation" is the temporary decommissioning of a road to encourage disconnected drainage, stabilized soils, and prevent vehicle travel during the rainy season.

[3] "Permanent decommissioning" is the decommissioning of a road, in a location is no longer intended for vehicle travel, soils are stabilized, watercourse crossings are removed or stabilized, and the area's natural drainage patterns are restored.

work area, an explanation of the infeasibility must be provided, and an alternative means to preventing erosive discharges to waters of the state must be provided within the NOI.

Table 1. Drainage Structure Spacing Requirements (in feet) Depending on Road Grade and Erosion Hazard Rating[4]

Estimated Erosion Hazard Rating	Road Grade Less Than 10 % Feet	Road Grade 11-25% Feet	Road Grade 25-50% Feet	Road Grade Greater than 50% Feet
Extreme	100	75	50	50
High	150	100	75	50
Moderate	200	150	100	75
Low	300	200	150	100
Note: Estimated Erosion Hazard Rating evaluation procedures specified in California Code of Regulations, title 14, § 912.5.				

16. Road Surface Drainages

a. To the extent feasible, road surfaces and ditches shall be hydrologically disconnected from streams and stream crossings. Road surface runoff must be designed to disperse flows to appropriate upland areas, rather than concentrating flows to waters of the state.

b. Sediment contributions from roads, cutbanks, and ditches shall be minimized by utilizing the appropriate closures depending on site activity and incorporating the following surface drainage structures: berm removal, road surface shaping (outsloping, insloping or crowning), rolling dips, ditch relief culverts, waterbars and other designs. Where feasible, access route construction and reconstruction shall outslope the access route to facilitate natural drainage patterns.

c. Disconnected drainage structures shall be installed upslope of and in close proximity to watercourse crossings. The disconnected drainage

[4] California Department of Forestry and Fire Protection Resource Management, Forest Practice Program. 2021. California Forest Practice Rules

structure should be installed according to the spacing requirements in Table 1.

d. Dischargers shall prioritize locating the outflow of the road surface drainage structures towards stable areas with effective filter strips containing a high infiltration capacity, dense vegetation, or obstructions. Road surface drainage structure outflow shall not directly discharge to waters of the state or significant existing or potential erosion sites. Road surface drainage shall be managed to prevent erosion.

e. Functional ditch relief, including culverts, rolling dips, and crossroad drains, shall be spaced with enough frequency to prevent saturated soils and erosion of access routes.

f. All sediment and other material disturbed during blading and other road construction activities shall be contained and removed or stabilized with effective engineered sediment and erosion control practices. Cut or bladed sediment or other material shall not be pushed off the roadway and left uncontrolled and un-stabilized.

17. Watercourse Crossings

a. Rock ford or rock armored fill crossings shall be installed instead of culverts on watercourses in locations where watercourse crossings have a higher risk of failure due to their landscape position (e.g., in areas prone to debris flows or landslides) or in areas that lack seasonal access or in remote areas.

b. Remove or stabilize watercourse crossings as follows:

i. Fills shall be excavated to form a channel as close as feasible to the natural watercourse grade, and that is wider than the natural channel upstream and downstream of the crossing to be removed;

ii. Any resulting cut bank shall not exceed a grade of 65 percent from the outside edge of the channel to prevent slumping and prevent erosion; and

iii. Where it is not feasible to remove a watercourse crossing on a road proposed for abandonment, the NOI must identify how erosion and sedimentation will be avoided and minimized.

18. Culvert Construction or Maintenance

a. Cured in Place Pipe (CIPP) is prohibited in the absence of formulation specific toxicity data that establishes that it will not cause detrimental

physiological responses to human, plant, animal, or aquatic life, or cause discharges to waters of the state that do not comply with water quality objectives or goals.

b. Replacement of culverts acting as grade control structures is not authorized under this Order. A vertical gap between the culvert and the immediate downstream stream channel indicates that the culvert likely functions as a grade control structure.

c. Projects proposing to replace culverts must design and implement a fluvial geomorphically appropriate channel stabilization project to prevent any existing scour or headcutting from migrating upstream. Repairs may include, but are not limited to, fill of scour holes with appropriately sized rock riprap or the construction of rock weirs with appropriately sized rock that are keyed well into the channel banks to minimize the risk of flanking.

d. The replaced or maintained culvert shall be in alignment with the stream channel upstream and downstream of the culvert.

e. Any replacement culvert or culvert that is to be left in place by a repair or maintenance project must be placed at a gradient and orientation that will not result in erosional scour at the outlet.

f. Replacement of a culvert with a similarly sized culvert is allowable only where there is no visual indication that the existing culvert is undersized. Visual indications of undersized culverts include, but are not limited to: sediment aggradation upstream of the culvert; evidence of flow over the top of the culvert (e.g., erosional rills in dirt road surfaces or erosion of shoulders adjacent to paved road surfaces), erosion of the fill between the culvert and the road surface, scour pools at the culvert outlet, or erosion of creek banks immediately downstream of the culvert.

g. Unless infeasible, replacement culverts must be sized to convey a 100-year flow event with debris, without pressurizing flow passing through the culvert. The 100-year flow event should be modeled under climate change projections, if available.

h. Deep fills (deeper than a backhoe can reach from the roadbed) with undersized culverts or culverts with high plugging potential must be fitted with an emergency overflow structure to accommodate 100-year floods.

i. Culvert inlets shall have low plug potential (debris barriers or deflectors are installed where needed, as long as they will not create a barrier to passage in fish bearing creeks).

j. Culverts shall be installed at the base of the fill and in line with the natural channel.

k. Replaced or maintained culverts shall be in upstream and downstream alignment with the stream channel.

l. Extend culvert outlets to length that prevents erosion and sediment discharges into waters of the state at levels that exceed water quality objectives or impairs beneficial uses.

m. The Permittee shall first consider using arch culverts or free-span bridge alternatives to solid bottom culverts (e.g., cylindrical culverts or box culverts) during culvert installation and replacement.

n. New culverts must not be located in a meander bend of the stream channel. If a failed culvert is within a meander bend of the stream, the replacement culvert should be placed away from the meander bend.

o. Plastic culverts are prohibited from being installed in high-threat fire areas as mapped by CAL FIRE's Fire and Resource Protection Program[5].

19. Toxic and Hazardous Materials

a. Activities permitted under this Order shall not discharge toxic substances in concentrations that produce detrimental physiological responses to human, plant, animal, or aquatic life. CIPP formulations that have not been appropriately tested to demonstrate that they are not toxic to aquatic life that is likely to be present in the local watershed shall not be used in culvert rehabilitation projects.

b. Discharge of unset cement, concrete, grout, slurry, damaged concrete spoils, concrete dust, or water that has contacted uncured concrete or cement, or related washout to surface waters, ground waters, or land is prohibited. If concrete washout is necessary at the site, washout containment shall be used to prevent any discharge. Wastewater may only be disposed by delivery to a sanitary wastewater collection system/facility (with authorization from the facility's owner or operator) or a properly licensed disposal or reuse facility.

c. Appropriate BMPs must be implemented throughout project activities to prevent and control potential leaks/spills/drainage of potentially hazardous materials such as: non-petroleum hydraulic fluid; epoxies; paints and other protective coating materials; cement concrete or asphalt concrete; and washings and cuttings thereof.

[5] California Department of Forestry and Fire Protection. 2022. Fire and Response Assessment Program (FRAP). Accessed May 2022. Available at: https://frap.fire.ca.gov/

d. Activities permitted under this Order shall not discharge waste classified as "hazardous" as defined in California Code of Regulations title 22, section 66261 and Water Code section 13173. These BMPs shall include, at a minimum:

i. All personnel handling fuels and other hazardous materials shall be properly trained.

ii. Adequate spill prevention and cleanup equipment and materials shall be present on site at all times during project implementation.

iii. All mechanized equipment shall be maintained in good operating order and inspected on a regular basis.

iv. All on-site fuel trucks or fuel containers shall be stored in an area where risk of contamination of water bodies by leaks or spills is minimized.

v. All equipment shall be fueled, maintained, and/or parked overnight in an upland area at least 100 feet from any delineated waters of the state.

vi. Hazardous materials, including chemicals, fuels, and lubricating oils, shall not be stored within 100 feet of any delineated waters of the state, and shall be stored in appropriate containers with appropriate secondary containment.

vii. Pumps or other stationary equipment operating within 100 feet of a waterbody or wetland shall utilize appropriate secondary containment systems to prevent spills.

viii. Any spills or leaks of hazardous materials, chemicals, fuels, lubricants or any other potential pollutants shall be promptly and completely treated using appropriate materials and equipment.

ix. Spill containment supplies shall be on site in all work areas in sufficient quantities to allow immediate remediation of fuel, oil, hydraulic fluid or similar leaks and spills.

x. Staging area for equipment and vehicle fueling and storage shall be designated at least one-hundred (100) feet away from waters of the state, in a location where accidental discharges of fluids or fuels cannot flow into waters of the state. Whenever not feasible, as when staging is from barges, secondary containment around fuels and other fluids, such as lubricants and secondary fuels, shall be implemented.

e. Projects that create new wetlands or affect existing wetlands shall be designed to include features or management measures that reduce the production of methylmercury in the wetland, including minimizing the repeated wetting and drying of soils by keeping wetlands flooded. In addition, sediment control measures shall be implemented to reduce the transport of total mercury or methylmercury out of the wetland.

20. Invasive Species and Soil Borne Pathogens

a. The Permittee is responsible for ensuring that all project personnel follow proper weed control practices, and that appropriate weed prevention measures are included in project plans.

b. Any straw, hay or other unprocessed plant material used for any purpose must be certified or documented as being weed free.

c. To prevent the spread of soil borne pathogens[6], equipment must be cleaned prior to entering the site. Any equipment leaving the project area shall be thoroughly cleaned using methods appropriate for the known pathogen before leaving the project area, unless the Permittee documents that no known soil borne pathogen infestations are present within the project area. If equipment is to be cleaned on site, the cleaning station must be identified in the NOI and cannot be located within one-hundred feet of any waters of the state.

21. Work in Delineated Waters of the State

a. Work in waters of the state must not cause or contribute to an exceedance of water quality objectives in the receiving waters. Work in delineated waters commences at the onset of the regulated activity and continues until the activity is finished and all restoration of the affected work area is complete. The term “work” means any ground disturbing activities in any delineated waters of the state that are permitted under this Order, regardless of the presence or absence of flowing or standing water.

b. All temporary dewatering activities are subject to the work-in-water reporting and monitoring conditions presented in the Water Quality Monitoring Section of this Order.

[6] Soil borne pathogens are any nematodes, or any bacterial, protozoan, viral or fungal pathogens that can cause disease or death to native plants, agricultural crops or ornamental plants (e.g., Phytophthora ramorum, the cause of sudden oak syndrome, and Phytophthora lateralis, the cause of Port Orford cedar root disease). The fungus that causes Valley Fever, Coccidioides spp., is not considered a soil borne pathogen in this Order.

c. Temporary diversions or impoundments of water, cofferdams, or similar structures installed for the purpose of temporarily dewatering work areas shall be performed according to the In-water Work/Stream Diversion and Water Quality Monitoring Plan provided by the Permittee, and approved by the appropriate Regional Water Board, including appropriate monitoring for water quality upstream and downstream of diversion structures as required in the Water Quality Monitoring section of this Order.

d. All surface waters, including ponded waters, shall be diverted away from areas undergoing grading, construction, excavation, vegetation removal, and/or any other activity which may result in a discharge to waters of the state.

e. Equipment may not be operated in standing or flowing waters unless implementing the following conditions:

i. All construction activities must be effectively isolated from water flows to the greatest extent possible. This may be accomplished by working in the dry season or dewatering the work area. When work in standing or flowing water is required, structures for isolating the in-water work area and/or diverting the water flow must not be contaminated by construction activities. All open flow temporary diversion channels must be lined with filter fabric or other appropriate liner material to prevent erosion. Structures used to isolate the in-water work area and/or diverting the water (e.g., coffer dam, geotextile silt curtain) must not be removed until all disturbed areas are stabilized.

ii. If groundwater dewatering is required for the project, the Permittee shall comply with applicable existing PG&E NPDES permit requirements. If additional Water Board dewatering permits are required, the designated Water Board staff contact must be notified and copied on pertinent correspondence pertaining to those other required permits.

iii. All temporary dewatering and stream diversion methods shall be designed to have the minimum necessary impacts to waters of the state. All stream diversion methods shall be installed such that natural flow is maintained upstream and downstream of the diversion area. Any temporary dams or diversions shall be installed such that the diversion does not cause sedimentation, siltation, or erosion upstream or downstream of the diversion area. Diverted flows must be of sufficient quality and quantity, and of appropriate temperature, to support existing fish and other aquatic life both above and below the diversion. Pre-project flows must be restored to the affected surface water body upon completion of work at that

location. All dewatering and stream diversion methods shall be removed immediately upon completion of activities for which dewatering or diversions are needed.

22. Stormwater

If the project is required to obtain coverage under the NPDES General Permit for Storm Water Discharges Associated with Construction and Land Disturbance Activities (Order No. 2009-0009-DWQ or 2022-0057-DWQ; NPDES No. CAS000002) (Construction General Permit), the Permittee shall comply with the requirements in the Construction General Permit. Generally, coverage under the Construction General Permit is required for construction activity resulting in a land disturbance of one acre or more, or less than one acre but is part of a larger common plan of development or sale that results in a land disturbance of one acre or more. Covered activities are described with additional detail in the Construction General Permit.

Compliance with the Construction General Permit constitutes compliance with Erosion and Sediment Control Conditions a and b below.

a. Erosion and Sediment Control

i. No later than 24 hours prior to the start of a likely precipitation event, the Permittee shall ensure that disturbed areas that drain to waters of the state are protected with correctly installed erosion and sediment control measures (e.g., jute, straw, coconut fiber erosion control fabric, coir logs, straw wattles, silt fence) or revegetated with propagules (e.g., seeds, cuttings, divisions) of locally collected native plants. Erosion control measures that contain monofilament mesh shall not be used. The likely precipitation event is defined as any weather pattern that is forecast to have a 50 percent or greater probability of producing precipitation in the project area. The Permittee shall maintain a daily record of precipitation forecast information which can be provided to the Water Board upon request.

ii. The timing for installation of the post-construction stormwater BMP subdrains, soils, mulch, and plants shall be scheduled to ensure that the installed bioretention areas do not receive runoff from exposed or disturbed areas that have not been landscaped. The constructed post-project stormwater BMPs shall not receive site runoff until all project landscaping is planted, and effective erosion control measures implemented to ensure that the stormwater features are protected from sediment accumulation.

b. Storm Water Management

i. Disturbed areas in delineated waters of the state and adjacent areas that drain to waters of the state must be temporarily stabilized to prevent erosion and accidental discharges into waters of the state at least 24 hours prior to any likely precipitation event. A likely precipitation event is any weather pattern that is forecast to have a 50 percent probability of producing precipitation in the project area, as predicted by a reliable weather forecast. If commencement of a precipitation event is predicted to begin less than 24 hours after the forecast is issued, temporary stabilization of the disturbed in-water work areas must begin immediately.

ii. No individual construction activity that could discharge sediment or other pollutants may be initiated if that activity and its associated erosion control measures cannot be completed prior to the onset of precipitation. After any rain event, the discharger shall inspect all sites currently under construction and all sites scheduled to begin construction within the next 72 hours for erosion and sedimentation problems and take corrective action as needed.

23. Directional Drilling

Because Horizontal Directional Drilling (HDD) and similar drilling operations may affect water quality, the following conditions shall apply to all drilling operations under waters of the state:

a. The discharge of bentonite, drilling muds, lubricants, or any drilling compounds into waters of the state is prohibited. A draft HDD or drilling plan shall be prepared and submitted to the Water Board for review at least 30 days before drilling activities under waters of the state.

b. Release of bentonite, drilling muds, lubricants, or any drilling compounds through fractures in the streambed or bank substrate during drilling is referred to as a “frack-out.” Because of the potential for frack-outs to occur, the HDD drilling plan shall include a frack-out response plan. The frack-out response plan shall specify all measures to be initiated if frack-outs should occur during HDD operations.

c. For all HDD and other drilling sites, a means of containment (e.g., damming, fluming) or screen capable of capturing all of the potential discharge shall be described in the HDD drilling plan. The downstream end of any such containment structure shall be capable of containing all bentonite or other drilling muds or debris that may be released during boring or drilling. Any drilling mud, spoils, etc. must be completely

removed from the streambed prior to removal of the containment structures (e.g., dam, flume, and screen).

d. An environmental monitor shall provide monitoring for compliance with the HDD or drilling plan throughout drilling operations under waters of the state.

e. Any HDD or other drilling operation shall be designed and directed in such a way as to minimize the risk of discharging spoils or other materials, including the frack-out release of drilling lubricants through fractures in the streambed or bank substrates, to waters of the state. In substrates where frack-outs are likely to occur, HDD contractors shall employ all reasonable means and methods available to minimize potential for frack-out.

f. All drilling muds or compounds will be contained and properly disposed of after drilling activities are completed.

g. If bore pits are excavated to support drilling operations, spoils shall be stored a minimum of 25 feet from the top of the bank of streams or wetland/riparian boundary, where feasible; if site specific conditions warrant storing spoils less than 25 feet from the top of the bank of streams or wetland/riparian boundary this request must be provided in the HDD or drilling plan submitted to the Water Board prior to any drilling activities with potential impacts to waters of the state. Spoils shall be stored behind a sediment barrier and covered with plastic or otherwise stabilized (e.g., tackifiers, mulch, or detention).

G. Restoration and Mitigation for Temporary Impacts

1. The Permittee shall restore all areas of temporary impacts to waters of the state and all project site upland areas of temporary disturbance which could result in a discharge to waters of the state as described in a restoration plan approved by the appropriate Regional Water Board.

The restoration plan shall be submitted to the appropriate Regional Water Board for review and approval with the NOI. The restoration plan shall provide the following: a schedule; plans for grading of disturbed areas to pre-project contours; a planting palette with plant species native to the project area; seed collection location; invasive species management; performance standards; and maintenance requirements (e.g., watering, weeding, and replanting).

2. In cases where implementation actions in the restoration plan cannot be reasonably conducted within one year of impacts to waters of the state, or where the adverse temporary impacts result in temporary loss of aquatic resource function(s), the Permittee may be required to provide compensatory mitigation to offset temporal loss of waters of the state. Examples of additional mitigation include, but are not limited to, enhancement activities

such as increasing the presence of native species and reducing dominance of non-native/invasive species, native willow staking, planting of native riparian vegetation, and trash removal.

3. The Water Board may extend the monitoring period beyond requirements of the restoration plan upon a determination by Water Board staff that the performance standards have not been met or are not likely to be met within the monitoring period.

H. Mitigation for Permanent Impacts

1. Compensatory mitigation is required to offset permanent impacts to waters of the state, unless the Permittee has demonstrated that the project authorized by this Order will restore or improve the ecological function of the impacted aquatic resource. Generally, compensatory mitigation shall take place within the same watershed as the impact site, but the permitting Water Board may approve compensatory mitigation in a different watershed or programmatic mitigation across one or multiple watersheds. Mitigation that occurs outside of the impacted watershed may require additional mitigation. When compensatory mitigation is required, the Permittee shall provide the following:

a. A draft compensatory mitigation plan at a level of detail sufficient to accurately evaluate whether compensatory mitigation offsets the adverse impacts attributed to the project considering the overall size and scope of impact.

b. Compensatory mitigation shall provide a minimum of a one-to-one mitigation to impact ratio, measured in area and length for mitigation banks, advanced mitigation, and in-lieu fee programs. Mitigation is required to ensure compliance with Executive Order W-59-93 that requires no net loss of the structure or function of California's wetland resources.[7] Mitigation should be in kind as much as is feasible. If mitigation is out-of-kind, the amount of mitigation should be increased. When mitigation is constructed, enhanced, or preserved offsite, the amount of mitigation should be increased to account for the distance between the impact site and the mitigation site. The amount of mitigation should also account for the uncertainty associated with the successful creation of a mitigation site. The Water Board will require a higher overall mitigation ratio where necessary to ensure replacement of lost aquatic resource functions and

[7] Includes temporary direct impacts to waters of the state and does not include upland areas of temporary disturbance which could result in a discharge to waters of the state. Temporary impacts, by definition, are restored to pre-project conditions and therefore do not include a physical loss of area or permanent degradation of ecological condition.

for permittee responsible mitigation conducted concurrently with impacts, subject to approval by the appropriate Regional Water Board.

c. Subject to approval by the appropriate Water Board, mitigation may be satisfied using any of the following compensatory mitigation methods: restoration, enhancement, and/or establishment.

d. No discharge of dredged or fill material to waters of the state shall occur prior to Water Board approval of a final mitigation plan covering the impacted site. The mitigation plan may be provided in advance of the identification of specific projects subject to Regional Water Board approval.

X. Public Notice

The State Water Board provided public notice of the application and draft certification pursuant to California Code of Regulations, title 23, section 3861 from July 12, 2022, to August 26, 2022. The State Water Board did not receive any comments during that comment period. In addition, the State Water Board noticed the draft order in accordance with Water Code section 13167.5 beginning on February 7, 2023 and ending on March 9, 2023. The State Water Board did not receive any comments during that comment period.

XI. California Environmental Quality Act (CEQA)

On June 21, 2022, the California Department of Fish and Wildlife, as lead agency, certified an environmental impact report State Clearinghouse No. 2017122028 for the Project and filed a Notice of Determination at the State Clearinghouse on July 7, 2022. Pursuant to CEQA, the Water Board has made Findings of Facts (Findings) which support the issuance of this Order and are included in Attachment E.

XII. Petitions for Reconsideration

Any person aggrieved by this action may petition the Water Board to reconsider this Order in accordance with California Code of Regulations, title 23, section 3867. A petition for reconsideration must be submitted in writing and received within 30 calendar days of the issuance of this Order.

XIII. Water Quality Certification and Waste Discharge Requirements

I hereby issue the Order for the Pacific Gas and Electric Company Bay Area Operations and Maintenance Program, SB21039IN, certifying that as long as all of the conditions listed in this Order are met, any discharge from the referenced Project will comply with the applicable provisions of Clean Water Act sections 301 (Effluent Limitations), 302 (Water Quality Related Effluent Limitations), 303 (Water Quality Standards and Implementation Plans), 306 (National Standards of Performance), and 307 (Toxic and Pretreatment Effluent Standards).

All Order actions are contingent on: (a) the discharge being limited and all proposed mitigation being completed in strict compliance with the conditions of this Order and the attachments to this Order; and (b) compliance with all applicable requirements of Statewide Water Quality Control Plans and Policies and the Regional Water Boards' Water Quality Control Plans.

Date

Karen Mogus, Deputy Director
Division of Water Quality

United States Department of the Interior

FISH AND WILDLIFE SERVICE
San Francisco Bay-Delta Fish and Wildlife Office
650 Capitol Mall, Suite 8-300
Sacramento, California 95814

In reply refer to:
08FBDT00-2020-F-0197

August 6, 2021

Katerina Galacatos, Ph.D.
South Branch Chief, Regulatory Division
San Francisco District
U.S. Army Corps of Engineers
450 Golden Gate Avenue, 4th Floor
San Francisco, CA 94102

Subject: Final Programmatic Formal Consultation for the Pacific Gas and Electric Company's (PG&E) Bay Area Operation and Maintenance (O&M) Program in Alameda, Contra Costa, Marin, Napa, Santa Clara, San Francisco, San Mateo, Solano, and Sonoma Counties, California (Corps File Number: 2018-00490)

Dear Dr. Galacatos:

This letter is in response to the U.S. Army Corps of Engineers' (Corps) June 11, 2020, letter requesting formal consultation with the U.S. Fish and Wildlife Service (Service) on the Corps issuance of a Regional General Permit (RGP) for PG&E's Bay Area O&M Program in Alameda, Contra Costa, Marin, Napa, Santa Clara, San Francisco, San Mateo, Solano, and Sonoma Counties, California. In the June 11, 2020, letter, the Corps determined that activities covered under the RGP may affect, and are likely to adversely affect the following species not included in PG&E's Bay Area O&M Habitat Conservation Plan (HCP): the endangered California least tern (*Sterna antillarum browni*) (CLT), the threatened western snowy plover (*Charadrius nivosus nivosus*) (WSP), endangered palmate-bracted bird's-beak (*Cordylanthus palmatus*), and the endangered soft bird's-beak (*Chloropyron molle* ssp. *molle*). The Corps also determined that activities covered under the RGP may affect, but are not likely to adversely affect the WSP designated critical habitat, and the soft bird's-beak designated critical habitat. The Corps initially requested consultation on the threatened delta smelt (*Hypomesus transpacificus*) and its critical habitat and the endangered Sonoma alopecurus (*Alopecurus aequalis* var. *sonomensis*) but later withdrew those requests.

The Corps also requested concurrence from the Service that the proposed Federal action and any associated incidental take of the federally listed species listed below were considered in the intra-Service section 7 consultation for PG&E's Section 10(a)(1)(B) permit for PG&E's Bay Area O&M HCP. The species included in the HCP that may be affected by the activities under the RGP are: the endangered California freshwater shrimp (*Syncaris pacifica*), the endangered

conservancy fairy shrimp (*Branchinecta conservatio*) and its designated critical habitat, the endangered longhorn fairy shrimp (*Branchinecta longiantenna*), the threatened vernal pool fairy shrimp (*Branchinecta lynchi*) and its designated critical habitat, the endangered vernal pool tadpole shrimp (*Lepidurus packardi*) and its designated critical habitat, the threatened Delta green ground beetle (*Elaphrus viridis*) and its designated critical habitat, the threatened California tiger salamander (*Ambystoma californiense*) (Central California distinct population segment (DPS)) and its designated critical habitat, the endangered California tiger salamander (Sonoma County DPS) and its designated critical habitat, the threatened California red-legged frog (*Rana draytonii*) and its designated critical habitat, the threatened Alameda whipsnake (*Masticophis lateralis euryxanthus*) and its designated critical habitat, the endangered San Francisco garter snake (*Thamnophis sirtalis tetrataenia*), the endangered California clapper rail (*Rallus longirostris obsoletus*)[1], the endangered salt marsh harvest mouse (*Reithrodontomys raviventris*), the endangered Burke's goldfields (*Lasthenia burkei*), the endangered Contra Costa goldfields (*Lasthenia conjugens*) and its designated critical habitat, the endangered fountain thistle (*Cirsium fontinale* var. *fontinale*), and the endangered Sebastopol meadowfoam (*Limnanthes vinculans*).

This response is provided under the authority of the Endangered Species Act of 1973, as amended (16 U.S.C. § 1531 *et seq*.) (Act), and in accordance with the implementing regulations pertaining to interagency cooperation (50 CFR 402).

In reviewing this project, the Service has relied upon: (1) the Corps' June 11, 2020, letter requesting consultation; (2) the June 2020, *Biological Assessment for the Regional General Permit for Pacific Gas and Electric Company's Bay Area Operation and Maintenance Program* (BA) prepared by Insignia Environmental (consultants); (3) the updated December 2020, BA; (4) PG&E's Bay Area O&M HCP; (5) electronic mail, telephone, and teleconference communications between the Service, PG&E, the Corps, and PG&E's consultants; and (6) other information available to the Service.

PG&E's Bay Area O&M HCP

The purpose of this programmatic consultation is to evaluate the effects of PG&E's Bay Area O&M Program on listed species that were not covered under PG&E's Bay Area O&M HCP (ICF 2017). The Service issued an Incidental Take Permit (Permit Number TES6826C-0 (Service 2017)) (ITP) to PG&E, in October of 2017 pursuant to section 10(a)(1)(B) of the Act. The Service also issued the September 28, 2017 intra-Service biological opinion (2017 BO) (Service File No. 08ESMF00-2013-F-0102) for issuance of the ITP. This programmatic consultation and the appurtenant species evaluations serve to coincide with the 30-year term of PG&E's Bay Area O&M HCP set to expire October 2, 2047 which would leave the remainder of approximately 26 years for the term of this PBO. In the 2017 BO, the Service concluded that the effects of PG&E's O&M activities and level of incidental take were not likely to jeopardize the continued existence of endangered California freshwater shrimp, the endangered conservancy fairy shrimp, the endangered longhorn fairy shrimp, the threatened vernal pool fairy shrimp, the endangered vernal pool tadpole shrimp, the threatened Delta green ground beetle, the threatened California tiger salamander (Central California DPS), the endangered California tiger salamander (Sonoma County DPS), the threatened California red-legged frog, the threatened Alameda whipsnake, the

[1] Until the Service officially adopts recent nomenclature changes made by the American Ornithologists' Union to Ridgway's Rail (*Rallus obsoletus*), we maintain the use of California clapper rail (*Rallus longirostris obsoletus*) in this correspondence. Note, the change in taxonomic assignment does not change the listing status of the species.

endangered San Francisco garter snake, the endangered California clapper rail, the endangered salt marsh harvest mouse, the endangered Burke's goldfields, the endangered Contra Costa goldfields, the endangered fountain thistle, and the endangered Sebastopol meadowfoam or result in the adverse modification or destruction of their respective designated critical habitats. We do not anticipate any additional adverse effects to the aforementioned 17 species or their critical habitats that were not previously evaluated in our 2017 BO. Thus, no incidental take beyond that anticipated in the 2017 biological opinion is likely to occur as a result of issuance of the RGP for PG&E's Bay Area O&M Program. Consistent with the 2017 BO, the Service concludes that issuance of the RGP for PG&E's Bay Area O&M Program is not likely to jeopardize the aforementioned 17 species or result in the adverse modification or destruction of their respective designated critical habitats. Activities under the RGP, if implemented as described in the updated BA, comply with all applicable conditions required by the PG&E Bay Area O&M HCP, ITP, and our intra-Service 2017 biological opinion and its associated incidental take statement. Therefore, by this consultation, incidental take for the aforementioned 17 species for this RGP is exempted by the ITP for the Bay Area O&M HCP.

Soft Bird's-beak Critical Habitat

The Service concurs that activities covered under the RGP may affect and are not likely to adversely affect the soft bird's-beak critical habitat. Although the Action Area intersects critical habitat for soft bird's-beak, overall impacts to critical habitat are anticipated to be short term and relatively minor due to the nature of the O&M activities. PG&E anticipates up to 0.02 acre of temporary impacts and no permanent impacts to soft bird's-beak critical habitat as a result of the proposed activities. Habitat affected by temporary disturbance is anticipated to return to its functionality as critical habitat for the species. Impacts are anticipated to be further minimized with the implementation of PG&E's avoidance and minimization measures (AMMs).

The Service does not concur that activities covered under the RGP may affect, but are not likely to adversely affect the WSP designated critical habitat. Although PG&E has identified that activities will likely result in only a small percentage of permanent impacts to the WSP designated critical habitat, the permanent loss of critical habitat, particularly over an annual basis, is still a reduction of the overall critical habitat and/or the primary constituent elements (PCEs) which therefore constitutes an adverse effect and warrants formal consultation.

The remainder of this document represents the Service's programmatic biological opinion on the effects of PG&E's Bay Area O&M Program on the CLT, the WSP and its critical habitat, the palmate-bracted bird's-beak, and the soft bird's-beak.

ADMINISTRATION OF THIS PROGRAMMATIC BIOLOGICAL OPINION

Many of the proposed O&M activities, projects, and conservation measures occur in waters regulated by the Corps and require a Corps' permit. Many of these projects have a small, individual footprint and can be permitted under the Corps' RGP. By providing a programmatic-level biological opinion for these O&M activities and projects, the Corps would not have to consult separately for each activity described in this programmatic biological opinion (PBO). The Service supported this approach because it allows for a more efficient workload and is more appropriate than the current approach of consulting on individual projects that are covered activities under the HCP.

Projects determined inconsistent with this biological opinion are those that exceed minimal effects to this species and would require a separate consultation. Restoration projects proposed as a conservation measure and associated with mitigation for these on-site O&M activities are not included in the analysis for this PBO and will require separate consultation with the Service.

CONSULTATION HISTORY

June 11, 2020	The Service receives the Corps' initiation letter for the project.
October 6, 2020	The Service requests a meeting with the Corps and PG&E to discuss PG&E's application for a RGP and to recommend a PBO to cover species not covered under the PG&E Bay Area O&M HCP.
October 16, 2020	The Service attends a meeting with the Corps, PG&E, and PG&E's consultant via teleconference. The Service, the Corps, and PG&E agree that a PBO would be appropriate for the issuance of the RGP. The Service recommended that PG&E and the Corps utilize the Service's December 1, 2004 PBO for delta smelt for activities proposed under PG&E's Bay Area O&M Program.
December 28, 2020	The Service receives an updated BA which addresses utilization of the Service's December 1, 2004, PBO for delta smelt and updated conservation measures with regard to CLT and WSP.
March 16, 2021	The Corps requests an official "Draft" of the PG&E O&M programmatic biological opinion and requests to withdraw the delta smelt and the delta smelt critical habitat from the consultation.
April 28, 2021	The Corps requests to withdraw the delta smelt and the Sonoma alopecurus from the consultation. The Corps will address effects to delta smelt by appending appropriate projects to the Service's December 1, 2004 PBO for delta smelt for activities proposed under PG&E's Bay Area O&M Program. The Corps determined that the Sonoma alopecurus would not be affected by the proposed project as the species is not anticipated to occur within the Action Area.
June 11, 2021	PG&E proposed modifications to their conservation measures. For the two plant species (i.e., palmate-bracted bird's-beak and soft bird's-beak), PG&E will create Map Book Zones and implement conservation measure Plant-04 to be consistent with the HCP. PG&E also proposed changes to the breeding season avoidance window for the CLT and WSP to be consistent with the Don Edwards Fish and Wildlife Refuge's Special Use Permit.
June 15, 2021	The Service issued a Draft PBO to the Corps and PG&E for their review and to provide comment.

July 21, 2021 PG&E provided minor comments to the Draft PBO.

July 27, 2021 The Service met with the Corps and PG&E to discuss comments provided by PG&E. After minor language edits, the Corps and PG&E agreed they were satisfied with the Draft PBO and requested issuance of a Final PBO.

BIOLOGICAL OPINION

Description of the Proposed Action

Electrical System Activities

PG&E's electric system consists of a transmission system and a distribution system. The electric transmission system consists of approximately 4,430 miles of transmission lines, 23,015 miles of distribution lines, and 207 substations. Within this system, approximately 2,699 electric structures (e.g., poles, boardwalks, pole foundations, and tower footings) are located within waters of the U.S. in the nine Bay Area counties.
Substation Maintenance

Typical major maintenance tasks include transformer, switch, fuse, cutout, meter, and insulator repair and replacement. Maintenance of substation systems requires this type of work approximately once per year. Load demands may require modifications to station equipment or installation of new facilities. Maintenance activities could require use of station property or adjacent property for construction staging, materials storage, permanent facilities, and land management. Substation maintenance is anticipated to result in approximately 20,000 square feet of temporary disturbance, which is not anticipated to occur every year.

Tower Replacement and Repair

PG&E performs routine O&M activities on towers throughout the Bay Area, including tower replacement and tower foundation repair. Old tower footings may be abandoned in place as necessary. 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 large quantity of material is needed at the job site, PG&E builds a temporary section of boardwalk laterally from the existing boardwalk or utilizes barges for work areas. A helicopter or barge is then used to place the material on the temporary boardwalk, and workers move the material to the work site by hand or wheelbarrow. A barge with a crane or helicopter is used to repair or replace the upper portion of the tower. In areas where there are no existing boardwalks, and/or construction of a temporary boardwalk is not feasible, all work will be conducted from a barge or helicopter. Barges may rest on the bottom of the bay at low tide depending on the local conditions.

For typical foundation repair procedures, the material is first brought to the site by helicopter or barge, or a combination of both. To repair foundations submerged in shallow water, such as in the fringes of San Francisco Bay, a cofferdam is installed during low tide around the footing to be repaired (or around the entire tower). The cofferdam is usually built out of 1.125-inch plywood and 4-inch by 4-inch strong backs, or with metal sheet piles. In the case of plywood cofferdams, mud near the base of the footing is removed using hand tools and the cofferdam is

pushed down to the required depth to expose the solid piling, which is usually 3 feet below the mud line. Metal sheet piles will be driven by a vibratory hammer to the appropriate depth. Typically, any removed mud or sediments are placed in bags and taken to a landfill. If there is limited mud collected, then it is returned to the base of the footing after the repair is complete.

To strengthen tower foundations, concrete from the existing footings is removed to expose the steel reinforcements. New pins are inserted, a new rebar cage is installed, and forms are constructed. The concrete is then poured, allowed to cure, and the form is removed. In some instances, grade beams are installed between adjacent foundations. This involves installing forms, pouring concrete, and removing the forms. Once the repair is complete, the cofferdam is removed by excavating around the outside and hoisting it from the workspace.

New tower piles are installed by first installing a cofferdam within the tower work area. The cofferdam keeps the enclosed area dry and minimizes the mobilization of sediment during construction activities. Any water in the cofferdam is pumped directly onto the adjacent land or into the adjacent water. Once the cofferdam is installed and dewatered, a barge-mounted pile driver is used to embed piles approximately 70 feet into the ground. The piles are usually composed of wood and surrounded by metal cages and cement. Temporary effects result from the approximately 25-foot by 40-foot footprint for the crane (when necessary for repairs) and an approximately 25-foot by 100-foot work area.

A crew of six to ten personnel is typically required, and tower/foundation repairs usually take 1 to 5 weeks to complete for each tower. Access occurs primarily on existing roads, though some overland access with small trucks or sport utility vehicles is also expected. In-water access will occur with the use of boats and barges primarily for towers within the San Francisco, San Pablo, Suisun, and Grizzly bays, and tributaries that are large enough for barges to access.

Boardwalk Replacement or Repair

PG&E has many miles of boardwalks that service transmission facilities in the vegetated margins, mudflats, and open water around the San Francisco Bay. The boardwalks typically extend from levees and provide access across marshes and salt ponds to transmission tower footings. Support equipment for replacement and repair may include, but is not limited to boats, barges, and helicopters. Barges may rest on the bottom of the bay at low tide depending on the local conditions. A staging yard located on land is often also used to store materials. All boardwalk replacement and repair activities are completed manually and require the use of generators and handheld equipment including, but not limited to, drills, chain saws, and skill saws. A crew of three to five personnel conduct the repair or replacement activities, which typically take 2 months to complete. Crews typically work from existing installed sections of boardwalks, which minimizes the need for access below and around the boardwalk. However, in some instances, work is conducted from barges and/or from the mudflat during low tide.

Replacement pilings are pushed into the ground using a steel bar for leverage, or hammered in using sledge hammers or similar tools. Degraded piles that have been replaced will be removed as close to the mudline as possible. Replacement planking is transported along the boardwalk on special hand-dollies. Planking is then slid into place, drilled, and bolted. The handrails are wood planks that are connected to the boardwalk by the support beams. If the existing boardwalk is substantially degraded, crews perform the work within an approximately 10-foot radius around the boardwalk being replaced. Handrails are then installed, which are wood planks that are

connected to the boardwalk with support beams. Support beams and then handrails are put in place, drilled, and bolted.

Pole Reinforcement and Replacement

Pole reinforcement methods may include attaching trusses to existing poles to provide additional support, or 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. The most common way to restore ground-level strength to utility poles involves the installation of a single (or in some cases, a double) steel truss. Steel trusses are usually galvanized to reduce corrosion potential. Steel trusses are driven to pre-defined depths and secured to the pole with high-strength steel banding. The pole is not removed to install the truss. Composite or fiberglass installations involve excavating around the pole, cleaning the pole, and treating the pole to arrest any decay. Composite fabric sheets are wrapped around the pole in layers, and a resin material is applied to each layer. The excavated area around the pole is then backfilled. The pole is not removed to install the composite materials. PG&E determines the type of reinforcement method after reviewing the results of an inspected line segment. This may require the installation of guy wires and anchors, by line truck auger, which could consist of a screw or a concrete structure. The work is generally performed by a crew of two to five personnel and takes 1 to 2 days to complete. Temporary impacts typically total approximately 6,500 square feet per year from work areas. When replacing a wooden transmission or distribution pole, the new pole is framed (i.e., crossarms, 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 auger is used to drill a hole, the new pole is placed into the new hole, the void is backfilled and compacted, and 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. This may require the installation of guy wires and anchors, which could consist of a screw or a concrete structure. Pole and equipment replacement and repair require an approximately 10-foot-long by 7-foot-wide work area. The work is generally performed by a crew of four to five personnel and is completed in 1 day for a distribution pole and up to 3 days for a transmission pole. Temporary impacts typically total approximately 0.80 acre per year as a result of using the work areas.

Line Reconductoring

PG&E replaces conductors (i.e., wires) once the wires have outlasted their usefulness or if increased capacity is required. Work crews install replacement conductors by temporarily splicing them to the ends of the existing conductors and pulling them through travelers (i.e., pulleys) attached to the arms of the towers or pole cross-arms. Conductor replacement begins with the installation of travelers 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. Once the travelers are in place, the conductor is unclipped from the insulators and a hoist is used to lower the existing conductor onto the travelers. Next, the existing conductor removed from the structures within a pull section. Once the new conductor is pulled into place, it is removed from the travelers and clipped onto the insulators. The travelers are then removed.

Reconductoring typically is done in 2- to 3-mile sections with the use of pull and tension sites (i.e., 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 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 (i.e., 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 on site, typically deliver and remove the reels. On-site cranes move the conductor reels on and off the semi-trucks. Pull sites are generally rectangular and vary in size from 50 to 350 feet wide for small pull sites and 100 to 1,250 feet long for large pull sites. Distances between pull sites vary, but on average, approximately 2.70 miles of conductor separates single pull sites or groups of pull sites. Vegetation mowing and minor grading may be required to prepare pull sites for use. Mats or gravel may also be used in wet locations. The work is generally conducted by a crew of three to eight personnel and potentially one helicopter crew over a period of 1 to 2 months.

Facility Access

Electric transmission and distribution O&M activities may require routine access road maintenance, including blading to smooth over washouts, eroded areas, and washboard surfaces as needed. Access road maintenance could include cleaning ditches, moving and establishing berms, clearing and making functional drain inlets to culverts, culvert repair, clearing and establishing waterbars, and cleaning and repairing over-side drains. Prefabricated bridges or culverts may need to be installed to ensure safe access and reduce environmental impacts. If the bridge is needed for only a short duration, a portable bridge is assembled onsite and secured with a crane to span the crossing. If a longer term crossing is required, a culvert may be installed after PG&E obtains all appropriate permits and authorizations. Likewise, existing culverts may need to be repaired or replaced from time to time. Access road maintenance includes the repair, replacement and installation of storm water diversion devices on an as-needed basis.

Where PG&E cannot complete O&M activities from an existing workspace, construction crews may place a mat as a work area. Equipment is then driven or placed onto the mats, and work is conducted from that location. Workers place the mats in such a way to help protect the vegetation within the temporary workspace during the maintenance activity. Mats are removed once the O&M activity has been completed.

Natural Gas System Activities

PG&E's natural gas system consists of a transmission system and a distribution system. The transmission system in the nine-county area comprises 16 primary gas transmission lines totaling approximately 1,820 miles of pipeline, and the distribution system consists of 19,350 miles of distribution pipelines.

Fencing

Protective security fencing is sometimes installed around pipeline facilities to discourage vandalism. Fencing these areas requires digging holes to install fence posts using an auger. Chain-link fencing is then installed between the fence posts. Fence installation typically requires a disturbance area of approximately 50 feet by 50 feet for each location. A crew of three personnel usually performs the fence installation within a few days.

Site-Specific Erosion Solutions

In some locations, scour and erosion within a waterway can result in pipe exposure. In these instances, site-specific solutions to the erosion problem (e.g., installing biodegradable jute netting, riprap, and rock fill) may be employed over the pipeline and within the waterway to protect the pipeline from potential damage. These erosion solutions are typically permanent to protect the exposed pipeline and prevent further erosion from occurring. The extent of the erosion solution will typically not be longer than 100 feet or wider than 50 feet on any stream in the RGP area. Installation will typically begin with preparing the site for installation of the erosion solution. This may involve clearing existing vegetation and minor recontouring in the area of existing erosion. Once prepared, the erosion solution will be delivered to the site on a truck and placed in the prepared area. The erosion solution will then be installed according to the manufacturer's specifications. PG&E installs erosion solutions at three to five locations per year. A crew of two to eight personnel is usually required over a period of approximately 2 weeks.

Internal Pipeline Inspection

PG&E is required to confirm the integrity of its natural gas pipeline system in accordance with the Pipeline Safety Act. PG&E inspects the pipeline integrity by use of an internal inspection tool that identifies potential anomalies (e.g., pipe corrosion, cracks, or indentations). If an anomaly is found during the inspection of the pipeline, it is reviewed, inspected, and repaired as necessary. To evaluate the identified anomaly, a crew of two to four personnel is deployed to excavate a bell hole using a backhoe. The area of the exposed pipeline depends on the size and type of the anomaly found, as well as the current ground conditions and depth of the pipe. Once the pipeline is exposed, technicians measure and document the anomaly and a Pipeline Engineer determines the appropriate repair method.

Anomaly repairs may include welding a sleeve around the pipe. This process begins with sandblasting the section of pipe that will be sleeved and preparing the sleeve itself. Once prepared, the sleeve is wrapped around the anomaly, secured in place, and welded to the pipe. The sleeve and adjacent pipe are coated and the surrounding area is backfilled as appropriate. Sleeve repairs typically require a crew of four to six personnel and can take 1 to 2 days to complete. If the anomaly is particularly severe, the segment of pipe may have to be replaced. Internal pipeline inspection typically takes approximately 1 week to complete. PG&E estimates that disturbance associated with these inspection activities totals approximately 50 by 100 feet for each instance.

Pipeline Recoating

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 Electronic Test System Station and then measures for a loss of voltage. The integrity of pipeline coating may also be inspected visually on exposed areas, such as spans, valves, or stations. Once recoating is determined to be required, the pipeline to be recoated is excavated using a backhoe. In some instances, excavation and backfill may be required in wetlands or waterways. PG&E will only conduct pipeline recoating activities when wetlands and waterways are dry to avoid impacts to aquatic species and habitat. A crew of approximately four to six personnel removes the old coating by jetting, scraping, or sandblasting

and typically places plastic sheeting or tarps below the pipe to collect the residue. PG&E tests the residue to determine if it is hazardous and disposes of it in accordance with regulations. The surface of the pipe is then prepared for the new coating by running a self-contained grit- or shot-blasting machine over the exposed area. The pipeline continues to operate while a coating machine applies the coating. On average, an approximately 20-foot-wide work area is needed for this activity. The estimated annual temporary fill is approximately 440 square feet. The activity typically takes approximately 3 to 5 days to complete.

Valve Recoating and Replacement

Valves regulate the flow of gas through the pipeline and enable crews to isolate portions of the pipeline. Occasionally, these valves malfunction or wear out. Depending on the condition of the valve, PG&E either recoats or replaces approximately five valves annually. Prior to replacing or installing valves, a portion of the gas line will need to be blown down (i.e., gas is evacuated to the atmosphere from the affected section of pipe through a blowdown stack). Equipment required for recoating valves typically includes a flatbed truck/trailer or dump truck with a trailer, a backhoe, a water truck, an excavator, a vacuum excavator, welding trucks, a trailer-mounted compressor, a truck-mounted crane, a side boom, a front-end loader, crew trucks, barricades, and safety fencing. Recoating is conducted by a crew of six to 13 personnel by sandblasting the valve over tarps, collecting the debris, and recoating the valve with a specialized epoxy that protects against corrosion. To coat the entire valve down to where it connects to the pipeline, the area around the valve must be excavated to expose the pipe and then backfilled once recoating is complete. In some cases, the existing valves are located in wetlands and waterways. PG&E will only conduct valve recoating and replacement activities when streambeds and waterways are dry to avoid impacts to aquatic species and habitat. Workspace dimensions can vary and are dependent on available space in the easement. In most cases, a workspace footprint for a valve replacement measures approximately 40 feet by 60 feet. The process generally takes 4 to 6 days to complete. Valve replacement involves excavation to access the existing valve and adjacent segment of pipeline, removal of the existing valve (and potentially a segment of the adjacent pipeline), installation of the new valve, and backfill of the excavated area. Equipment required for replacing or installing valves is generally the same as the equipment required for valve recoating as discussed previously. Each valve replacement typically takes 4 to 5 weeks to complete, and crews conduct maintenance within the existing facility footprint.

Pipeline Cathodic Protection

Cathodic protection is a technique to control pipeline corrosion by making the pipeline the cathode of an electrochemical cell. As a pipeline’s coating degrades over time, it requires increased cathodic protection to prevent corrosion. A cable rated for the expected current output connects the negative terminal of a rectifier to the pipeline. The cable is installed underground usually via open trench. 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 installation of a cathodic protection system requires a type of anode (e.g., horizontal anode bed, flex anode, deep well anode) to be installed parallel and adjacent to the pipeline. The

distance from the anode installation to the pipeline may range from several hundred feet to several miles. Depending on the type of anodes installed, the equipment required may include pickup trucks, a trencher, a welding truck, a flatbed truck/trailer or dump truck with a trailer, a backhoe, a lowboy trailer, a tractor cat-loader, and/or a water truck. The anode installation is placed in the trench parallel to the pipeline, and the excavations are backfilled and recontoured to their original conditions. The pipeline continues to operate during installation or replacement of the anodes. The installation of certain types of anode beds requires excavation. The installation of cathodic protection equipment requires a crew of six to ten personnel and typically takes 7 to 10 days to complete. PG&E undertakes many cathodic protection activities each year using the methods described previously. An approximately 100-foot by 10-foot work area is needed to install the cable, excavate the soil, and stockpile soil.

Pipeline Lowering and Replacement

State and Federal code, as well as PG&E procedures dictate when pipeline segments need to be replaced. Public safety sometimes necessitates the replacement or abandonment of pipeline sections when they are damaged by construction projects, acts of nature, or aging and corrosion. The equipment typically required for pipeline segment replacement or abandonment includes a truck, bulldozer, excavator, frac tank, forklift, lowboy and trailer, sideboom, water truck, and a welding rig. Pipeline segment replacement begins with clearing and grading the right-of-way (ROW) and trenching and excavating the existing pipeline. A new trench is excavated for the new pipeline segment parallel and adjacent to the existing pipeline. PG&E typically places the new section of pipe as close to the abandoned pipeline as possible and modifies any existing easements by expanding the easement width to accommodate the new section of pipeline. For longer pipeline segment replacements, a welded and coated pipe is lifted and lowered into the trench by side boom tractors and excavators. Padded slings are used so the tractors can lower the pipe without damaging the pipe's protective coating. For shorter pipeline replacements, especially sections damaged by third parties or corrosion, replacements are typical within the same alignment.

Before the old pipeline is removed from service, it is blown down (i.e., gas is evacuated to the atmosphere from the affected section of pipe through a blowdown stack). The new pipeline segment is tested and X-rayed, and then tied in to the existing pipeline at the points where the old segment was removed. An existing pipeline is usually abandoned in place by first cleaning it, and then filling it with slurry before the pipeline is capped. Slurry is used if the pipeline crosses a waterbody or needs to be stabilized. If the old pipeline segment is removed instead of being abandoned, it is cut into smaller sections and transported to a facility where segments may be recycled or disposed of properly. All trenches are then backfilled. Backfilling the trench involves replacing and compacting the excavated subsoil into the trench and re-spreading the stockpiled topsoil, if appropriate, to return the surface to its original grade. The topsoil may be mounded slightly over the trench to accommodate any future settling of the trench backfill. Where possible, native material excavated from the pipeline trench is used to backfill the trench. If rock conditions are encountered during trench excavation, the trench bottom is first padded with a layer of imported rock-free sand.

The length of pipe affected varies, depending on the reason for replacement. The minimum length of pipe replaced is typically approximately 40 feet (for one joint of pipe), though up to 1 mile could be replaced during each replacement effort. A crew of 15 to 20 personnel is typically required for pipeline segment replacement and lowering projects. Two to 4 weeks are needed to

complete small replacements and approximately 24 weeks to complete large replacements. Trenching and soil excavation, soil stockpiling, staging, and construction vehicles typically disturb an approximately 100-foot-wide work area, which includes the 10-foot excavation area. However, if pipeline replacement takes place within an environmentally sensitive area, the width of the work area is typically narrowed to 40 to 60 feet in width depending on the terrain and site specific conditions to minimize impacts.

Pipeline lowering and replacement activities may require the installation of prefabricated bridges or culverts 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 on site 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.

Water Diversion Techniques

Pipeline crossings within water features that have flowing water require the implementation of water diversion techniques to minimize the potential for impacts to water quality and create a dry and safe work area. This requires a crew of two to three personnel installing a diversion structure (e.g., a dam or weir and a pump or headgate) to divert water through a temporary ditch or pipe to convey the water around the section of pipeline that requires O&M work. However, many of the water features in the Action Area are ephemeral, and work will most likely be conducted when the features are dry and diversion is not necessary. Upon completion of work on the pipeline segment, the water diversion structure is removed and the flow of the water feature is restored to its original state. Water diversion, including restoring flow of the water feature to its original state, typically takes 3 to 5 days to complete. Water diversion techniques temporarily disturb an approximately 10-foot-long and 20-foot-wide work area.

Pipeline Access

Pipeline O&M activities may require routine access road maintenance, including blading to smooth over washouts, eroded areas, and washboard surfaces as needed. Access road maintenance could include cleaning ditches, moving and establishing berms, clearing and making functional drain inlets to culverts, culvert repair, clearing and establishing waterbars, and cleaning and repairing over-side drains. O&M may require the installation of prefabricated bridges or culverts to ensure safe access and reduce environmental impacts. If the bridge is needed for only a short duration, a portable bridge is assembled onsite and secured with a crane to span the crossing. If a longer term crossing required, a culvert is installed after PG&E obtains all appropriate permits and authorizations. Likewise, existing culverts may need to be repaired or replaced from time to time. Access road maintenance includes the repair, replacement, and installation of storm water diversion devices on an as-needed basis. Where PG&E cannot complete O&M activities from an existing workspace, construction crews may place a mat as a work area. Equipment is then driven or placed onto the mats, and work is conducted from that location. Workers place the mats in such a way to help protect the vegetation within the temporary workspace during the maintenance activity. Mats will be removed after the O&M activity has been completed.

Conservation Measures

PG&E has developed general and species-specific conservation measures or AMMs to minimize or reduce the potential impacts to federally-listed species and their habitats that are located within the Action Area. Relevant AMMs were taken from the Bay Area O&M HCP and supplemented with additional species-specific measures for species that were not covered in the HCP. Please refer to the project BA and/or the PG&E HCP for standard best management practices, spill prevention plans, storm water pollution prevention plans, and other general conservation measures.

Bay Area O&M HCP Measures

PG&E will apply the following Field Protocols (FP), Hot Zone (HZ) AMMs, and Habitat-Specific AMMs described in the Bay Area O&M HCP to avoid and minimize potential impacts at they pertain to federally-listed species addressed in this document:

FP-02: Park vehicles and equipment on pavement, existing roads, or other disturbed or designated areas (barren, gravel, compacted dirt).

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.

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).

FP-06: Minimize potential for species to seek refuge or shelter in pipes and culverts. Inspect pipes and culverts, of diameter wide enough to be entered by a 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 special-status species is suspected or discovered.

FP-07: Vehicle speeds on unpaved roads will not exceed 15 miles per hour.

FP-08: Prohibit trash dumping, firearms, open fires (such as barbecues), hunting, and pets (except for safety in remote locations) at work sites.

FP-10: Reduce activity footprint wherever possible and minimize the amount of time spent at a work location to reduce the potential for take of species.

FP-11: Utilize standard erosion and sediment control best management practices (pursuant to the most current version of Permittee's *Stormwater Field Manual for Construction Best Management Practices*) to prevent construction site runoff into waterways.

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.

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 qualified 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.

FP-14: If an activity disturbs 0.1 acre or more of habitat for a special-status species in grasslands, the field crew will revegetate the area with a commercial seed mix.

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 when feasible. If refueling must be conducted closer to wetlands, construct a secondary containment area subject to review by an environmental field specialist and/or qualified biologist. Maintain spill prevention and cleanup equipment in refueling areas.

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.

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.

HZ-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.

HZ-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. Activities that cannot avoid vernal pool impacts will be completed when pools are clearly dry.

Wetland-1: Identify vernal pools and establish buffers. Maintain a buffer of 250 feet around vernal pools and vernal pool complexes when feasible. 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 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.

Wetland-2: Identify wetlands, ponds, and riparian areas and establish buffers. Maintain a buffer of 50 feet around wetlands, ponds, and riparian areas when feasible. 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 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.

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).

Plant-02: Heavy equipment shall remain on access roads or other previously disturbed areas unless otherwise prescribed by a land planner or biologist.

Plant-03: Stockpile separately the upper 4 inches of topsoil during excavations associated with covered activities. Stockpiles topsoil will be used to restore the disturbed ROW.

Plant-04: When activities greater than 0.1 acre in size within a MBZ will have direct impacts on special-status species, work with the crew to place flagging, fencing, or other physical exclusion barriers to minimize disturbances. If the work will directly impact special-status plant species, implement Plant-05, -06, -07, and -08 AMMs.

Plant-05: If a special-status 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 Service review and approval.

Plant-06: If a special-status annual plant species is present and it cannot be avoided, conduct activities after seeds have matured to the extent possible.

Plant-07: If a special-status 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).

The following conservation measures or AMMS proposed by PG&E are specific to CLT and WSP for this document:

1. O&M activities within 600 feet of actively nesting CLT will not be conducted during the breeding season (March 1 through August 31). Work will occur within the limited operating period of September 1 through February 28 or 29 if CLT are nesting within 600 feet.

2. No O&M activities will be performed within 600 feet of an active WSP nest or brood during the WSP breeding season (March 1 through September 14). Work will occur within the limited operating period of September 15 through February 28 or 29 if WSP are nesting within 600 feet. Vehicles driving on levees and pedestrians walking on boardwalks or levees will remain at least 600 feet away from WSP nests and broods. If WSP chicks are present near any levee that will be accessed by vehicles (e.g., for construction, inspection, or access), vehicle use will be under the supervision of a qualified biologist to ensure that no chicks are present within the path of the vehicle.

3. Helicopter flight paths will avoid active CLT colonies and WSP nests. Helicopter landings will take place on existing levees or roads. No landings in tidal marshes are permitted.

The Following conservation measure or AMM proposed by PG&E are specific to the palmate-bracted bird's-beak and the soft bird's-beak for this document:

1. For the palmate-bracted bird's-beak and soft bird's-beak, PG&E will create Map Book Zones and implement Plant-04 to be consistent with the HCP.

Compensatory Mitigation

PG&E is proposing to mitigate for permanent impacts to CLT and WSP habitat at a ratio of 3:1. PG&E will also provide compensatory mitigation for any permanent impacts to federally listed plant species at a ratio of 1:1. PG&E proposes to follow a similar mitigation process as outlined in the Bay Area O&M HCP for the federally-listed wildlife and plant species. This may include funding the acquisition, management, enhancement, and/or restoration of affected species' habitat. All proposed mitigation must be submitted to the Service for review and approval prior to implementation. PG&E will secure mitigation in advance of the work. As work is performed, the actual impacts to species' habitat will be tracked, and mitigation efforts will be adjusted accordingly to ensure that the appropriate amount of mitigation is provided. PG&E will report the annual mitigation acreage used to the applicable agencies and confirm that the remaining acreage is adequate for future mitigation.

Compensatory mitigation for all permanent impacts to wildlife habitat and federally-listed plant species will occur using one or a combination of the following options as deemed appropriate from the Service through a submittal, review and approval process: (1) Developing permittee-responsible mitigation sites; (2) purchasing credits from conservation banks; and/or; (3) contributing to habitat restoration and/or enhancement programs. Please refer to the BA and/or the PG&E HCP for details regarding the mitigation submittal, review, and approval process.

With this RGP specifically in mind, PG&E is in the process of developing sites that can provide compensatory mitigation for the impacts to species covered under this RGP. This includes potential sites that could be used for multiple terrestrial species, including the three plant species, at various Sonoma Land Trust projects within the Petaluma River and Sonoma Creek watersheds. All sites will be acquired in coordination with the Service. PG&E will receive credit for the mitigation following the development and recordation of the easement, equivalent conservation instrument, or ownership (County, State, or Federal land donation), establishment of an endowment or other financial mechanism for long-term funding, and development of a long-term management plan.

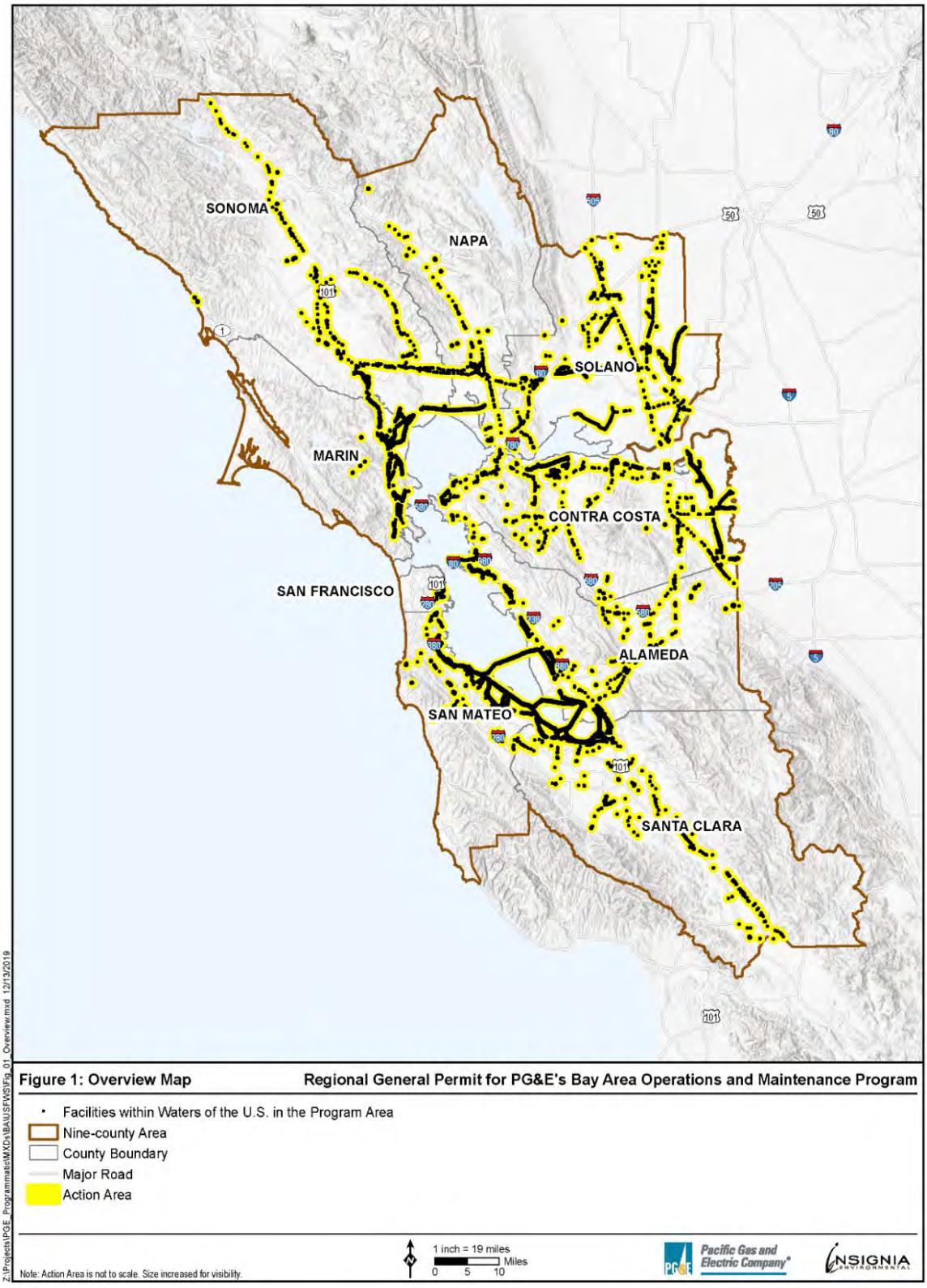
All conservation bank credits will be acquired in coordination with the Service. PG&E will receive credit for the site following the submittal of the bill of sale for the purchase of the credits.

All contributions to habitat restoration and/or enhancement programs will be coordinated with the Service. In cases where PG&E funds restoration efforts, mitigation credit will be conditionally approved upon funding and fully approved once the performance criteria for the restoration project are met.

Action Area

The Action Area is defined as “all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action,” (50 Code of Federal Regulations [CFR] 402.02). For the purposes of the effects assessment, the Action Area is located within the nine Bay Area Counties of Alameda, Contra Costa, Marin, Napa, Santa Clara, San Francisco, San Mateo, Solano, and Sonoma, California. The Action Area is defined as the gas and electric structures that occur within waters and wetlands, plus an approximately 1,000-foot buffer where effects (e.g., nest disturbance, turbidity, unanticipated spills, etc.) could occur. PG&E does not anticipate that pipeline replacement or repair will occur within the San Francisco, San Pablo, or Suisan bays as part of the program. Therefore, pipelines within bay waters were excluded from the Action Area. The Action Area for the program is approximately 160,400 acres (250 square miles)(Figure 1.).

Figure 1. Action Area for the PG&E O&M PBO



ANALYTICAL FRAMEWORK for the JEOPARDY DETERMINATION

Section 7(a)(2) of the Act requires that Federal agencies ensure that any action they authorize, fund, or carry out is not likely to jeopardize the continued existence of listed species. "Jeopardize the continued existence of" means to engage in an action that reasonably would be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of that species (50 CFR § 402.02).

The jeopardy analysis in this biological opinion considers the effects of the proposed Federal action, and any cumulative effects, on the range wide survival and recovery of the listed species. It relies on four components: (1) the *Status of the Species*, which describes the current range wide condition of the species, the factors responsible for that condition, and its survival and recovery needs; (2) the *Environmental Baseline*, which analyzes the current condition of the species in the Action Area without the consequences to the listed species caused by the proposed action, the factors responsible for that condition, and the relationship of the Action Area to the survival and recovery of the species; (3) the *Effects of the Action*, which includes all effects that are caused by the proposed Federal action; and (4) the *Cumulative Effects*, which evaluates the effects of future, non-Federal activities in the Action Area on the species. The *Effects of the Action* and *Cumulative Effects* are added to the *Environmental Baseline* and in light of the status of the species, the Service formulates its opinion as to whether the proposed action is likely to jeopardize the continued existence of listed species.

ANALYTICAL FRAMEWORK for the DESTRUCTION or ADVERSE MODIFICATION DETERMINATION

Section 7(a)(2) of the Act requires that Federal agencies ensure that any action they authorize, fund, or carry out is not likely to destroy or to adversely modify designated critical habitat. A final rule revising the regulatory definition of "destruction or adverse modification" (DAM) was published on August 27, 2019 (84 FR 44976). The final rule became effective on October 28, 2019. The revised definition states:

"*Destruction or adverse modification* means a direct or indirect alteration that appreciably diminishes the value of critical habitat as a whole for the conservation of a listed species."

The DAM analysis in this biological opinion relies on four components: (1) the *Status of Critical Habitat*, which describes the current range-wide condition of the critical habitat in terms of the key components (i.e., essential habitat features, primary constituent elements, or physical and biological features) that provide for the conservation of the listed species, the factors responsible for that condition, and the intended value of the critical habitat overall for the conservation/recovery of the listed species; (2) the *Environmental Baseline*, which analyzes the current condition of the critical habitat in the Action Area without the consequences to designated critical habitat caused by the proposed action, the factors responsible for that condition, and the value of the critical habitat in the Action Area for the conservation/recovery of the listed species; (3) the *Effects of the Action*, which determines all consequences to designated critical habitat that are caused by the proposed Federal action on the key components of critical habitat that provide for the conservation of the listed species, and how those impacts are likely to influence the conservation value of the affected critical habitat; and (4) *Cumulative Effects*,

which evaluate the effects of future non-Federal activities that are reasonably certain to occur in the Action Area on the key components of critical habitat that provide for the conservation of the listed species and how those impacts are likely to influence the conservation value of the affected critical habitat. The *Effects of the Action* and *Cumulative Effects* are added to the *Environmental Baseline* and in light of the status of critical habitat, the Service formulates its opinion as to whether the action is likely to destroy or adversely modify designated critical habitat. The Service's opinion evaluates whether the action is likely to impair or preclude the capacity of critical habitat in the Action Area to serve its intended conservation function to an extent that appreciably diminishes the rangewide value of critical habitat for the conservation of the listed species. The key to making that finding is understanding the value (i.e., the role) of the critical habitat in the Action Area for the conservation/recovery of the listed species based on the *Environmental Baseline* analysis.

Status of the Species

California Least Tern

The California least tern is a subspecies of the least tern. It was federally listed in 1969 under the Endangered Species Preservation Act of 1966 which was implemented under the June 2, 1970, Proposed Rule, Part 17 - Conservation of Endangered Species and Other Fish or Wildlife (35 FR 8491)(Part 17). The CLT was formally added to the list of endangered species in the October 13, 1970, amendment to Part 17 under Appendix D United States List of Endangered Native Fish and Wildlife (35 FR 16047). The CLT was then subsequently considered an endangered species under the current Endangered Species Act of 1973 which repealed the Endangered Species Preservation Act of 1966. Critical habitat has not been designated for this species. The Service issued the *Revised California Least Tern Recovery Plan* on April 2, 1980 (Service 1980). A 5-year review was conducted in 2006 where it was recommended to be downlisted to threatened (Service 2006a). Another 5-year review was conducted in 2020 where no change of status was recommended (Service 2020) due to the decreasing trend in numbers, increasing age of some populations, sustained poor productivity over the last 10 years, and ongoing threats (e.g., predation, food availability). Please refer to the Service's July 7, 2020, 5-year review for the species' description, habitat preference, and life history.

Western Snowy Plover

The western snowy plover is a subspecies of snowy plover. The Pacific coast population of the WSP was federally listed as threatened in 1993 (58 FR 12864). The Pacific coast population is defined as those individuals that nest within 50 miles of the Pacific Ocean on the mainland coast, peninsulas, offshore islands, bays, estuaries, or rivers of the United States and Baja California, Mexico (58 FR 12864). The Pacific coast population of the western snowy plover breeds on the Pacific coast from southern Washington to southern Baja California, Mexico. Critical habitat for the species was designated on September 29, 2005, (70 FR 56970) and revised on June 19, 2012, to increase the size of the critical habitat (77 FR 36727). The Service issued the *Recovery Plan for the Pacific Coast Population of the Western Snowy Plover* on August 13, 2007 (Service 2007). A 5-year review was conducted in 2006 (Service 2006b) where no change in status was recommended. Another 5-year review was conducted in 2019 (Service 2019) where again no change in status was recommended. Please refer to the Service's August 13, 2007, *Recovery Plan for the Pacific Coast Population of the Western Snowy Plover* for the species' description, habitat preference, and life history.

Palmate-bracted Bird's-beak

Palmate-bracted bird's-beak is an annual herb in the Orobanchaceae (broomrape) family. It was listed as endangered on July 1, 1986 (51 FR 23765). Critical habitat has not been designated for this species. The Service issued the *Recovery Plan for Upland Species of the San Joaquin Valley, California* on September 30, 1998 (Service 1998) which covered several species including the palmate-bracted bird's-beak. A 5-year review was conducted in 2009 (Service 2009a) where no change in status was recommended. Please refer to the Service's September 30, 1998, *Recovery Plan for Upland Species of the San Joaquin Valley, California* for the species' description, habitat preference, and life history.

Soft Bird's-beak

Soft bird's-beak is an annual herb in the Orobanchaceae (broomrape) family. It was listed as endangered on November 20, 1997 (62 FR 61916). Critical habitat was designated for the species in 2007 (72 FR 18518). The Service issued the *Recovery Plan for Tidal Marsh Ecosystems of Northern and Central California* on August 27, 2013 (Service 2013) which covered several species including the soft bird's-beak. A 5-year review was conducted in 2009 (Service 2009b) where no change in status was recommended. Please refer to the Service's August 27, 2013, *Recovery Plan for Tidal Marsh Ecosystems of Northern and Central California* for the species' description, habitat preference, and life history.

Status of Western Snowy Plover Critical Habitat

The Service designated critical habitat for the Pacific Coast population of the western snowy plover in 2005 (70 FR 56969). The Service published a proposed revision to critical habitat on March 22, 2011 (76 FR 16046) and a final rule revising designating critical habitat on June 19, 2012 (77 FR 36268). In total, approximately 24,527 acres of critical habitat for the Pacific Coast population of the western snowy plover in Washington, Oregon, and California, fall within the boundaries of the critical habitat designation. Pursuant to the Act and its implementing regulations under 50 CFR 424.12, the Service is required to identify the physical or biological features essential to the conservation of western snowy plover in areas occupied at the time of listing, focusing on the features' PCEs. We consider PCEs to be the elements of physical or biological features that provide for a species' life history processes and are essential to the conservation of the species. Based on the best available information, the PCEs essential to the conservation of the western snowy plover are the following: sandy beaches, dune systems immediately inland of an active beach face, salt flats, mud flats, seasonally exposed gravel bars, artificial salt ponds and adjoining levees, and dredge spoil sites, with: (1) areas that are below heavily vegetated areas or developed areas and above the daily high tides; (2) shoreline habitat areas for feeding, with no or very sparse vegetation, that are between the annual low tide or low water flow and annual high tide or highwater flow, subject to inundation but not constantly under water, that support small invertebrates, such as crabs, worms, flies, beetles, spiders, sand hoppers, clams, and ostracods, that are essential food sources; (3) surf- or water-deposited organic debris, such as seaweed (including kelp and eelgrass) or driftwood located on open substrates that supports and attracts small invertebrates described in PCE 2 for food, and provides cover or shelter from predators and weather, and assists in avoidance of detection (crypsis) for nests, chicks, and incubating adults; and (4) minimal disturbance from the presence of humans, pets, vehicles, or human-attracted predators, which provide relatively undisturbed areas for individual and population growth and for normal behavior.

Environmental Baseline

Environmental Baseline refers to the condition of the listed species or its designated critical habitat in the Action Area, without the consequences to the listed species or designated critical habitat caused by the proposed action. The *Environmental Baseline* includes the past and present impacts of all Federal, State, or private actions and other human activities in the Action Area, the anticipated impacts of all proposed Federal projects in the Action Area that have already undergone formal or early section 7 consultation, and the impact of State or private actions which are contemporaneous with the consultation in process. The consequences to listed species or designated critical habitat from ongoing agency activities or existing agency facilities that are not within the agency's discretion to modify are part of the *Environmental Baseline*.

Due to the size of the Action Area, the *Environmental Baseline* will be described in general terms for each species addressed in this PBO. Habitat conditions for each species within the Action Area range from relatively undisturbed areas to areas in active and inactive agriculture to areas of extensive urbanization. PG&E's facilities, other than those that might be built as a result of minor new construction, pre-exist and are a baseline condition throughout the Action Area. Ongoing O&M activities that will be covered under this PBO are currently occurring on the landscape in roughly the same scope and frequency as was described in the PG&E's Bay Area O&M HCP. Thus, for establishing the *Environmental Baseline,* O&M activities described in this PBO, excluding minor new construction, are existing conditions with regard to PG&E facilities and ROWs within the Action Area.

California Least Tern

Within the San Francisco Bay region, CLT have more recently nested at several known locations, including Alameda Point with the largest numbers, Vandenberg Air Force Base, PG&E's Pittsburg Power Plant, Eden Landing Ecological Reserve, and Hayward Regional Shoreline. Since 2009, CLT have established small nesting colonies at new locations in the northeast portion of the San Francisco Bay estuary, including in Suisun Bay at the Montezuma Wetlands and at Green Island within the Napa-Sonoma Marshes Wildlife Area.
The Action Area includes estuary/bay habitats; therefore, suitable nesting and foraging habitat is present in the Action Area. California least tern nesting and foraging habitat occurs in the vicinity of substations at Mallard Slough and Bair Island. Towers and boardwalks are located in or near occupied CLT foraging and nesting habitat on Bair Island, in Alviso ponds, near Mount Eden Creek in the Eden Landing Ecological Reserve ponds, and at Mallard Slough. Poles are also located in or near occupied foraging and nesting habitat on Bair Island and Alviso ponds. Gas facilities are located in or near CLT occupied foraging and potential nesting locations off Cordelia Slough, Bay Farm Island, and Bair Island.

Western Snowy Plover

Within the San Francisco Bay region, WSP breeds primarily above the high tide line on coastal beaches, sand spits, beaches at creek and river mouths, salt pans at lagoons and estuaries, and river bars. The largest known coastal breeding population of this species is located in and around the San Francisco Bay. Due to human disturbance at coastal beaches, many WSP in the Bay Area nest in dry salt ponds or on large, open salt pan areas. The Action Area includes estuary/bay habitats; therefore, suitable nesting and foraging habitat is present in the Action Area. Potential and known nesting locations for WSP are in the vicinity of PG&E substations at Bair Island, Don

Edwards San Francisco Bay National Wildlife Refuge, Mount Eden Creek in the Eden Landing Ecological Reserve ponds, and the Ravenswood salt ponds. Boardwalks and towers are located in or near occupied foraging and nesting habitat in the San Francisco Bay, south of the San Mateo-Hayward Bridge. PG&E poles are also located in or near occupied foraging and nesting habitat at Don Edwards San Francisco Bay National Wildlife Refuge. PG&E gas facilities are located in occupied WSP habitat near the mouth of San Francisquito Creek.

Palmate-bracted Bird's-beak

Palmate-bracted bird's-beak is found in alkaline soils within chenopod scrub and valley and foothill grassland habitats. There are California Natural Diversity Database (CNDDB) records for palmate-bracted bird's-beak within the City of Livermore in Alameda County at the Springtown Preserve and suitable habitat is present in the Action Area. A previous PG&E assessment for the Bay Area O&M HCP found that a distribution line crosses one occurrence approximately 0.5 west of N. Vasco Road and approximately 1 mile north of Interstate 580 in the City of Livermore, California, but there are no gas or electric facilities located in occupied habitat as represented in the CNDDB occurrence. There is potential to encounter palmate-bracted bird's-beak in suitable habitats that have not been surveyed.

Soft Bird's-beak

Soft bird's-beak is found in coastal salt marshes and blooms from June through November. Designated critical habitat for soft bird's-beak occurs in the Action Area near Suisun City and in the vicinity of Joyce Island off Suisun Bay and in Benicia State Park off the Carquinez Strait in Solano County; in Napa County off the Napa River near the confluence with Carneros Creek; and in Point Pinole Regional Shoreline in Contra Costa County. CNDDB records for soft bird's-beak are concentrated in the designated critical habitat for the species, but there are also records in Contra Costa County off Suisun Bay in marshes near the City of Concord and the community of Bay Point (CNDDB 2021). The Action Area includes estuary and bay habitats; therefore, suitable habitat is present in the Action Area. Towers and boardwalks are located in marshes in the vicinities of Suisun City and Benicia State Park, and poles are located in Hastings Slough at the former Concord Naval Weapons Station. However, very few facilities are located within occupied habitat, and there are no substations in occupied habitat. Gas facilities are located in the marshes in the vicinity of Benicia State Park, but only a few facilities are located in occupied habitat. A previous PG&E assessment for the Bay Area O&M HCP found that electric distribution lines cross two occurrences of soft bird's-beak in Solano County. The first occurrence is located south of Interstate 780 in the Benicia State Park and the second occurrence is located south of Highway 12 and southwest of Suisun City. In addition, there is the potential to encounter soft bird's-beak in suitable habitats that have not been surveyed.

Western Snowy Plover Designated Critical Habitat

Three subunits occur in the Eden Landing Ecological Preserve. All three units were occupied at the time of listing and were documented as occupied in 2017 (CNDDB 2021). Subunit CA 13A is approximately 237 acres and encompasses salt ponds designated as E11, E15B, and E16B. It is located just south of Highway 92 and the San Mateo Bridge and west of Union City in Alameda County. Approximately 228 acres are State owned and approximately 8 acres are privately owned. Essential features provided by the subunit include sparsely vegetated areas above daily high tides, such as salt pans, artificial salt ponds, and adjoining levees, for nesting and foraging.

Subunit CA 13B is approximately 171 acres and encompasses a salt pond designated as E14, just south of Eden Creek. This subunit is located west of Union City in Alameda County. The entire subunit is State owned. Essential features provided by the subunit include sparsely vegetated areas above daily high-tides, such as salt pans, artificial salt ponds and adjoining levees, for nesting and foraging. Subunit CA 13C, Eden Landing is approximately 609 acres and encompasses salt ponds designated as E6A and E6B. This subunit is located just north of Old Alameda Creek and west of Union City in Alameda County. Essential physical or biological features provided by the subunit include sparsely vegetated areas above daily high-tides, such as salt pans, artificial salt ponds, and adjoining levees, for nesting and foraging.

The Ravenswood Subunit CA 14 is approximately 89 acres and consists of the southwestern portion of salt pond SF2 located east of the City of East Palo Alto in San Mateo County near the western approach to the Dumbarton Bridge on the Don Edwards San Francisco Bay National Wildlife Refuge. This subunit was occupied at the time of listing and was documented as occupied in 2017 (CNDDB 2021). The role of this critical habitat unit is to provide nesting and foraging habitat for the western snowy plover in South San Francisco Bay. Pond SF2 has undergone renovations intended to provide ponded areas, islands, and salt pan for several species of shorebirds, including western snowy plovers. The Ravenswood unit was drawn to encompass the salt pan area. This unit was occupied at the time of listing and is currently occupied. Essential physical or biological features provided by the unit include sparsely vegetated areas above daily high-tides, such as salt pans, artificial salt ponds and adjoining levees, for nesting and foraging.

The Warm Springs Subunit CA 15 is approximately 168 acres and encompasses the northeastern portion of salt evaporation ponds designated as A22 and A23 in the Warm Springs area of the South San Francisco Bay between the Cities of Fremont and Milpitas in Alameda County. This subunit was occupied at the time of listing and was documented as occupied in 2017 (CNDDB 2021). The entire unit is federally owned. Essential physical or biological features provided by the unit include sparsely vegetated areas above daily high-tides, such as salt pans, artificial salt ponds, and adjoining levees, for nesting and foraging.

Effects of the Action

Effects of the Action are all consequences to listed species or critical habitat that are caused by the proposed action, including the consequences of other activities that are caused by the proposed action. A consequence is caused by the proposed action if it would not occur but for the proposed action and it is reasonably certain to occur. *Effects of the Action* may occur later in time and may include consequences occurring outside the immediate area involved in the action.

PG&E's O&M Activities will be undertaken almost entirely on existing facilities within the Action Area. The effects of habitat loss resulting from individual O&M activities are expected to be small. Habitat disturbance is most often temporary in nature, and distributed throughout these species' ranges in the Action Area rather than condensed into one location, thereby minimizing the effects of implementation of individual activities. The expected permanent loss resulting from implementation of O&M activities over the term of this programmatic biological opinion (to coincide with the 30-year term of the PG&E Bay Area O&M HCP permit), in comparison to the habitat remaining to this species throughout its range, is small (less than 2 acres for each species over the approximate 26-year term). PG&E has committed to conserving habitat for each species, through the various measures described in the *Conservation Measures*. Individual species and critical habitat effects are described below.

California Least Tern and Western Snowy Plover

The proposed project will likely generate temporary noise and visual disturbance that will exceed ambient conditions in areas that may support CLT and WSP. Equipment noise, vibration, and visual disturbance may interfere with normal behaviors. These behaviors include feeding, sheltering, movement between refugia and foraging grounds, and other essential behaviors. Intolerable levels of disturbance that may force individuals to flush from cover or prevent them from seeking available cover could expose them to a predation risk or other dangers that otherwise would not occur. As O&M activities are typically discrete, CLT and WSP would likely be able to avoid the area of disturbance and would likely be able to find alternate suitable foraging opportunities in the surrounding areas.

Anthropogenic disturbance associated with the proposed action that could occur near known and potential CLT and WSP nesting locations could contribute to a lack of nest success, as well as deter the use of nearby foraging locations. For these reasons, PG&E will not perform any O&M activities while inside suitable CLT or WSP habitat during their respective nesting seasons. PG&E will also limit helicopter hovering and flying over known nesting locations during the nesting season for CLT and WSP.

Electric system O&M activities could result in the loss of suitable habitat used for both nesting and foraging in the vicinity of substations. PG&E anticipates that the proposed action will temporarily impact approximately 0.70 acre of suitable foraging and nesting habitat for CLT and approximately 0.70 acre of suitable foraging and nesting habitat for WSP on an annual basis. It is anticipated that the proposed action will permanently impact approximately 0.07 acre of potentially suitable foraging and nesting habitat for CLT and approximately 0.07 acre of potentially suitable foraging and nesting habitat for WSP on an annual basis. These impacts are anticipated to occur annually over the 26-year term of this PBO to coincide with the 30-year term of the PG&E O&M HCP set to expire October 2, 2047. This would equate to a total of approximately 18.2 acres of temporary impacts each and approximately 1.82 acres of permanent impacts each for the CLT and WSP. Impacts to nesting habitat are anticipated to be minimal. Annual construction will be relatively short in duration for most O&M activities. Disruption to foraging habitat will be temporary and are not anticipated to substantially reduce the overall availability of foraging habitat for the CLT or WSP. In addition, habitat disturbance will also be minimized by confining disturbance areas to the smallest practicable area. PG&E proposes to compensate for all permanent impacts to CLT and WSP habitat at a ratio of 3 to 1.

CLT and WSP prey species can also be affected if a hazardous material spill results in a decrease in the availability of fish and the benthic prey species for the fish due to immediate contamination and residual contamination after construction activities have ended. In addition, fish and benthic species can be exposed to hazardous contaminants that have settled in sediments during the installation and removal of cofferdams. Implementation of the general AMMs will minimize the risk of exposure to hazardous contaminants. As a result, the risk of exposure to contaminants that may affect prey species for CLT and WSP are expected to be prevented.

PG&E currently implements AMMs as part of the PG&E Bay Area O&M HCP for other federally listed species during O&M activities. PG&E proposes to minimize adverse effects to CLT, WSP, and their nesting and foraging habitats by implementing the Bay Area O&M HCP measures, which include parking vehicles and equipment on previously disturbed areas, using existing access and ROW roads, restrictions on boat docking, avoidance of helicopter use near

active nests, and not conducting O&M activities within suitable habitat for during their nesting season.

Palmate-bracted Bird's-beak and Soft Bird's-beak

Listed plants may be affected where the movement or parking of vehicles and/ or the placement of equipment and staging materials may damage or crush adult plants and seedlings. Ground disturbance such as blading and excavation can destroy or damage individual plants, destroy or bury seeds, and provide opportunities for colonization by invasive plants. Excavation and grading has the potential to alter soil properties, create conditions unsuitable for the growth of some species (for other species it may promote germination or seedling establishment), and can change surface drainage patterns. The roots of perennial species are susceptible to damage from soil compaction by equipment or staging materials. Additional effects could result from activities that cause erosion that degrades habitat, ground disturbance that facilitates the establishment of invasive plant species that compete with native vegetation, or accidental ignition of a fire that damages or kills individuals. Sidecast soil from excavation, spilled materials, and other substances (such as broadcast herbicides) could be carried by ditches or swales to nearby sensitive areas, causing physical or physiological damage to the plants there.

Habitat may be permanently lost during O&M activities when towers or poles are replaced or when foundations are expanded during tower repairs. Temporary impacts to federally-listed plants and/or their habitat may occur during the installation of fencing and site-specific erosion solutions, as well as during excavations related to pipeline inspection, recoating, cathodic protection, pipeline lowering and replacement, and water diversion techniques. PG&E proposes to implement the Bay Area O&M HCP measures which include measures for managing hazardous material, reducing the introduction of noxious weeds, reporting species encounters, and frac-out response. Habitat disturbance will also be restricted to the minimum area necessary to complete O&M activities and PG&E proposes to compensate for the loss of habitat for all O&M activities.

Western Snowy Plover Designated Critical Habitat

WSP critical habitat will be impacted by the activities from the PG&E Bay Area O&M Program. PG&E anticipates up to 0.04 acre of annual temporary impacts and 0.01 acre of annual permanent impacts to WSP critical habitat as a result of the proposed activities. All four of the PCEs for this critical habitat unit will be affected from the permanent loss of habitat by activities occurring in WSP critical habitat units CA 13A, CA13B, CA 13C, CA 14, and CA 15. In addition, the habitat could be temporarily impacted by potential spills during construction which could cause contamination of soil and water and detriment to invertebrate prey. The habitat could be impacted by project personnel using the temporary work areas and causing contouring of the soils and changes in sediments, rocks, and shells that could be used as nesting sites. PG&E will implement the AMMs to minimize impacts to WSP critical habitat, including BMPs for soil erosion and spill prevention and containment, as well as providing compensatory mitigation for impacts to WSP habitat at a 3:1 ratio.

Cumulative Effects

Cumulative effects include the effects of future State, Tribal, local, or private actions that are reasonably certain to occur in the Action Area considered in this biological opinion. Future

Federal actions that are unrelated to the proposed project are not considered in this section; they require separate consultation pursuant to section 7 of the Act. The Service is not aware of specific projects that might affect the CLT, WSP, palmate-bracted bird's-beak, or the soft bird's-beak in the Action Area that are currently under review by State, county, or local authorities.

Most lands included in the 160,400-acre Action Area are privately owned but within a ROW or easements deed with PG&E. Under the terms of these deeds, the landowner may use the ROW lands for any purpose which will not interfere with PG&E's use of the ROW. Buildings or other structures cannot be erected within the boundary of the right-of-way, as these would interfere with PG&E's activities. Consequently, the ROW easement deed provides no protection from land-use change within the ROWs, with the exception that buildings will not be constructed within the ROW boundaries. Other State or private activities are expected to occur within these ROWs, including cattle grazing, agricultural or urban development, road building, and herbicide use. Although housing development is not expected within the boundary of a right-of-way, development or other land-use changes may occur on lands directly bordering the ROWs. Although land-cover in a ROW area may stay in a natural condition, development or other land-use changes on bordering lands would substantially reduce the habitat value of the ROW lands. These future activities may not be subject to section 7 consultation (and thus are considered to enter into cumulative effects). These activities are not associated with the proposed project.

Continued human population growth in the Action Area is expected to drive further development of agriculture, cities, industry, transportation, and water resources in the foreseeable future. This future development, and the associated infrastructure will further contribute to the continued loss and fragmentation of natural areas, including areas harboring the species covered in this biological opinion. Ongoing loss and fragmentation of natural land-cover in the Action Area and anthropogenic factors such as pesticides and invasion of exotic species is expected to continue through the 26-year term of this PBO to coincide with the 30-year term of the PG&E Bay Area O&M HCP.

Conclusion

After reviewing the current *Status of the Species*, the *Environmental Baseline*, the *Effects of the Action*, and the *Cumulative Effects*, it is the Service's biological opinion that the issuance of the RGP for PG&E's Bay Area O&M activities is not likely to jeopardize the continued existence of the CLT, WSP, palmate-bracted bird's-beak, or the soft bird's-beak. This is based on the current status of the federally-listed species' population range-wide, implementation of the *Conservation Measures* to minimize the adverse effects on individual of the species and their habitats during O&M activities, and the small scope and size of habitat impacts to localized areas for individual O&M activities.

After reviewing the current *Status of the Critical Habitat* for WSP critical habitat, the *Environmental Baseline* for the Action Area, the *Effects of the Action*, and the *Cumulative Effects*, it is the Service's biological opinion that the proposed project is not likely to result in destruction or adverse modification to WSP critical habitat. The small size of the temporary (approximately 0.04 acre annually) and permanent impacts (approximately 0.01 acre annually) will not diminish the value of critical habitat as a whole for the conservation of the WSP. This is anticipated to occur over the term of the PBO which coincides with the 30-year term of the PG&E O&M HCP set to expire October 2, 2047. This equates to a total of approximately 1.04 acres of temporary impacts and approximately 0.26 acre of permanent impacts over

approximately 26 years. The permanent impact (approximately 0.26 acre) represents 0.0002 % of the total area of the 5 subunits designated as critical habitat for the WSP. Therefore, the proposed project is not likely to impair or preclude the capacity of critical habitat in the Action Area to serve its intended conservation function to an extent that appreciably diminishes the rangewide value of critical habitat for the conservation of the WSP.

INCIDENTAL TAKE STATEMENT

Section 9 of the Act and Federal regulation pursuant to section 4(d) of the Act prohibit the take of endangered and threatened species, respectively, without special exemption. Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. Harass is defined by Service regulations at 50 CFR 17.3 as an intentional or negligent act or omission which creates the likelihood of injury to wildlife by annoying it to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding, feeding, or sheltering. Harm is defined by the same regulations as an act which actually kills or injures wildlife. Harm is further defined to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing essential behavior patterns, including breeding, feeding, or sheltering. Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered to be prohibited taking under the Act provided that such taking is in compliance with the terms and conditions of this Incidental Take Statement.

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

Sections 7(b)(4) and 7(o)(2) of the Act generally do not apply to listed plant species. However, limited protection of listed plants from take is provided to the extent that the Act prohibits the removal and reduction to possession of federally-listed endangered plants or the malicious damage of such plants on areas under federal jurisdiction, or the destruction of endangered plants on non-federal areas in violation of State law or regulation or in the course of any violation of a State criminal trespass law.

Amount or Extent of Take

The Service anticipates that individual CLT and WSP will be subject to incidental take in the form of harm. All CLT and WSP will be subject to harm through the temporary (approximately 18.2 acres) and permanent (approximately 1.82 acres) modification of habitat, and harm through the use of vehicles and large equipment during construction activities that could interfere with

normal behaviors within suitable habitat in the Action Area. Take in the form of harm from interference of normal behaviors to individual CLT and WSP may be difficult to quantify due to seasonal fluctuations in their numbers, random environmental events, or additional environmental disturbances. The Service does not anticipate any take through physical injury of individuals or lethal take of CLT or WSP as a result of O&M activities. Conservation measures proposed by PG&E and described in the *Description of the Proposed Action* will reduce, but not eliminate, the potential for incidental taking of CLT and WSP. Upon implementation of the *Reasonable and Prudent Measures*, incidental take associated with the project will become exempt from the prohibitions described under section 9 of the Act.

Effect of the Take

In the accompanying programmatic biological opinion, the Service determined that this level of anticipated take is not likely to result in jeopardy to the species or destruction or adverse modification of critical habitat.

Reasonable and Prudent Measures

The following reasonable and prudent measures are necessary and appropriate to minimize the effects of the proposed project to the CLT and WSP:

1. The Corps shall require PG&E minimize effects to listed species from O&M activities.

2. The Corps shall require PG&E implement the *Conservation Measures* as described in the *Description of the Proposed Action*.

Term and Condition

In order to be exempt from the prohibitions of section 9 of the Act, the Corps shall ensure that PG&E complies with the following term and condition, which implement the respective reasonable and prudent measures described above. This term and condition is non-discretionary.

1. Term and Condition 1 implements Reasonable and Prudent Measures 1 and 2:

    a. PG&E shall educate and inform personnel involved in the project as to the *Conservation Measures* and *Term and Condition* in this PBO.

    b. The Corps shall ensure PG&E complies with the *Reporting Requirements* below.

Reporting Requirements

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

1. The Service must be notified within 24 hours of the finding of any injured or dead listed species or any unanticipated damage to its habitat associated with the proposed project. Injured listed species shall be cared by a licensed veterinarian or other qualified person. Notification will be made to Jana Affonso, the Assistant Field Supervisor of the Endangered Species Division at: San Francisco Bay-Delta Fish and Wildlife Office, 650 Capitol Mall, Suite 8-300, Sacramento, California 95814 or by telephone at (916) 930-2664, and must include the date, time, and precise location of the individual/incident clearly indicated on a U.S. Geological Survey 7.5 minute quadrangle or other maps at a finer scale, as requested by the Service, and any other pertinent information. When an injured or dead individual of the listed species is found, the applicant through the Navy shall follow the steps outlined in the *Disposition of Individuals Taken* section below.

2. Sightings of any listed or sensitive animal species shall be reported to the Service and CNDDB (https://www.wildlife.ca.gov/Data/BIOS).

3. PG&E shall maintain a full and accurate account of all temporary and permanent habitat loss throughout the term of this PBO.

4. PG&E shall submit an annual report of all temporary and permanent habitat loss from O&M activities and projects covered under this PBO to the Corps and the Bay-Delta Fish and Wildlife Office.

Disposition of Individuals Taken

Injured listed species must be cared for by a licensed veterinarian or other qualified person(s), such as the Service-approved biologist. Dead individuals must be sealed in a resealable plastic bag containing a paper with the date and time when the animal was found, the location where it was found, and the name of the person who found it, and the bag containing the specimen frozen in a freezer located in a secure site, until instructions are received from the Service regarding the disposition of the dead specimen. The Service contact persons are Jana Affonso, the Assistant Field Supervisor of the Endangered Species Division at: San Francisco Bay-Delta Fish and Wildlife Office, 650 Capitol Mall, Suite 8-300, Sacramento, California 95814 or by telephone at (916) 930-2664.

CONSERVATION RECOMMENDATIONS

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

1. The Service recommends PG&E maintain current knowledge of San Francisco Bay Area species biology, ecology, and status to inform project design and species-specific *Conservation Measures*.

2. Encourage or require the use of appropriate California native species in restoration efforts.

3. Facilitate additional educational programs geared toward the importance and conservation of tidal marsh and seasonal wetlands.

4. Assist the Service with implementing other recovery actions identified within the most current recovery plans for CLT and WSP.

5. Encourage the participation in programs being developed by the Federal and State resource agencies to limit and reverse the spread of non-natives, such as Spartina, Phragmites, Lepidium, and other invasives within San Francisco Bay Area.

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

REINITIATION – CLOSING STATEMENT

This concludes the Programmatic Formal Consultation for the Pacific Gas and Electric Company's (PG&E) Bay Area Operation and Maintenance (O&M) Program as provided in 50 CFR §402.16,

1. Reinitiation of consultation is required and shall be requested by the Federal agency or by the Service, where discretionary Federal involvement or control over the action has been retained or is authorized by law and:

    a. If the amount or extent of taking specified in the incidental take statement is exceeded;

    b. If new information reveals effects of the action that may affect listed species or critical habitat in a manner or to an extent not previously considered;

    c. If the identified action is subsequently modified in a manner that causes an effect to the listed species or critical habitat that was not considered in the biological opinion or written concurrence; or

    d. If a new species is listed or critical habitat designated that may be affected by the identified action.

2. An agency shall not be required to reinitiate consultation after the approval of a land management plan prepared pursuant to 43 U.S.C. 1712 or 16 U.S.C. 1604 upon listing of a new species or designation of new critical habitat if the land management plan has been adopted by the agency as of the date of listing or designation, provided that any authorized actions that may affect the newly listed species or designated critical habitat will be addressed through a separate action-specific consultation. This exception to reinitiation of consultation shall not apply to those land management plans prepared pursuant to 16 U.S.C. 1604 if:

a. Fifteen years have passed since the date the agency adopted the land management plan prepared pursuant to 16 U.S.C. 1604; and

b. Five years have passed since the enactment of Public Law 115-141 [March 23, 2018] or the date of the listing of a species or the designation of critical habitat, whichever is later.

Please address any questions or concerns regarding this response to Brian Hansen, Senior Fish and Wildlife Biologist, at Brian_Hansen@fws.gov or (916) 930-5642 or Kim Squires, Section 7 Division Manager, at Kim_Squires@fws.gov. Please refer to Service file number 08FBDT00-2020-F-0197 in any future correspondence regarding this project.

Sincerely,

Jana Affonso
Acting Field Supervisor

REFERENCES

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UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
West Coast Region
777 Sonoma Avenue, Room 325
Santa Rosa, California 95404-4731

April 6, 2023 **Refer to NMFS No:** WCRO-2021-02887

James Mazza
Regulatory Division Chief
Department of the Army
San Francisco District, Corps of Engineers
450 Golden Gate Avenue
San Francisco, California 94102-3406

Re: Endangered Species Act Section 7(a)(2) Biological Opinion and Magnuson–Stevens Fishery Conservation and Management Act Essential Fish Habitat Response for the Pacific Gas and Electric Company's Bay Area Operation and Maintenance Program (Corps File No. 2018-00490S)

Dear Mr. Mazza:

Thank you for your letters of November 10, 2021, and April 4, 2023, requesting consultation with NOAA's National Marine Fisheries Service (NMFS) pursuant to section 7 of the Endangered Species Act of 1973 (ESA) (16 U.S.C. 1531 et seq.) for the Pacific Gas and Electric Company's (PG&E) Bay Area Operation and Maintenance Program (O&M Program). PG&E has applied for a regional general permit (RGP) from the U.S. Army Corps of Engineers (Corps) pursuant to Section 404 of the Clean Water Act of 1972, as amended, 33 U.S.C. § 1344 *et seq*., and Section 10 of the Rivers and Harbors Act of 1899, as amended, 33 U.S.C. § 403 *et seq*. PG&E proposes to conduct routine maintenance activities on electrical and natural gas infrastructure in the nine-county San Francisco Bay Area.[1]

The enclosed biological opinion is based on our review of the information provided by PG&E and the Corps for O&M Program activities and describes our analysis of potential effects on threatened Central California Coast steelhead (*Oncorhynchus mykiss*), threatened California Central Valley steelhead (*O. mykiss*), endangered Sacramento River Winter-run Chinook salmon *(O. tshawystsha)*, threatened Central Valley Spring-run Chinook salmon (*O. tshawystsha*), threatened Southern Distinct Population Segment of North American green sturgeon (*Acipenser medirostris*), and their designated critical habitats in accordance with section 7 of the ESA. In this biological opinion, NMFS concludes the proposed O&M Program activities are not likely to jeopardize the continued existence of these ESA-listed steelhead, salmon and green sturgeon, nor is it likely to adversely modify their critical habitat. However, NMFS anticipates take of these species will occur during Program activities and an incidental take statement is included with the enclosed biological opinion.

[1] The nine Bay Area counties consist of Alameda, Contra Costa, Marin, Napa, San Francisco, San Mateo, Santa Clara, Solano, and Sonoma counties.

NMFS has also found that the proposed O&M Program may affect, but is not likely to adversely affect threatened South-Central California Coast steelhead (*O. mykiss*), threatened California Coastal Chinook salmon (*O. tshawystsha*), endangered Central California Coast coho salmon (*O. kisutch*), and their designated critical habitat in accordance with section 7 of the ESA.

Thank you, also, for your request for consultation pursuant to the essential fish habitat (EFH) provisions in Section 305(b) of the Magnuson–Stevens Fishery Conservation and Management Act [16 U.S.C. 1855(b)] for this action. Based on NMFS' review, we concluded that the action would adversely affect EFH for species managed under the Pacific Coast Salmon, Pacific Coast Groundfish, and Coastal Pelagic Species Fishery Management Plans (FMP). Therefore, we have included the results of that review in Section 3 of the enclosed document.

Please contact Sara Azat at the California Coastal Office in Santa Rosa at sara.azat@noaa.gov or 707-575-6067 if you have any questions concerning this consultation, or if you require additional information.

Sincerely,



Alecia Van Atta
Assistant Regional Administrator
California Coastal Office

Enclosure

cc: Greg Brown, Corps of Engineers, San Francisco, CA (gregory.g.brown@usace.army.mil)
Matt Brown, PG&E, Fresno, CA (mvb5@pge.com)
Copy to E-file FRN 151422WCR2021SR00227

Endangered Species Act (ESA) Section 7(a)(2) Biological Opinion and Magnuson–Stevens Fishery Conservation and Management Act Essential Fish Habitat Response

Pacific Gas and Electric Company Bay Area Operation and Maintenance Program
NMFS Consultation Number: WCRO-2021-02887

Affected Species and NMFS' Determinations:

ESA-Listed Species	Status	Is Action Likely to Adversely Affect Species?	Is Action Likely to Jeopardize the Species?	Is Action Likely to Adversely Affect Critical Habitat?	Is Action Likely to Destroy or Adversely Modify Critical Habitat?
Central California Coast Steelhead (*Oncorhynchus mykiss)*	Threatened	Yes	No	Yes	No
California Central Valley Steelhead (*O. mykiss*)	Threatened	Yes	No	Yes	No
Sacramento River Winter-run Chinook (*O. tshawytscha*)	Endangered	Yes	No	Yes	No
Central Valley Spring-run Chinook (*O. tshawytscha*)	Threatened	Yes	No	Yes	No
North American Green Sturgeon (*Acipenser medirostris*)	Threatened	Yes	No	Yes	No
South-Central California Coast steelhead DPS (*O. mykiss*)	Threatened	No	NA	No	NA
California Coastal Chinook (*O. tshawytscha*)	Threatened	No	NA	No	NA
Central California Coast Coho Salmon (*O. kisutch*)	Endangered	No	NA	No	NA

Fishery Management Plan That Identifies EFH in the Project Area	Does Action Have an Adverse Effect on EFH?	Are EFH Conservation Recommendations Provided?
Pacific Coast Salmon	Yes	Yes
Pacific Coast Groundfish	Yes	Yes
Coastal Pelagic Species	Yes	Yes

Consultation Conducted By: National Marine Fisheries Service, West Coast Region

Issued By: 

Alecia Van Atta
Assistant Regional Administrator
California Coastal Office

Date: April 4, 2023

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1. INTRODUCTION

This Introduction section provides information relevant to the other sections of this document and is incorporated by reference into Sections 2 and 3, below.

1.1. Background

NOAA's National Marine Fisheries Service (NMFS) prepared the biological opinion (opinion) and incidental take statement (ITS) portions of this document in accordance with section 7(b) of the Endangered Species Act (ESA) of 1973 (16 U.S.C. 1531 et seq.), as amended, and implementing regulations at 50 CFR part 402.

We also completed an essential fish habitat (EFH) consultation on the proposed action, in accordance with section 305(b)(2) of the Magnuson–Stevens Fishery Conservation and Management Act (MSA) (16 U.S.C. 1801 et seq.) and implementing regulations at 50 CFR part 600.

We completed pre-dissemination review of this document using standards for utility, integrity, and objectivity in compliance with applicable guidelines issued under the Data Quality Act (DQA) (section 515 of the Treasury and General Government Appropriations Act for Fiscal Year 2001, Public Law 106-554). The document will be available within two weeks at the NOAA Library Institutional Repository [https://repository.library.noaa.gov/welcome]. A complete record of this consultation is on file at California Coastal NMFS office.

1.2. Consultation History

In 2017, the Pacific Gas and Electric Company (PG&E) finalized a Habitat Conservation Plan and obtained an ESA Section 10(a)(1)(B) incidental take permit from the U.S. Fish and Wildlife Service (FWS) for the Bay Area Operation and Maintenance Program (O&M Program). The FWS Section 10(a)(1)(B) permit authorized the incidental take of several terrestrial species and fairy shrimp. In 2019, PG&E began preparing an application for a regional general permit (RGP) from the U.S. Army Corps of Engineers (Corps) pursuant to Section 404 of the Clean Water Act of 1972, as amended, 33 U.S.C. § 1344 *et seq*., and Section 10 of the Rivers and Harbors Act of 1899, as amended, 33 U.S.C. § 403 *et seq*., for O&M Program activities in waters of the U.S in the nine Bay Area counties, consisting of Alameda, Contra Costa, Marin, Napa, San Francisco, San Mateo, Santa Clara, Solano, and Sonoma counties.

PG&E with the assistance of a consultant team, prepared a draft biological assessment which evaluated the effects of O&M Program activities on listed species under the jurisdiction of the NMFS. The January 2020 administrative draft of this biological assessment was submitted by PG&E to NMFS for review and comment.

On June 4, 2020, PG&E, their consultants, and NMFS met via teleconference to discuss the scope of activities proposed for inclusion in the RGP.

NMFS and PG&E had several conference calls between August and December 2020 to discuss Program activities, scope of the programmatic consultation, and conservation recommendations.

On February 1, 2021, NMFS leadership met with PG&E representatives to discuss O&M Program activities and information needs for the NMFS-Corps section 7 consultation.

On March 9, 2021, PG&E provided a revised draft of the biological assessment for NMFS review, and discussions between NMFS, the Corps, and PG&E representatives continued through March, April and May 2021 regarding the scope of the consultation. Based on the information provided in the draft biological assessment it was determined that proposed O&M Program work in freshwater streams occurs primarily, but not exclusively, in ephemeral waterways that are not occupied by listed anadromous fish. In addition, the generalized descriptions of O&M activities in freshwater streams presented in the March 2021 biological assessment did not provide sufficient information for NMFS to assess potential effects on listed fish in freshwater areas. Therefore, the Corps, NMFS, and PG&E agreed to focus the consultation on O&M activities associated with electrical infrastructure in tidal waters because these activities are routinely permitted by the Corps and potential effects on listed fish are well understood and predicable.

A revised draft biological assessment was provided to NMFS on June 18, 2021, and discussions continued between NMFS and PG&E to clarify the project description, scope of activities, and development of avoidance/minimization measures.

By letter dated November 10, 2021, the Corps requested formal consultation with NMFS for PG&E's O&M activities within tidal waters and tidal wetlands of San Francisco Bay. With the consultation request, the Corps provided a biological assessment and EFH Assessment, prepared by Insignia Environmental and titled *National Oceanic and Atmospheric Administration - National Marine Fisheries Service Biological Assessment for the Regional General Permit for Pacific Gas and Electric Company's Bay Area Operation and Maintenance Program, October 2021* (BA).

During February, March and April 2022, NMFS, the Corps, and PG&E representatives exchanged information regarding the project description. Specifically, NMFS requested additional details on tower replacement and eelgrass avoidance measures from PG&E.

During August and September 2022, NMFS, the Corps and PG&E representatives exchanged information regarding pile driving and the proposed mitigation program. A revised biological assessment was submitted on September 9, 2022, to NMFS and the Corps for review.

On September 29, 2022, the Corps transmitted to NMFS the final biological assessment for PG&E's O&M Program activities in tidal waters. Due to a minor error in Table 12 of the biological assessment, a revision was made by PG&E's consultant team on September 30, 2022. The final biological assessment was transmitted to NMFS on September 30, 2022 (September 2022 Biological Assessment).

A revised version of the September 2022 Biological Assessment's Technical Appendix A was provided by PG&E to NMFS on November 22, 2022.

During December 2022, NMFS determined that additional information and conservation measures were required to assess gas line crossing activities within freshwater streams. On December 12, 2022, PG&E representatives provided the geographic coordinates for 482 gas pipeline crossings in the nine Bay Area counties project area. Review by NMFS staff determined that approximately 110 of these crossings overlap with listed fish and critical habitat. The NMFS review of gas line crossing locations also revealed that three additional listed fish species (*i.e.*, threatened California Coastal Chinook salmon, endangered Central California Coast coho salmon, and threatened South-Central California Coast steelhead) may be affected by the O&M Program.

Between January and March 2023, NMFS and PG&E continued work together to identify gas line crossing sites that may affect listed anadromous fish and develop conservation measures for these freshwater work locations. On April 4, 2023, a supplemental biological assessment was transmitted to NMFS by the Corps for PG&E Bay Area O&M Program (March 2023 Supplemental Biological Assessment), and the Corps clarified that their request for formal consultation included all of the RGP's proposed activities in tidal waters and freshwater streams in the Bay Area. The Corps also requested on April 4, 2023, NMFS concurrence with the Corps' finding that the O&M Program would not adversely affect threatened California Coastal Chinook salmon, endangered Central California Coast coho salmon, threatened South-Central California Coast steelhead, and their designated critical habitat.

On July 5, 2022, the U.S. District Court for the Northern District of California issued an order vacating the 2019 regulations that were revised or added to 50 CFR part 402 in 2019 ("2019 Regulations," see 84 FR 44976, August 27, 2019) without making a finding on the merits. On September 21, 2022, the U.S. Court of Appeals for the Ninth Circuit granted a temporary stay of the district court's July 5 order. On November 14, 2022, the Northern District of California issued an order granting the government's request for voluntary remand without vacating the 2019 regulations. The District Court issued a slightly amended order two days later on November 16, 2022. As a result, the 2019 regulations remain in effect, and we are applying the 2019 regulations here. For purposes of this consultation and in an abundance of caution, we considered whether the substantive analysis and conclusions articulated in the biological opinion and incidental take statement would be any different under the pre-2019 regulations. We have determined that our analysis and conclusions would not be any different.

1.3. Proposed Federal Action

Under the ESA, "action" means all activities or programs of any kind authorized, funded, or carried out, in whole or in part, by Federal agencies (see 50 CFR 402.02). Under the MSA, "Federal action" means any action authorized, funded, or undertaken, or proposed to be authorized, funded, or undertaken by a Federal agency (see 50 CFR 600.910).

The Corps proposes to authorize PG&E to conduct routine O&M activities on natural gas and electric transmission distribution infrastructure within wetlands and non-wetland waters of the U.S. within the nine-county San Francisco Bay Area.[2] The Corps would issue the RGP pursuant

[2] The nine Bay Area counties consist of Alameda, Contra Costa, Marin, Napa, San Francisco, San Mateo, Santa Clara, Solano, and Sonoma counties.

to Section 404 of the Clean Water Act of 1972, as amended, 33 U.S.C. § 1344 *et seq*. and Section 10 of the Rivers and Harbors Act of 1899, as amended, 33 U.S.C. § 403 *et seq*. The RGP would provide authorization for five (5) years and may be renewed for a total duration of up to 10 years.

PG&E's O&M Program includes activities in terrestrial areas, tidal waters, and freshwater streams. Electrical infrastructure O&M activities will be performed in terrestrial areas and tidal waters (see Section 1.3.2). Natural gas line system O&M activities will be performed in terrestrial areas, tidal waters, and freshwater streams (see Section 1.3.3). Access road maintenance will be performed in terrestrial areas and freshwater streams (see Section 1.3.4). As described in Section 2 of this opinion, eight listed species of anadromous fish may be affected by PG&E's O&M Program. Table 1 provides a summary of listed fish species affected by PG&E O&M activities. Figure 1 presents a map of the Bay Area and overview of PG&E's O&M Program facilities associated with electrical towers and natural gas lines.

Table 1. Categories of O&M Activities and Affected ESA-Listed Fish

PG&E O&M Activity	Area Work Conducted	ESA-Listed Fish Species Present
Electrical Transmission Tower Repair and Replacements	Estuarine	Central California Coast Steelhead
		California Central Valley Steelhead
		Sacramento River Winter-run Chinook
		Central Valley Spring-Run Chinook
		Southern DPS Green Sturgeon
	Terrestrial	n/a
Natural Gas System Infrastructure Repair and Replacement	Estuarine	Central California Coast Steelhead
		California Central Valley Steelhead
		Sacramento River Winter-run Chinook
		Central Valley Spring-Run Chinook
		Southern DPS Green Sturgeon
	Stream Crossings	Central California Coast Steelhead
		South-Central California Coast Steelhead
		California Coastal Chinook
		Central California Coast Coho
	Terrestrial	n/a
Access Road Maintenance	Stream Crossings	Central California Coast Steelhead
		South-Central California Coast Steelhead
		California Coastal Chinook
		Central California Coast Coho
	Terrestrial	n/a

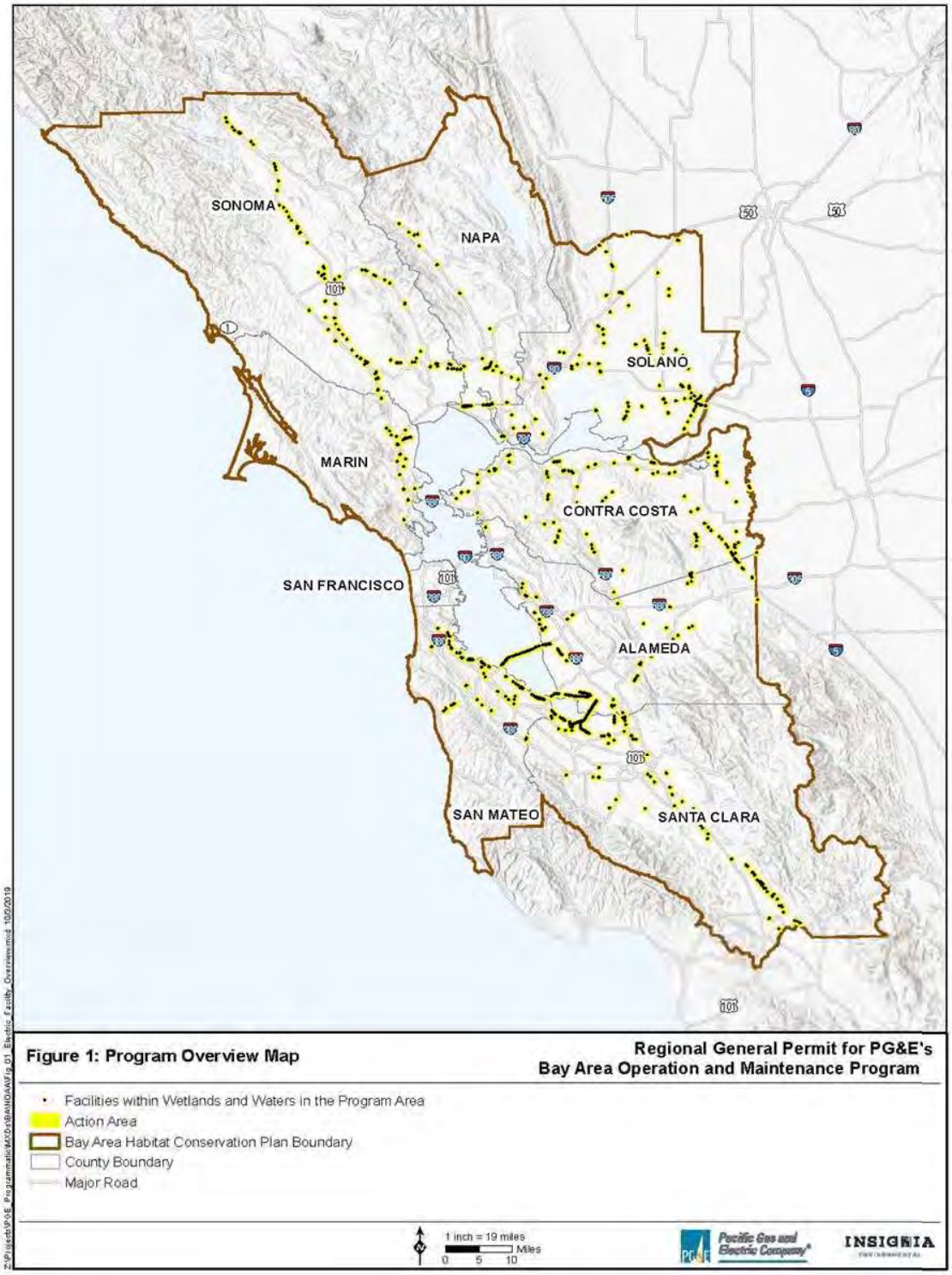


Figure 1. Action Area and Overview of PG&E Bay Area O&M Program Facilities (Source: PG&E Bay Operations September 2022 Biological Assessment)

1.3.1. RGP Implementation Procedures

The RGP implementation process is described in Section 4 of the March 2023 Supplemental Biological Assessment. PG&E will prepare and submit to the Corps project-specific Pre-Construction Notification packages for each proposed O&M Program activity conducted under the RGP. The Pre-Construction Notification must include, among other things, a complete project description, location, construction timing, avoidance/minimization measures, and mitigation actions. The Corps will review each Pre-Construction Notification to confirm eligibility under the RGP and PG&E may not proceed until the Corps provides written approval.

For those activities that may affect NMFS listed fish and/or critical habitat, the Corps or PG&E will provide copies of Pre-Construction Notification packages to NMFS for review. The Corps with input from NMFS will confirm that all Program limits, avoidance/minimization measures, and mitigation requirements developed for this programmatic consultation and required by the RGP are included. For proposed O&M Program actions that do not meet all the requirements of the RGP or this programmatic consultation, the Corps would initiate and complete individual ESA/EFH consultations with NMFS prior to authorizing these activities.

1.3.2. Electrical Infrastructure O&M Activities

PG&E proposes routine maintenance on electrical infrastructure in the Bay Area to maintain safety and operability. The electrical transmission system in the Bay 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. The distribution system includes primary and secondary distribution lines that deliver electricity and distribution transformers that reduce voltage from distribution to utilization (i.e., residential or commercial) levels. Primary distribution lines carry three-phase AC power in the 2–50 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 electrical power for lighting and most appliances.

PG&E conducts patrols of its lines and associated facilities annually or on more frequent basis. Inspections of electrical tower footings and poles are performed 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. 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. 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.

The majority of electrical infrastructure O&M activities will be conducted in terrestrial areas. No electrical infrastructure is located in freshwater streams; thus, no electrical tower or pole repair/replacement activities will be conducted in freshwater streams. Some electrical

infrastructure work will be performed by the O&M Program in tidal wetland and estuarine waters in Suisun Bay, Grizzly Bay, San Pablo Bay, and San Francisco Bay, collectively referred to as the San Francisco Bay in this opinion. Table 2 provides a summary of the proposed electrical tower repair and boardwalk activities in tidal areas that may affect listed fish and/or designated critical habitat, and includes the typical equipment used, activity duration, anticipated annual frequency, and average project footprint in fish habitat.

For the purposes of this consultation PG&E has categorized the proposed electrical infrastructure O&M activities in tidal areas as "high" or "low" impact (Table 3). Activities that are defined as high include pile driving or cofferdam installation, and may result in adverse impacts to listed fish species, critical habitat, or EFH. These activities require additional avoidance, minimization or mitigation measures (see Section 1.3.5 of this opinion). All high impact activities would be conducted during a limited operating period (LOP) between June 1 and November 30. Low impact activities would also be conducted between June 1 and November 30, but low impact activities may extend work until January 15, provided that these activities are initiated prior to November 30 of the previous year.

Table 2. Summary of Activities in Tidal Waters

Activity	Equipment	Duration of Each Project	Number in Tidal Habitat	Frequency	Average Footprint in Habitat
Tower Repair and Replacement	Barge, helicopter, rubber mats, metal sheet piles, plywood, concrete, vibratory hammer, impact hammer, and piles	7 to 35 days	121 facilities	17 towers per year	500 square feet
Boardwalk Repair and Replacement	Boat, barge, helicopter, generator and handheld equipment (including drills, chain saws, and circular saws)	60 days	50 miles	15 sections of various lengths per year	variable

Table 3. Activity Type and Impact Level in Tidal Waters

Activity	Impact Level
Tower Repair and Replacement without Pile Driving or Cofferdam Installation	Low
Tower Repair and Replacement with Pile Driving or Cofferdam Installation	High
Boardwalk Repair or Replacement	Low

1.3.2.1 Tower Replacement and Repair

Tower replacement and repair work includes work at the tower site and access to the construction tower site. Replacement refers to the removal of an existing tower and replacement

with a new tower. Tower repair includes the cleaning and repair of concrete tower caps, installation of fiberglass casings, and tower painting. PG&E may temporarily place a rubber mat at the base of each footing as a work area during O&M activities.

Access to towers may occur from existing boardwalks, a temporary section of boardwalk, or crews may utilize a barge as a work area. A helicopter or barge may be used to place construction materials on the boardwalk or barge, and then materials would be moved to the work site by hand. Most minor tower repairs would be conducted from existing boardwalks. A barge with a crane or helicopter would be used to repair or replace the upper portion of the tower, in areas where there are no existing boardwalks, and/or where construction of a temporary boardwalk is not feasible. Depending on the local conditions, the work barges may rest on the bottom of the bay at low tide.

Old tower footings may be abandoned in place or removed in association with tower foundation repairs and replacements (see Section 1.3.2.2). Footing removal would be assessed on a case-by-case basis depending on the impact of removing the footing, or whether the remaining footing would be a hazard to navigation. Cofferdams would be installed to conduct footing removals in tidal waters (see Section 1.3.2.6 of this opinion for additional information regarding cofferdams). Degraded wooden pilings would be removed by being cut at mudline level at low tide.

1.3.2.2 Tower Foundation Repair or Replacement

Tower foundation repair or replacement work in subtidal and intertidal habitats would generally be performed with cofferdams. Cofferdams would be installed during low tide around a tower footing or around the entire tower to isolate the work area from the waters of San Francisco Bay (see Section 1.3.2.6 of this opinion for additional information regarding cofferdams). The cofferdam would keep the enclosed work area dry and minimizes the mobilization of sediment during construction activities.

To strengthen tower foundations, some concrete from the existing footings is removed to expose the steel (rebar) reinforcements. New pins are inserted, a new rebar cage is installed, and concrete forms are constructed. Concrete will be mixed off site and delivered to work sites via helicopter or barge. A form is constructed around the footing to hold the concrete during curing. The concrete is then poured, allowed to cure, and the form is removed. In some instances, grade beams, which hold pile caps together and strengthen tower foundations, are installed between adjacent foundations. This involves installing forms, pouring concrete, and removing the forms. Once the repair is complete, the cofferdam is removed by excavating around the outside and hoisting it from the workspace.

In instances where a complete replacement or new foundations are required, piles are first installed adjacent to the existing foundation (see Section 1.3.2.7 of this opinion for additional information regarding pile driving). Once piles are installed, a new tower foundation is created on the piles. When all replacement work is complete, the cofferdams are removed as described above.

A crew of six to 10 personnel is typically required for tower foundation repair or replacement, and work would occur over a period of 7 to 35 days to complete each tower. Access may occur

on existing roads where available. In-water access occurs through the use of boats and barges for towers within San Francisco Bay and tributaries/tidal sloughs that are large enough for barges to access.

1.3.2.3 Boardwalk Replacement or Repair

PG&E has more than 50 miles of boardwalks that service their electrical transmission facilities in the vegetated marshes, mudflats, and open waters around the San Francisco Bay. The boardwalks typically extend from levees and provide access across marshes and salt ponds to electrical tower footings. Support equipment for replacement and repair of boardwalks include, but is not limited to, boats, barges, and helicopters. A 100-foot by 200-foot staging yard located on land is often also used to store materials. All boardwalk replacement and repair activities are completed manually and require the use of generators and handheld equipment, including, but not limited to drills, chain saws, and circular saws. A crew of three to five personnel conducts the repair or replacement activities and this work typically takes up to 60 days to complete. Crews typically work from existing installed sections of boardwalks, which minimizes the need for access below and around the boardwalk. However, in some instances, work is conducted from barges and/or from the mudflat (*i.e.,* unvegetated sediment) during low tide.

Based on the muddy, soft substrate that is commonly encountered during boardwalk replacement and repair activities, replacement pilings are typically pushed into the mud by using a steel bar for leverage. This method does not require hammering or striking that will result in vibratory or noise disturbance to aquatic species. Occasionally, small pilings may be hammered into place by hand using sledgehammers or similar tools when substrates and sediments require it. Piling installation via hammer or sledgehammer generally requires five to 10 strikes to install a single piling. Each 4-inch by 4-inch piling is made of plastic lumber. Degraded pilings that have been replaced will be removed as close to the mudline as possible by being cut at mudline level during low tide.

Replacement planking is transported along the boardwalk on special hand-dollies. Planking is then slid into place, drilled, and bolted. If the existing section of boardwalk is substantially degraded, crews perform the work within an approximately 10-foot radius around the boardwalk section being replaced. Handrails are then installed (or replaced), which are wood planks that are connected to the boardwalk with support beams.

1.3.2.4 Pole Reinforcement and Replacement

Proposed pole reinforcement methods include attaching trusses to existing poles to provide additional support or the use of a polyvinyl chloride product to reinforce deteriorating wood poles. The most common method to restore ground-level strength to utility poles involves the installation of a single (or in some cases, a double) steel truss. The reinforced pole remains in place next to the installed truss. Composite fabric sheets may also be used for reinforcement of poles. Sheets are wrapped around the pole in layers and a resin material is applied to each layer. PG&E determines the type of reinforcement method after reviewing the results of an inspected line segment. This may require the installation of guy wires and anchors, by line truck auger, which could consist of a screw or a concrete structure. The work is generally performed by a crew of two to five personnel and takes 1 to 2 days to complete.

Pole replacement involves framing the new pole (i.e., crossarms, pins, insulators, grounds, bonding, markers, and any equipment are installed) on the ground adjacent to the existing pole prior to setting the replacement pole in the ground. To replace a pole, the line is typically de-energized. A line truck auger is used to drill a hole, the new pole is placed into the new hole, the void is backfilled and compacted, and 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. Pole and equipment replacement and repair would require an approximately 10-foot-long by 7-foot-wide work area. The work is generally performed by a crew of four to five personnel and is completed in one day for a distribution pole and up to three days for a transmission pole. Pole replacements conducted by the O&M Program will not be performed in tidal waters or freshwater streams.

1.3.2.5 Line Reconductoring

Line reconductoring involves the replacement of conductors (i.e., wires) once the wires begin to show wear or cannot handle the transmission load or if increased capacity is required. Work crews install replacement conductors by temporarily splicing them to the ends of the existing conductors and pulling them through travelers (i.e., pulleys) attached to the arms of the towers or pole cross-arms. Conductor replacement is performed with boom trucks, winches, and in some cases, a helicopter may be used.

Reconductoring typically is done in 2 to 3-mile sections with the use of temporary pull and tension sites (*i.e.*, pull sites). Several pieces of equipment are used at the pull sites, including tensioners (*i.e.*, 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. This work is generally conducted by a crew of three to eight personnel and potentially one helicopter crew over a period of 1 to 2 months. Although PG&E avoids locating pull sites above water, the geometry of the alignment, pole/tower placement, or topography may require that some pull sites are located on the water. On-water pull sites will be located on a work barge. Aside from utilizing a work barge, no in-water work is associated with line reconductoring activities.

1.3.2.6 Cofferdam Construction in Tidal Waters

As discussed above, cofferdams may be installed to perform tower repairs/replacements in tidal areas. Cofferdams would be constructed of 1.125-inch (approximately) plywood and support beams, or constructed using metal sheet piles. Plywood cofferdams would be installed by first clearing the mud, by hand, from the base of the footing and the plywood is pushed down to 3-foot depth (approximately). Metal sheet pile cofferdams would installed using a vibratory hammer operated from a barge. Mud and sediments removed during construction would be reused on site, or bagged and taken to a landfill. Cofferdams would be installed and closed during low tide. Any water in the cofferdam would be pumped directly onto the adjacent land or into the adjacent water. Avoidance and minimization measures and best management practices for cofferdam installation and dewatering are provided in Section 1.3.5 below.

1.3.2.7 Pile Installation

As discussed above, installation of piles may be required for tower repairs and replacements. Pile types include wood, steel, and concrete piles. Concrete piles would be cast in place using a hollow steel pile as the casing or form. Installations would occur by helical pile driving, vibratory hammer pile driving, and impact hammer pile driving. Helical pile driving is a relatively new method of pile installation where large piles are screwed into the soil instead of being driven with a hammer. The type of pile installation utilized at each site will be determined by the site characteristics (e.g., soil or substrate type) and/or the availability of pile type. Avoidance and minimization measures for pile driving include work windows, hammer cushions, and bubble curtains (see Section 1.3.5 below).

The majority of the pile-driving activities required for tower repair/replacements and foundation repairs/replacements will occur within muddy, fine materials, and soft habitat that range from clay (very fine) to silt to sand (relatively course). Additionally, approximately 92% of the tower foundations where pile driving will occur are located in water depths at or above mean lower low water (MLLW); approximately 7% are located in water depths between 0 and -15 feet MLLW; and less than 1% is located in water depths below -15 feet MLLW. A barge mounted vibratory or impact hammer, or a combination of the two, would be used to drive the piles. A helical pile driver or impact hammer may be utilized to install piles to their final depth. Piles would range from 16 to 72 inches in diameter. When an impact hammer is used, up to 2,000 strikes may occur per day.

When 24-inch diameter piles or smaller are used to repair foundations at a single tower, approximately 16 piles are installed and pile driving would last between 16 and 24 days. When 60-inch diameter piles are used to repair foundations at a single tower, four piles are installed and pile driving would typically take between 6 and 15 days. Installation of 72-inch piles would be similar to 60-inch diameter piles.

1.3.3. Natural Gas System O&M Activities

PG&E acquires natural gas in open markets and moves it (by means of compression) through a series of compressor stations prior to use or storage. Gas is distributed to individual residential and business customers via smaller, lower-pressure distribution pipelines, transitioning from high-pressure lines to smaller, low-pressure lines via pressure regulators or gas pressure-limiting stations. In the Bay Area, PG&E owns and operates a compressor station and 1,820 miles of transmission pipelines, which convey natural gas to 19,350 miles of distribution lines.

Proposed PG&E natural gas line O&M activities will primarily occur in terrestrial areas; although gas line crossings at streams is common and a small number of gas lines are located in tidal wetlands or estuarine waters. Natural gas line O&M activities consist of site-specific erosion measures over pipelines, pipeline recoating, pipeline replacement, valve recoating, and valve replacement. These proposed activity types would occur in terrestrial areas and at waterway crossings throughout the nine counites of San Francisco Bay Area. Table 4 provides a summary of these activities. Table 5 presents the known streams with listed anadromous fish and/or designated critical habitat in the action area with PG&E gas line crossings. Although unlikely, there may be additional gas line locations on streams with listed anadromous fish or

critical habitat that were not identified by PG&E during consultation and are not listed in Table 5. During implementation of the RGP, PG&E's pre-construction notifications for individual O&M activities will identify specific locations and specify whether or not listed anadromous fish or designated critical habitat may be present at work sites.

Table 4. Summary of Natural Gas System O&M Activities in Streams with Listed Anadromous Fish

Activity	Description	Equipment	Duration	Expected Frequency	Footprint in Habitat
Site-Specific Erosion Measures	Protection of gas lines at sites of scour and erosion though placement of biodegradable jute, riprap, and rock	Trucks, backhoe, and excavator	1 to 14 days	2 per year	Up to 500 square feet of permanent impact per project
Pipeline Recoating	Gas lines are recoated with epoxy.	Backhoe, sandblaster, plastic sheeting and tarps, and shot-blasting machine	3 to 5 days	2 per year	No new permanent impacts
Valve Recoating and Replacement	Gas valves are recoated with epoxy or replaced.	Trucks, backhoe, excavator, sandblasting, coating machine, and crane	4 to 6 days for recoating; 28 to 35 days for replacement	1 per year	Up to 200 square feet of permanent impact per project
Pipeline Replacement	Excavation of trench and pipe segments are replaced.	Truck, bulldozer, excavator, frac tank, sideboom, and welding rig	28 to 168 days	2 per year	Up to 2,500 square feet of permanent impact per project

Table 5. Gas Crossing Streams with Listed Anadromous Fish and Critical Habitat[3]

Gas Crossing Number[4]	Stream Name	Likely to Support Year-Round Flow[5]
14	Norton Slough	
15	West Slough	
16, 17	Russian River	YES
24	Tributary to Windsor Creek	
25, 27	Windsor Creek	
26	Mill Creek	
28	Cañon Creek	
29	Napa River	YES
79	Napa River	
30	Putah Creek	
33, 34, 35	South Fork Putah Creek	
38	Tributary to Santa Rosa Creek	
43, 44, 52, 53, 54	Santa Rosa Creek	
45, 46, 48	Tributary to Santa Rosa Creek	
73, 75, 78	Laguna de Santa Rosa	
99	Lindsey Slough	
112	Schell Creek	
113	Huichica Creek	
114	Unnamed Stream	
115	Unnamed Stream	
116, 117, 118, 119	Suscol Creek	
131	Adobe Creek	
132	Green Valley Creek	
135	Cordelia Slough	YES

[3] Additional gas line crossing locations with listed anadromous salmonids and/or designated critical habitat in the Bay Area O&M Program action area (see Figure 1) may be identified during implementation of the RGP.

[4] Reference number from March 2023 Supplemental Biological Assessment. Each reference number refers to a separate gas line crossing.

[5] NOAABA-AMM-13 limits gas line O&M activities in streams with listed anadromous fish and/or designated critical habitat to periods when channels are naturally dry; O&M activities will not be performed in stream channels at these locations if streamflow is present.

Gas Crossing Number[4]	Stream Name	Likely to Support Year-Round Flow[5]
146	Schultz Slough	
149, 150	San Antonio Creek	
183	Sacramento River	YES
185, 186	Grizzly Island Tidal Slough	YES
197	Montezuma Slough	YES
203, 206	Novato Creek	
218, 223	Miller Creek	
226, 227	Taylor Slough - Jersey Island	YES
228	Gallinas Creek	
229, 230	Dutch Slough - Jersey Island	YES
238	Pinole Creek	
239	Pacheco Creek	YES
240	Arroyo del Hambre	
247	Alhambra Creek	
251	Rock Slough	YES
256, 257	Old River	YES
258, 259	Wildcat Creek	
261, 262	Alhambra Creek	
265, 266	Corte Madera Creek	
269, 270	Werner Dredger Cut	YES
338	Arroyo Las Positas	
350	Arroyo Valle	
352	Colma Creek	
360, 363, 364	Vallecitos Creek	
365	Alameda Creek	YES
371, 372, 376, 377	San Mateo Creek	YES
384, 385, 386	Tidal Slough Tributary to Lower Coyote Creek	YES
394, 395, 396,	Apanolio Creek	
387, 397, 399	Pilarcitos Creek	
402, 403	San Francisquito Creek	
404, 405, 415, 416	Coyote Creek	YES

Gas Crossing Number[4]	Stream Name	Likely to Support Year-Round Flow[5]
427, 428, 432, 437, 438, 443, 451	Coyote Creek	
413	Mountain View Slough	YES
414	Stevens Creek	YES
417, 419, 424	Guadalupe River	YES
445	Guadalupe River	
422, 423	Los Trancos Creek	
426	Upper Penitencia Creek	
441	Los Gatos Creek	

1.3.3.1 Site-Specific Erosion Measures at Gas Lines

In locations where scour and erosion within a waterway has exposed a gas pipeline, PG&E proposes to construct site-specific solutions to the erosion problem. Site-specific solutions would consist of placement of biodegradable jute netting, riprap, and rock fill over the exposed portions of the pipeline. These erosion solutions are designed to protect the exposed pipeline and prevent further erosion from occurring. The extent of the erosion solution will typically not be longer than 100 feet or wider than 50 feet on any stream in the program area. Installation will typically begin with preparing the site for installation of the erosion solution. This may involve clearing vegetation and minor recontouring in the area of existing erosion. Once prepared, the erosion solution will be delivered to the site on a truck and placed in the prepared area. The erosion solution will then be installed according to the manufacturer's specifications. Erosion solutions may require geotechnical investigations to design and install.

For scour and erosion solution activities in waterways with listed anadromous fish and/or designated critical habitat (see Table 5), PG&E proposes measures to ensure activities do not degrade fish habitat, impair natural channel functions, or impede fish passage. Specifically, no hardscape will be installed within the streambed or banks at any project sites with listed anadromous fish and/or designated critical habitat. In streams with listed anadromous fish, PG&E will use non-hardscape solutions such as biodegradable jute netting, straw, hydroseeding, waddles, and native plants. In addition, site-specific erosion protection structures will not span more than 20 percent of the active channel width and will not exceed 500 square feet per site. Site-specific erosion measures will be designed to not constrict flow in the channel and not increase water velocities in the channel. Installation of scour and erosion protection will only be conducted when work sites are naturally dry; no dewatering or cofferdams will be utilized for this activity. If work activities impact riparian vegetation, sites will be revegetated with native plant species in a manner consistent with maintaining safety at PG&E's infrastructure. A crew of two to eight personnel is usually required over a period of up to 14 days. PG&E expects to conduct two erosion protection projects per year in waterways with listed anadromous fish and/or designated critical habitat.

1.3.3.2 Pipeline Recoating

When a natural gas line's costing has deteriorated, PG&E proposes to recoat pipelines with epoxy to protect them from degradation and external corrosion. Once recoating is determined to be required, the pipeline segment is excavated using a backhoe. The surface of the pipe is then prepared for the new coating by running a self-contained grit- or shot-blasting machine over the exposed area. The pipeline continues to operate while a coating machine applies the coating. Upon completion of the recoating, sediment excavated to exposed the pipe will be replaced to cover the pipeline and the surface contoured to return the site to pre-construction conditions.

Recoating of pipelines may be conducted at stream crossings. As with site-specific erosion activities, pipeline recoating at stream crossings with listed anadromous fish/critical habitat (see Table 5) will only be performed when the site is naturally dry. No stream dewatering or cofferdams will be used to dewater work sites for recoating of pipelines. When recoating is completed, the trench will be backfilled with the previously excavated materials and the streambed/banks re-countered to pre-construction conditions. On average, an approximately 20-foot-wide work area is needed for this activity. No new permanent impacts are anticipated with this activity, as all work will be performed within the existing pipeline alignment. If work activities impact riparian vegetation, sites will be revegetated with native plant species in a manner consistent with maintaining safety at PG&E's infrastructure. A crew of approximately four to six personnel conducts this activity. Pipeline recoating typically takes 3 to 5 days to complete at stream crossings. PG&E expects to conduct two pipeline recoating projects per year in waterways with listed anadromous fish and/or designated critical habitat.

1.3.3.3 Valve Recoating and Replacement

Proposed O&M Program activities include the recoating and replacement of valves on gas pipelines. Depending on the condition of the valve, PG&E either recoats or replaces the values. Prior to replacing or installing valves, PG&E will isolate portions of the pipeline where work will be performed and excavation may be required to expose the valve. Once the valve has been exposed through excavation, recoating is conducted by sandblasting the valve over tarps, collecting the debris, and recoating the valve with a specialized epoxy that protects against corrosion. The recoating process generally takes 4 to 6 days to complete, and would be conducted by a crew of six to 13 personnel.

Valve replacement involves excavation of soils to access the existing valve and adjacent segment of pipeline, removal of the existing valve (and potentially a segment of the adjacent pipeline), installation of the new valve, and backfill of the excavated area. Valve recoating or replacement typically involves excavating an area 40 feet by 60 feet to access the valves. Each valve replacement typically takes 28 to 35 days to complete, and would be performed with the same equipment as recoating.

PG&E identified only two valves in the O&M Program area that are located within 100 feet of waterways supporting listed anadromous fish and/or critical habitat. If work is required at either of these valves, only one would be worked on per year. Valve recoating or replacement activities would not be performed in wetted areas of waterways with anadromous fish. Excavation of materials to expose valves located near waterways with listed anadromous fish would be

performed without disturbing the stream channel. If work activities impact riparian vegetation, sites will be revegetated with native plant species in a manner consistent with maintaining safety at PG&E's infrastructure.

1.3.3.4 Gas Pressure Limiting Station Construction

PG&E may install new pressure limiting stations on natural gas lines. Human population densities determine the class location of pipeline designations. A change in the class location designation may trigger the installation of a pressure limiting station. Pressure limiting stations lower the pressure of the gas in a line. A typical station encompasses a footprint of approximately 250 feet by 100 feet, including above ground pipe and valve structures, and a small control building surrounded by security fencing. Pressure limiting stations will not be located in tidal waters or freshwater streams.

1.3.3.5 Pipeline Replacement

Proposed O&M Program activities include the replacement of sections of natural gas lines. Some replacements may also include lowering the pipeline. The equipment typically required for pipeline segment replacement includes a truck, bulldozer, excavator, frac tank, forklift, lowboy and trailer, sideboom, water truck, and a welding rig. Pipeline segment replacement begins with clearing and grading the right-of-way, and trenching and excavating the existing pipeline. A new trench is excavated for the new pipeline segment parallel and adjacent to the existing pipeline. PG&E typically places the new section of pipe as close to the abandoned pipeline as possible and modifies any existing easements by expanding the easement width to accommodate the new section of pipeline.

The length of affected pipe varies, depending on the reason for replacement. The minimum length of pipe replaced is typically 40 feet. For longer pipeline segment replacements, a welded and coated pipe is lifted and lowered into the trench by sideboom tractors and excavators. Padded slings are used so the tractors can lower the pipe without damaging the pipe's protective coating. For shorter pipeline replacements, especially sections damaged by third parties or corrosion, replacements are typically within the same alignment. Old pipeline segments may be removed or abandoned in place.

Following the placement of the new pipeline segment and removal of any existing segments, all trenches are then backfilled. Backfilling the trench involves replacing and compacting the excavated subsoil into the trench and re-spreading the stockpiled topsoil, if appropriate, to return the surface to its original grade. Native material excavated from the pipeline trench is used to backfill the trench.

In most cases, pipeline replacements are not located in waters. However, there may be some segments within waters, including waters containing listed anadromous fish and their critical habitat. As described above for erosion measures and pipeline recoating, PG&E proposes to only perform pipeline replacements at stream crossings with listed anadromous fish/critical habitat (see Table 5) when the site is naturally dry. No stream dewatering or cofferdams will be used to dewater work sites for pipeline replacements. When the new pipe segment is installed, the trench will be backfilled with the previously excavated native materials and the streambed/banks re-

countered to pre-construction conditions. If work activities impact riparian vegetation, sites will be revegetated with native plant species in a manner consistent with maintaining safety at PG&E's infrastructure.

The O&M Program also proposes to ensure gas line crossing activities do not create any fish passage impediments for anadromous species. NOAABA-AMM-15 requires PG&E to evaluate all pipeline replacement and abandonment activities at sites with listed anadromous fish and/or critical habitat and confirm that the project design conforms with the most current NMFS guidelines for fish passage at stream crossings.

On average, trenching for pipeline replacement typically requires a 10-foot wide excavation area. A crew of approximately 15 to 20 personnel is required to conduct this activity. Approximately 14 to 28 days are required to complete small pipeline replacements. Although most pipeline replacement actions will occur within the existing pipeline footprint, there may be sites where minor adjustments to the alignment are required.

1.3.4. Road Maintenance for Facility Access

Access to PG&E's electrical infrastructure and gas line facilities requires routine maintenance of roads. Routine road maintenance activities for the O&M Program will include blading to smooth over washouts, eroded areas, and washboard surfaces as needed. Access road maintenance could also include cleaning ditches, moving and establishing berms, clearing and making functional drain inlets, clearing and establishing water bars, and cleaning and repairing over-side drains. Road maintenance activities will primarily be conducted in upland areas and outside of waterways with listed anadromous fish. However, the O&M Program may also repair/replace culverts on streams to ensure safe access to and from PG&E electrical infrastructure and natural gas line facilities. The location of these stream crossing activities could occur throughout the nine-county O&M Program area, including sites on streams with listed anadromous fish and/or critical habitat (See Table 5).

At some O&M project sites a temporary bridge may be installed on an existing roadway to cross a channel. Portable, prefabricated bridges will be used and remain in place for the duration of the O&M project, which can range from a few days to 24 weeks. Temporary bridges will be installed over a stream crossing as a clear-span structure (NOAABA-AMM-15). No bridge structural elements will extend into the channel and a crane would be used to place the bridge without disturbing the channel or waters of the stream. No new roads with be constructed in associated with temporary bridges or culvert repairs/replacements.

Construction activities associated with culvert repair/replacement would not occur in flowing waters on streams with listed anadromous salmonids/critical habitat. PG&E proposes to only conduct culvert work at stream crossings when the work sites are naturally dry (NOAABA-AMM-13). No stream dewatering or cofferdams will be used to dewater work sites for road maintenance activities in streams with anadromous fish and/or critical habitat. In addition, PG&E will ensure that all culvert activities at sites with listed anadromous fish and/or critical habitat will be designed to meet the most current NMFS guidelines for fish passage at stream crossings (NOAABA-AMM-15). If work activities impact riparian vegetation, sites will be revegetated with native plant species in a manner consistent with maintaining safety at PG&E's

infrastructure (NOAABA-AMM-16). No more than two culvert repair/replacement or bridge crossing projects will occur per year on streams with listed anadromous fish and/or critical habitat. Each culvert replacement project may permanently affect up to 5,000 square feet of area.

1.3.5. Avoidance and Minimization Measures

PG&E's proposed avoidance and minimization measures for the O&M Program are presented in the September 2022 Biological Assessment, Section 2.1 and Attachment A. Additional and revised avoidance and minimization measures are presented in the March 2023 Supplemental Biological Assessment, Section 4.

Measures presented below are a sub-set of the proposed measures and designed to address water quality, listed fish species, elevated underwater sound levels, and fish habitat. All proposed avoidance and minimization measures are presented in the September 2022 Biological Assessment and the March 2023 Supplemental Biological Assessment.

BA-AMM-03: Annual Reporting. PG&E will prepare and submit an annual report to the U.S. Fish and Wildlife Service (USFWS) and NOAA Fisheries by March 31 for O&M activities conducted during the previous calendar year. The annual report will include a brief description of each project (e.g., project type and location), as well as any listed species observed and designated critical habitat or sensitive habitat in which worked was conducted. In addition, specific detail regarding the status of the project construction (i.e., not constructed, under construction, or completed); date of project implementation and duration of construction; a listing of pile size, type, and installation methods; estimated length of boardwalks repaired or replaced, and materials used; mitigation information; and any underwater noise monitoring will be included in the annual report.

WQ-AMM-01: **Discharge from Construction.** Discharge of the following to surface waters, ground waters, or land will be prohibited:

- unset cement, concrete, grout or damaged concrete spoils;
- water that has contact uncured concrete or cement; or
- concrete related washout.

If concrete washout is necessary at a site, washout containment will be used to prevent any discharge. Wastewater will be delivered to and disposed of at a sanitary wastewater collection system/facility (with authorization from the facility's owner or operator) or a properly licensed disposal or reuse facility.

WQ-AMM-02: Refueling Procedure. Vehicular and equipment refueling within 250 feet from the edge of vernal pools, and 100 feet from the edge of other wetlands, streams, or waterways is prohibited. If refueling must be conducted closer to wetlands, a secondary containment area subject to review by an environmental field specialist and/or biologist will be constructed. Spill prevention and cleanup equipment will be maintained in refueling areas.

BA Attachment A: Activity Specific Erosion and Sediment Control Plan. PG&E will develop and implement an Activity-Specific Erosion and Sediment Control Plan (A-ESCP) for

all construction projects, and good-housekeeping best management practices (BMPs) are implemented throughout the year. PG&E's Good Housekeeping A-ESCP with standard BMPs is presented as Attachment A to the BA.

WQ-AMM-03: In-Water Activities. The duration of in-water activity will be limited to the minimum amount of time necessary to conduct O&M activities

WQ-AMM-04: Staging and Storage Area. Staging and storage areas for equipment, materials, fuels, lubricants, and solvents will be located away from wetlands and waters, as feasible, in areas where spoil or accidental spills cannot be washed into the water feature.

NOAABA-AMM-01: Boat Access and Docking. Every effort will be made to minimize disturbance to subtidal and wetland vegetation. During boat access, boats will be docked to existing facilities or landed in areas that minimize the potential impact to subtidal and wetland vegetation. Barges will be placed on mudflats in such a manner that subtidal and wetland vegetation is not disturbed. Work crews will be trained to avoid vegetated areas, and foot traffic will be confined to existing facilities, mudflats, and established work areas to minimize disturbance to vegetation.

NOAABA-AMM-02: Dewatering in Tidal Waters. All water pumps used during initial dewatering and fish relocation will follow the intake screen criteria identified in NOAA Fisheries' *Juvenile Fish Screen Criteria for Pump Intakes (1996) See https://media.fisheries.noaa.gov/dam-migration/fish_screen_criteria_for_pumped_water_intakes.pdf.* Water remaining in the cofferdam will be pumped directly onto the adjacent land at low tide when feasible, and a qualified biological monitor will be present. If pumping water onto adjacent land is not feasible, water will be pumped into open water or mudflats directly adjacent to the cofferdam. Fish encountered during dewatering will be carefully relocated by a NOAA Fisheries and U.S. Fish and Wildlife Service-approved fisheries biologist to suitable habitat adjacent to work areas, per NOAABA-AMM-03. Dewatering activities will not be conducted within streams that support federally listed fish.

NOAABA-AMM-03: Fish Salvage and Relocation in Isolated Tideland Pools and Cofferdam Dewatering in Tidal Waters. An experienced fisheries biologist will be present to observe cofferdam dewatering activities whenever pumps are operating and monitor work in tidal waters that may hold salmonids in isolated pools. The agency-approved biologist will ensure that fish species do not become trapped against the cofferdam filter and any fish that were not swept out of the work area will be rescued. Efforts will be made to reduce collecting and handling stress, minimize the time that fish are held in buckets, and minimize handling stress during processing and release. Fish collection efforts will be conducted using sweep and block nets and will occur within the cofferdam area until multiple passes have been conducted and substantial depletion or absence of fish has been documented. Rescued fish will be released 100 feet away from the cofferdam, or at another location approved by NOAA Fisheries as soon as possible. Additional fish salvage and relocation procedures include the following:

- No employee or contractor will remove any fish, dead or alive, from the site for personal use. All efforts to reduce the time that live fish are out of the water will be made to

reduce the chances of fish injury or death during the fish rescue. All fish will be promptly returned to the water.

- Listed fish species will be processed first and released as soon as possible. All fish species will be recorded on data sheets, as well as the time and date that each individual was caught; location where the individual was caught; gear type used; water temperature; total number of individuals caught; and any other pertinent observations of the fish.

- After the fish rescue effort is completed, dewatering of the area will continue. The agency-approved biologist and/or fish rescue biologist will provide a worker education program in the event that additional fish may remain within the dewatering area. The biologist will return to the site to rescue additional fish if the workers observe them within the dewatering area.

- If any turtles or snakes are captured during fish rescue, they will be relocated to the fish release site(s).

Following dewatering and relocation of fish, further monitoring by an experienced fisheries biologist will no longer be required for the dewatered area, unless the integrity of the cofferdam seal is compromised and the work area becomes re-watered.

NOAABA-AMM-04: Seasonal Avoidance in Estuary/Bay Waters for Low-Impact Activities. In-water O&M activities that do not include impact hammer use and do not include cofferdam construction are considered "low-impact activities". Low-impact activities within the San Francisco, San Pablo, Suisun, and Grizzly bays will occur during the limited operating period (LOP) (i.e., between June 1 and November 30) to the maximum extent possible in order to avoid Chinook salmon and steelhead migration.

If necessary, in-water O&M activities that do not involve impact pile driving or cofferdam installation will be allowed to occur between June 1 and January 15, provided the activities are initiated prior to November 30. No new O&M activities will be initiated outside of the LOP, and PG&E will finish the activity as soon as logistically possible based on site-specific construction conditions. PG&E will provide compensatory mitigation at an increased ratio for permanent impacts from O&M activities conducted after November 30. (see Section 6 -Compensatory Mitigation in the Project's September 2022 Biological Assessment).

Pole reinforcement and repair above mean high water, as well as tower and/or boardwalk repair and replacement above mean high water, are not subject to this LOP, as PG&E expects potential effects to federally listed fish species will be minimal or will not occur.

NOAABA-AMM-05: Seasonal Avoidance in Estuary/Bay Waters for High-Impact Activities. In-water O&M activities that include impact hammer use and/or cofferdam construction are considered "high-impact activities". High-impact activities within the San Francisco, San Pablo, Suisun, and Grizzly bays will be planned and scheduled to occur between June 1 and November 30. No impact pile driving will be initiated if it cannot reasonably be completed by November 30. If unforeseen circumstances prevent the completion of pile driving

by November 30, PG&E will request an extension from the Corps on a case-by-case basis to complete the pile driving that has already been initiated.

Pole reinforcement and repair above mean high water, as well as boardwalk repair and replacement, are not subject to this LOP, as PG&E expects potential effects to federally listed fish species will be minimal or will not occur.

NOAABA-AMM-06: Soft Start. Prolonged, soft-start procedures will be implemented when impact pile driving is required for piles greater than 20 inches in diameter in waters that provide habitat for federally listed anadromous fish species. Soft-starts will include pile driving at 40- to 60-percent reduced energy for at least 15 seconds, followed by a 1-minute waiting period. This procedure will be repeated at least two times before commencing full-energy impact pile driving.

NOAABA-AMM-07: Eelgrass Bed Avoidance. PG&E will avoid all eelgrass (*Zostera spp*.) beds. If any O&M activities must occur within eelgrass beds. PG&E will comply with NOAA Fisheries' California Eelgrass Mitigation Policy and Implementing Guidelines (NOAA Fisheries 2014a), including pre- and post-construction surveys to assess impacts to eelgrass.

NOAABA-AMM-08: Installation of Piles. PG&E will prioritize using a vibratory hammer to install piles, but when an impact hammer is necessary, only one hammer will be used at a time with no more than 2,000 strikes per day on piles within an individual work area. PG&E will also utilize sound attenuation devices during pile-driving (e.g., hammer cushions, bubble curtains, dewatered cofferdams, dewatered isolation casings, etc.). Air bubble curtains would be utilized for impact driving of piles larger than 12 inches in diameter unless the work site is dewatered by a cofferdam. In instances when impact driving is limited to periods of low tide and water depths are less than 4 inches for the entire duration of the pile driving, air bubble curtains are not required. In addition, pile-driving activities that require multiple days at the same location will occur at least 12 hours apart to avoid impacts to federally listed fish species.

NOAABA-AMM-09: Installation of Cofferdams. PG&E will prioritize using a vibratory hammer to install sheet pile cofferdams, but when an impact hammer is necessary, only one hammer will be used at a time with no more than 2,000 strikes per day on piles within an individual work area. PG&E will also utilize sound attenuation devices during pile-driving (e.g., hammer cushions, bubble curtains, dewatered cofferdams, dewatered isolation casings, etc.). In addition, pile-driving activities that require multiple days at the same location will occur at least 12 hours apart to avoid impacts to federally listed fish species. Cofferdams will be installed and closed during low tide.

NOAABA-AMM-10: Hydroacoustic Monitoring. PG&E will conduct hydroacoustic monitoring during the installation of all 72-inch piles when cofferdams are not utilized. PG&E will also conduct hydroacoustic monitoring during the installation of the first 60-inch pile at each discrete tower location when cofferdams are not used. If the sound pressure levels (SPLs) do not exceed 206 decibels (dB) peak and/or the daily accumulated sound exposure level (cSEL) does not exceed 187 dB during the monitoring (see Table 7 in the Project's September 2022 Biological Assessment) of the installation of the first 60-inch pile, PG&E may stop monitoring activities at that tower location. If SPLs or cSEL dB levels exceed limits established in Table 7 of the Project's September 2022 Biological Assessment for 60-inch piles, PG&E will take

additional measures to reduce the sound impacts below established sound impact limits. Monitoring will continue at these locations and will only stop when noise is recorded on a continuing basis (one full day or approximately 2,000 strikes) below the thresholds established in Table 7 of the September 2022 Biological Assessment. PG&E will continue to implement these measures for all remaining 60-inch piles at the locations where they were implemented. Hydroacoustic monitoring will only occur when water depth is 3 feet or greater at mean lower low water to allow for adequate depth for hydrophone placement. PG&E will report the results of the monitoring in their annual report using the NMFS Underwater Noise Monitoring Plan Template.

NOAABA-AMM-11: Removal of Piles. Pile removal will occur using either a vibratory hammer or direct pull method of extraction. A vibratory hammer/extraction must be attempted first unless it presents a greater risk of disturbance to sediments (*i.e.,* contaminants are present). The direct pull method will be utilized if it is more appropriate for the substrate type, pile length, and structural integrity of the piling.

NOAABA-AMM-12: Removal of Cofferdams. Cofferdam removal will occur using either a vibratory hammer or direct pull method of extraction. A vibratory hammer/extraction must be attempted first unless it presents a greater risk of disturbance to sediments. The direct pull method will be utilized if it is more appropriate for the substrate type, pile length, and structural integrity of the piling.

NOAABA-AMM-13: In-Stream Work During Dry Conditions Only. Activities performed in streams known to support or with the potential to support listed fisheries (having suitable habitat and connectivity to known fisheries streams) and streams designated as critical habitat will be conducted during naturally dry conditions. In addition, trenching and pipeline excavation activities will not be conducted within flowing streams that provide federally listed fish habitat.

NOAABA-AMM-14: Hardscape Limitation. No hardscape (i.e., rock, concrete, or other hard structural material) will be installed within the bed or banks of any stream that is known to support listed fish or that has suitable habitat, including designated critical habitat, for listed fish as well as connectivity to known listed fisheries streams. Site-specific erosion protection structures will not span more than 20 percent of the active channel width and will not exceed 500 square feet per site. In no cases will site-specific erosion protection structures compromise or impede fish passage. Site-specific erosion measures will not constrict flow in the channel and not increase water velocities in the channel.

NOAABA-AMM-15: Culvert Repair and/or Replacement, Temporary Bridges, and Pipeline Replacement and/or Abandonment to Accommodate Fish Passage. Existing culverts that are repaired or replaced in streams supporting listed fish or that have suitable habitat to support listed fish and connectivity to known listed fisheries streams, and streams designated as critical habitat must meet standards for fish passage as identified in the current version of NOAA Fisheries' Guidelines for Salmonid Passage at Stream Crossings (See https://www.fisheries.noaa.gov/west-coast/habitat-conservation/west-coast-fish-passage-guidelines). PG&E will also ensure that prefabricated bridges are designed in a manner that avoids impacts to streams that support listed fish. If deemed necessary, PG&E will conduct a channel morphology assessment to ensure these standards can be met prior to execution of the

O&M activity. In addition, the use of rock will be minimized, and no more than 2 culvert repairs or replacement will occur in fish habitat per year.

In the event that a pipeline requires replacement or abandonment in place, the pipeline depth and specifications will be designed to meet the standards for fish passage identified in NOAA Fisheries' Guidelines for Salmonid Passage at Stream Crossings. In addition, culvert repair and replacement, pipeline replacement, and pipeline abandonment activities will not be conducted within flowing streams that provide federally listed fish habitat and designated critical habitat. Work will only be conducted when project site conditions are naturally dry.

1.3.6. Mitigation

PG&E intends to provide compensatory mitigation for future impacts from O&M activities in advance by using an estimate of the projected impact (Table 6) and the following proposed mitigation ratios:

- For activities that are conducted within the LOP and result in permanent impacts, PG&E proposes to mitigate for those impacts at a 3-to-1 ratio.
- For activities that are conducted outside of the LOP, PG&E proposes to mitigate for permanent impacts at a ratio of 4-to-1.

Based on the estimated area of new or expanded tower footings placed in San Francisco Bay, PG&E has calculated compensatory mitigation for impacts to estuarine waters (Table 6). The 4-to-1 ratio was used to calculate the highest projected impact totals to provide a conservative estimate for the purpose of calculating initial compensatory mitigation requirements.

Table 6. Projected Permanent Impacts and Compensatory Mitigation in Tidal Waters

Listed Anadromous Fish Species	Approx. Permanent Impact (acres annually)	Projected Compensatory Mitigation with 4-to-1 Ratio (acres)	
		Annually	5 Years
Central Valley Spring-Run Chinook Salmon	<0.01	0.04	0.2
Sacramento River Winter-Run Chinook Salmon	<0.01	0.04	0.2
Central California Coast Steelhead	0.03	0.12	0.6
California Central Valley Steelhead	<0.01	0.04	0.2
Southern DPS of Green Sturgeon	0.02	0.08	0.4
Total	0.08	0.32	1.6

Based on the projected impacts and mitigation proposed, PG&E proposes to contribute $600,000 in initial funding to one or more fish passage and/or fish habitat improvement projects within the San Francisco Bay, and/or freshwater salmonid migratory corridors within the greater San Francisco Bay Area. Should PG&E exceed its initial projected impact, it will contribute additional funding to habitat improvement projects at $10 per square foot of additional compensatory mitigation required, and no less than 0.1 acre.

If the Corps renews the RGP for an additional 5-year period and PG&E has not fully allocated the projected compensatory mitigation credit[6], the remaining credit will apply to the renewed RGP as an advanced credit. If additional compensatory mitigation associated with a 5-year renewal is needed, PG&E will provide additional funding at $10.00 per square foot.

During the course of the program, PG&E will report actual annual impacts to fish and fish habitat over the life of the RGP. PG&E will provide annual updates to NOAA Fisheries showing actual impact acreages converted to compensatory mitigation required using appropriate ratios as outlined above, including a ledger showing debiting and allocation of credit achieved against projected mitigation.

NMFS considered, under the ESA, whether or not the proposed action would cause any other activities and determined that it would not.

2. ENDANGERED SPECIES ACT: BIOLOGICAL OPINION AND INCIDENTAL TAKE STATEMENT

The ESA establishes a national program for conserving threatened and endangered species of fish, wildlife, plants, and the habitat upon which they depend. As required by section 7(a)(2) of the ESA, each Federal agency must ensure that its actions are not likely to jeopardize the continued existence of endangered or threatened species or to adversely modify or destroy their designated critical habitat. Per the requirements of the ESA, Federal action agencies consult with NMFS, and section 7(b)(3) requires that, at the conclusion of consultation, NMFS provide an opinion stating how the agency's actions would affect listed species and their critical habitats. If incidental take is reasonably certain to occur, section 7(b)(4) requires NMFS to provide an ITS that specifies the impact of any incidental taking and includes reasonable and prudent measures (RPMs) and terms and conditions to minimize such impacts.

The Corps determined the proposed action is not likely to adversely affect threatened South-Central California Coast steelhead (*O. mykiss*), threatened California Coastal Chinook salmon (*O. tshawystsha*), endangered Central California Coast coho salmon (*O. kisutch*), and their designated critical habitat. Our concurrence is documented in the "Not Likely to Adversely Affect" Determinations section (Section 2.12 below).

2.1. Analytical Approach

This biological opinion includes both a jeopardy analysis and an adverse modification analysis. The jeopardy analysis relies upon the regulatory definition of "jeopardize the continued existence of" a listed species, which is "to engage in an action that reasonably would be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of that species" (50 CFR 402.02). Therefore, the jeopardy analysis considers both survival and recovery of the species.

[6] PG&E has likely overestimated the amount of mitigation to ensure funding is available to accomplish it. If their actual impacts are less than estimated, PG&E will apply the remaining funds to their impacts in the following five years.

This biological opinion also relies on the regulatory definition of "destruction or adverse modification," which "means a direct or indirect alteration that appreciably diminishes the value of critical habitat as a whole for the conservation of a listed species" (50 CFR 402.02).

The designations of critical habitat for ESA listed steelhead, Chinook salmon, and green sturgeon use the term primary constituent element (PCE) or essential features. The 2016 final rule (81 FR 7414; February 11, 2016) that revised the critical habitat regulations (50 CFR 424.12) replaced this term with physical or biological features (PBFs). The shift in terminology does not change the approach used in conducting a "destruction or adverse modification" analysis, which is the same regardless of whether the original designation identified PCEs, PBFs, or essential features. In this biological opinion, we use the term PBF to mean PCE or essential feature, as appropriate for the specific critical habitat.

We use the following approach to determine whether a proposed action is likely to jeopardize listed species or destroy or adversely modify critical habitat:

- Evaluate the rangewide status of the species and critical habitat expected to be adversely affected by the proposed action.
- Evaluate the environmental baseline of the species and critical habitat.
- Evaluate the effects of the proposed action on species and their critical habitat using an exposure–response approach.
- Evaluate cumulative effects.
- In the integration and synthesis, add the effects of the action and cumulative effects to the environmental baseline, and, in light of the status of the species and critical habitat, analyze whether the proposed action is likely to: (1) directly or indirectly reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of that species; or (2) directly or indirectly result in an alteration that appreciably diminishes the value of critical habitat as a whole for the conservation of a listed species.
- If necessary, suggest a reasonable and prudent alternative to the proposed action.

To conduct this assessment, NMFS examined an extensive amount of information from a variety of sources. Detailed background information on the biology and status of the listed species and critical habitat has been published in a number of documents including peer reviewed scientific journals, primary reference materials, and governmental and non-governmental reports. Additional information regarding the effects of the Program's actions on the listed species, their anticipated response to these actions, and the environmental consequences of the actions as a whole was formulated from the aforementioned resources, and the following biological assessments:

> PG&E. 2022. National Oceanic and Atmospheric Administration – National Marine Fisheries Service Biological Assessment for the Regional General Permit for Pacific Gas and Electric Company's Bay Area Operation and Maintenance Program. September 2022.

PG&E. 2023. National Oceanic and Atmospheric Administration – National Marine Fisheries Service March 2023 Biological Assessment Supplement. March 2023.

Information taken directly form published, citable documents are referenced in the text and listed at the end of this document. A complete record of this consultation is on file at NMFS North-Central Coast Office in Santa Rosa, California (ARN #151422WCR2021SR00227).

2.2. Rangewide Status of the Species and Critical Habitat

This opinion examines the status of each species that is likely to be adversely affected by the proposed action. The status is determined by the level of extinction risk that the listed species face, based on parameters considered in documents such as recovery plans, status reviews, and listing decisions. This informs the description of the species' likelihood of both survival and recovery. The species status section also helps to inform the description of the species' "reproduction, numbers, or distribution" for the jeopardy analysis. The opinion also examines the condition of critical habitat throughout the designated area, evaluates the conservation value of the various watersheds and coastal and marine environments that make up the designated area, and discusses the function of the PBFs that are essential for the conservation of the species.

This biological opinion analyzes the effect of the proposed PG&E O&M Program activities in the San Francisco Bay on the following Federally-listed species (Distinct Population Segment [DPS] or Evolutionary Significant Unit [ESU]) and designated critical habitats:

Central California Coast (CCC) steelhead (*Oncorhynchus mykiss*) DPS
Threatened (71 FR 834; January 5, 2006)
Critical habitat (70 FR 52488; September 2, 2005);

California Central Valley (CCV) steelhead (*O. mykiss*) DPS
Threatened (71 FR 834; January 5, 2006)
Critical habitat (70 FR 52488; September 2, 2005);

Central Valley (CV) spring-run Chinook salmon (*O. tshawytscha*) ESU
Threatened (70 FR 37160; June 28, 2005)
Critical habitat (70 FR 52488; September 2, 2005);

Sacramento River winter-run Chinook salmon (*O. tshawytscha*) ESU
Endangered (70 FR 37160; June 28, 2005)
Critical habitat (58 FR 33212; June 16, 1993);

North American green sturgeon (*Acipenser medirostris*) Southern DPS
Threatened (71 FR 17757; April 7, 2006)
Critical habitat (74 FR 52300; September 8, 2008).

2.2.1. CCC Steelhead and CCV Steelhead

Steelhead are anadromous forms of *Oncorhynchus mykiss*, spending some time in both freshwater and saltwater. Steelhead are iteroparous, or capable of spawning more than once

before death (Busby *et al.* 1996). Although one-time spawners are the great majority, Shapovalov and Taft (1954) reported that repeat spawners are relatively numerous (17.2 percent) in California streams. Steelhead young usually rear in freshwater for 1 to 3 years before migrating to the ocean as smolts, but rearing periods of up to 7 years have been reported. Migration to the ocean usually occurs in the spring. Steelhead may remain in the ocean for 1 to 5 years (2 to 3 years is most common) before returning to their natal streams to spawn (Busby *et al.* 1996).

Adult steelhead typically migrate from the ocean to freshwater between December and April, peaking in January and February (Fukushima and Lesh 1998). Adults returning to spawn may migrate several miles, hundreds of miles in some watersheds, to reach their natal streams. Although spawning typically occurs between January and May, the specific timing of spawning may vary a month or more among streams within a region, and within streams interannually. Spawning and smolt emigration may continue through June (Busby *et al.* 1996). Female steelhead dig a nest in the stream and then deposit their eggs. After fertilization by the male, the female covers the nest with a layer of gravel. Steelhead do not necessarily die after spawning and may return to the ocean, sometimes repeating their spawning migration one or more years. The embryos incubate within the nest. Hatching time varies from about three weeks to two months depending on water temperature. The young fish emerge from the nest about two to six weeks after hatching.

Steelhead fry rear in edgewater habitats and move gradually into pools and riffles as they grow larger. Cover is an important habitat component for juvenile steelhead, both as a velocity refuge and as a means of avoiding predation (Shirvell 1990, Meehan and Bjornn 1991). Steelhead, however, tend to use riffles and other habitats not strongly associated with cover during summer rearing more than other salmonids. Young steelhead feed on a wide variety of aquatic and terrestrial insects, and emerging fry are sometimes preyed upon by older juveniles. Rearing steelhead juveniles prefer water temperatures of 7.2 to 14.4 degrees Celsius (°C) and have an upper lethal limit of 23.9°C (Barnhart 1986, Bjornn and Reiser 1991). However, they can survive in water up to 27°C with saturated dissolved oxygen conditions and a plentiful food supply. Fluctuating diurnal water temperatures also aid in survivability of salmonids (Busby *et al.* 1996). Juvenile steelhead emigrate episodically from natal streams during fall, winter, and spring high flows, to the ocean to continue rearing to maturity.

The distribution of steelhead in the ocean is not well known. Interannual variations in climate, abundance of key prey items (e.g. squid), and density dependent interactions with other salmonid species are key drivers of steelhead distribution and productivity in the marine environment (Atcheson *et al.* 2012; Atcheson *et al.* 2013). Available information indicates that steelhead originating from central California use a cool, stable, thermal habitat window (ranging between 8-14 degrees Celsius [°C]) in the marine environment characteristic of conditions in northern waters above the 40th parallel to the southern boundary of the Bering Sea (Hayes *et al.* 2012).

2.2.1.1 Status of CCC Steelhead

CCC steelhead was listed as federally threatened in 1997 (62 FR 43937) and the listing was updated in 2006 (71 FR 834). This DPS includes all naturally spawned steelhead from the Russian River in Sonoma County to Aptos Creek in Santa Cruz County as well as the drainages

of San Francisco, Suisun, and San Pablo Bays eastward to Chipps Island at the confluence of the Sacramento and San Joaquin rivers. The DPS also includes two artificial propagation programs, the Don Clausen Fish Hatchery and the Kingfisher Flat Hatchery/Scott Creek (Monterey Bay Salmon and Trout Project) steelhead hatchery programs.

Historically, approximately 70 populations of steelhead existed in the CCC steelhead DPS (Spence *et al.* 2008, Spence *et al.* 2012). Many of these populations (about 37) were independent, or potentially independent, meaning they had a high likelihood of surviving for 100 years absent anthropogenic impacts (Bjorkstedt *et al.* 2005). The remaining populations were dependent upon immigration from nearby CCC steelhead DPS populations to ensure their viability (McElhaney *et al.* 2000, Bjorkstedt *et al.* 2005).

While historical and present data on abundance are limited, CCC steelhead numbers are substantially reduced from historical levels. A total of 94,000 adult steelhead were estimated to spawn in the rivers of this DPS in the mid-1960s, including 50,000 fish in the Russian River, which is considered the largest population within the DPS (Busby *et al.* 1996). Recent estimates for the Russian River are on the order of 7,000 adult fish returning to spawn (NMFS 2016a), however abundance estimates for smaller coastal streams in the DPS indicate low but stable levels with recent estimates for several streams (Lagunitas, Waddell, Scott, San Vicente, Pudding, and Caspar creeks) of individual run sizes of 500 fish or less (62 FR 43937). Some loss of genetic diversity has been documented and attributed to previous among-basin transfers of stock and local hatchery production in interior populations in the Russian River (Bjorkstedt *et al.* 2005). In San Francisco Bay streams, reduced population sizes and fragmented habitat condition has likely also depressed genetic diversity in these populations. Similar losses in genetic diversity in the Napa River may have resulted from out-of-basin and out-of-DPS releases of steelhead in the Napa basin in the 1970s and 1980s. These transfers included fish from the South Fork Eel River, San Lorenzo River, Mad River, Russian River, and the Sacramento River.

The scarcity of information on CCC steelhead abundance continues to make it difficult to assess whether conditions have changed appreciably since the previous status review assessment (Williams *et al*. 2016). The most recent status update concludes that steelhead in the CCC DPS remain "likely to become endangered in the foreseeable future", as new and additional information does not appear to suggest a change in extinction risk (NMFS 2016). NMFS concluded that the CCC steelhead DPS shall remain listed as threatened (81 FR 33468; May 26, 2016).

Recent monitoring efforts indicate steelhead still occur in all diversity strata of the DPS. However, hatchery-origin fish remain more prevalent than natural-origin fish in the Russian River, and an overall downward abundance trend was observed in one of the more robust populations, Scott Creek. Small-scale fish passage improvement and habitat restoration projects have improved habitat conditions locally; however, the DPS still faces threats throughout the region from both legacy habitat degradation and modification, as well as new urban growth, continued water diversions, and dams.

A final recovery plan for CCC steelhead was completed by NMFS in October 2016 (NMFS 2016b). The plan describes key threats, actions needed to achieve recovery, and measurable

criteria by which NMFS will determine when recovery has been reached. Recovery plan actions are primarily designed to restore ecological processes that support healthy steelhead populations, and address the various activities that harm these processes and threaten the species' survival. The recovery plan calls for a range of actions including the restoration of floodplains and channel structure, restoring riparian conditions, improving streamflows, restoring fish passage, protecting and restoring estuarine habitat, among other actions.

2.2.1.2 Status of CCV Steelhead

CCV steelhead was listed as federally threatened in 1998 (63 FR 13347) and the listing was updated in 2006 (71 FR 834). This DPS includes all naturally spawned anadromous *O. mykiss* (steelhead) populations below natural and manmade impassable barriers in the Sacramento and San Joaquin rivers and their tributaries, excluding steelhead from San Francisco and San Pablo Bays and their tributaries. The DPS also includes two artificial propagation programs, the Coleman National Fish Hatchery and Feather River Hatchery steelhead hatchery programs.

CCV steelhead historically were well-distributed throughout the Sacramento and San Joaquin rivers (Busby *et al.* 1996). Although it appears CCV steelhead remain widely distributed in Sacramento River tributaries, the vast majority of historical spawning areas are currently above impassable dams. At present, all CCV steelhead are considered winter-run steelhead (McEwan and Jackson 1996), although there are indications that summer steelhead were present in the Sacramento River system prior to the commencement of large-scale dam construction in the 1940s (IEP 1999). McEwan and Jackson (1996) reported that wild steelhead stocks appear to be mostly confined to upper Sacramento River tributaries such as Antelope, Deer, and Mill creeks and the Yuba River. However, naturally spawning populations are also known to occur in Butte Creek, and the upper Sacramento mainstem, Feather, American, Mokelumne, and Stanislaus rivers (CALFED 2000). It is possible that other small populations of naturally spawning steelhead exist in Central Valley streams, but are undetected due to lack of sufficient monitoring and research programs; increases in fisheries monitoring efforts led to the discovery of steelhead populations in streams such as Auburn Ravine and Dry Creek (IEP 1999).

Small self-sustaining populations of CCV steelhead exist in the Stanislaus, Mokelumne, Calaveras, and other tributaries of the San Joaquin River (McEwan 2001). On the Stanislaus River, steelhead smolts have been captured in rotary screw traps at Caswell State Park and Oakdale each year since 1995 (Demko *et al*. 2000). Incidental catches and observations of steelhead juveniles also have occurred on the Tuolumne and Merced rivers during fall-run Chinook salmon monitoring activities, indicating that steelhead are widespread, if not abundant, throughout accessible streams and rivers in the Central Valley (Good *et al*. 2005).

Steelhead counts at the Red Bluff Diversion Dam (RBDD) declined from an average annual count of 11,187 adults for the ten-year period beginning in 1967, to an average annual count 2,202 adults in the 1990's (McEwan and Jackson 1996). Estimates of the adult steelhead population composition in the Sacramento River (natural origin versus hatchery origin) have also changed over this time period; through most of the 1950's, Hallock *et al*. (1961) estimated that 88 percent of returning adults were of natural origin, and this estimate declined to 10-30 percent in the 1990's (McEwan and Jackson 1996). Furthermore, the California Fish and Wildlife Plan estimated a total run size of about 40,000 adults for the entire Central Valley, including San

Francisco Bay, in the early 1960s (CDFW 1965). In 1991-92, this run was probably less than 10,000 fish based on dam counts, hatchery returns and past spawning surveys (McEwan and Jackson 1996).

The 2016 status review (Williams *et al*. 2016) summarized that little had changed in the status of CCV steelhead since 2011 (Williams *et al.* 2011). While there are some increased returns to hatcheries in the Central Valley, the returns of wild fish and data on the wild population are still lacking. Most natural-origin CCV populations are very small, are not monitored, and may lack the resiliency to persist for protracted periods if subjected to additional stressors, particularly widespread stressors such as climate change. The genetic diversity of CCV steelhead has likely been impacted by low population sizes and high numbers of hatchery fish relative to natural-origin fish. The life-history diversity of the DPS is mostly unknown, as very few studies have been published on traits such as age structure, size at age, or growth rates in CCV steelhead.

In July 2014, NMFS released a final Recovery Plan for CCV steelhead (NMFS 2014). The Recovery Plan outlines actions to restore habitat, access, and improve water quality and quantity conditions in the Sacramento River to promote the recovery of listed salmonids. Key actions for the Recovery Plan include conducting landscape-scale restoration throughout the Delta, incorporating ecosystem restoration into Central Valley flood control plans that includes breaching and setting back levees, and restoring flows throughout the Sacramento and San Joaquin River basins and the Delta.

2.2.2. CV Spring-run and Sacramento River Winter-run Chinook Salmon

Chinook salmon return to freshwater to spawn when they are 3 to 8 years old (Healey 1991). Runs are designated on the basis of adult migration timing; however, distinct runs also differ in the degree of maturation at the time of river entry, thermal regime and flow characteristics of their spawning site, and actual time of spawning (Myers *et al.* 1998). Both winter-run and spring-run Chinook salmon tend to enter freshwater as immature fish, migrate far upriver, and delay spawning for weeks or months. For comparison, fall-run Chinook salmon enter freshwater at an advanced stage of maturity, move rapidly to their spawning areas on the mainstem or lower tributaries of rivers, and spawn within a few days or weeks of freshwater entry (Healey 1991). Adult endangered Sacramento River winter-run Chinook salmon enter San Francisco Bay from November through June (Hallock and Fisher 1985), and delay spawning until spring or early summer. Adult threatened Central Valley spring-run Chinook salmon enter the Sacramento-San Joaquin Delta (Delta) beginning in January and enter natal streams from March to July (Myers *et al.* 1998). Central Valley spring-run Chinook salmon adults hold in freshwater over summer and spawn in the fall. Central Valley spring-run Chinook salmon juveniles typically spend a year or more in freshwater before migrating toward the ocean. Adequate instream flows and cool water temperatures are more critical for the survival of Central Valley spring-run Chinook salmon due to over summering by adults and/or juveniles.

Sacramento River winter-run Chinook salmon spawn primarily from mid-April to mid-August, peaking in May and June, in the Sacramento River reach between Keswick Dam and the RBDD. Central Valley spring-run Chinook salmon typically spawn between September and October depending on water temperatures. Chinook salmon generally spawn in waters with moderate gradient and gravel and cobble substrates. Eggs are deposited within the gravel where

incubation, hatching, and subsequent emergence take place. The upper preferred water temperature for spawning adult Chinook salmon is 13°C (Chambers 1956) to 14 °C (Reiser and Bjornn 1979). The length of time required for eggs to develop and hatch is dependent on water temperature, and quite variable.

Sacramento River winter-run Chinook salmon fry begin to emerge from the gravel in late June to early July and continue through October (Fisher 1994). Juvenile winter-run Chinook salmon spend 4 to 7 months in freshwater prior to migrating to the ocean as smolts. Central Valley spring-run Chinook salmon fry emerge from November to March and spend about 3 to 15 months in freshwater prior to migrating towards the ocean (Kjelson *et al*. 1982). Post-emergent fry seek out shallow, nearshore areas with slow current and good cover, and begin feeding on small terrestrial and aquatic insects and crustaceans. Chinook fry and parr may spend time rearing within riverine and/or estuarine habitats including natal tributaries, the Sacramento River, non-natal tributaries to the Sacramento River, and the Delta.

Within estuarine habitat, juvenile rearing Chinook salmon movements are generally dictated by tidal cycles, following the rising tide into shallow water habitats from the deeper main channels, and returning to the main channels when the tide recedes (Healey 1991; Levings 1982; Levy and Northcote 1982). Juvenile Chinook salmon forage in shallow areas with protective cover, such as intertidal and subtidal mudflats, marshes, channels and sloughs (Dunford 1975; McDonald 1960). As juvenile Chinook salmon increase in length, they tend to school in the surface waters of the main and secondary channels and sloughs, following the tides into shallow water habitats to feed (Allen and Hassler 1986). Kjelson *et al*. (1982) reported that juvenile Chinook salmon demonstrated a diel migration pattern, orienting themselves to nearshore cover and structure during the day, but moving into more open, offshore waters at night. The fish also distributed themselves vertically in relation to ambient light. Juvenile Sacramento River winter-run Chinook salmon migrate to the sea as smolts after only rearing in freshwater for 4 to 7 months, and occur in the Delta from October through early May (CDFW 2000). Most Central Valley spring-run Chinook salmon smolts are present in the Delta from mid-March through mid-May depending on flow conditions (CDFW 1998).

2.2.2.1 Status of Sacramento River Winter-run Chinook Salmon

Sacramento River winter-run Chinook salmon was first listed as a threatened species in 1990 (55 FR 46515). In 1994, NMFS reclassified the ESU as an endangered species due to several factors, including: (1) the continued decline and increased variability of run sizes since its listing as a threatened species in 1989; (2) the expectation of weak returns in coming years as the result of two small year classes (1991 and 1993); and (3) continuing threats to the species (59 FR 440). NMFS issued a final listing determination on June 28, 2005 (70 FR 37160). The Sacramento River winter-run Chinook salmon ESU includes winter-run Chinook salmon spawning naturally in the Sacramento River and its tributaries, as well as two artificial propagation programs: winter-run Chinook salmon from the Livingston Stone National Fish Hatchery and winter-run Chinook in a captive broodstock program maintained at Livingston Stone National Fish Hatchery and the University of California Bodega Marine Laboratory.

The Sacramento River winter-run Chinook salmon ESU has been completely displaced from its historical spawning habitat by the construction of Shasta and Keswick dams. Approximately, 300

miles of tributary spawning habitat in the upper Sacramento River is now inaccessible to the ESU. Most components of the Sacramento River winter-run Chinook salmon life history (e.g., spawning, incubation, freshwater rearing) have been compromised by the habitat blockage in the upper Sacramento River. The only remaining spawning habitat in the upper Sacramento River is between Keswick Dam and RBDD. This habitat is artificially maintained by cool water releases from Shasta and Keswick Dams, and the spatial distribution of spawners in the upper Sacramento River is largely governed by the water year type and the ability of the Central Valley Project to manage water temperatures in this area.

Between the time Shasta Dam was built and the Sacramento River winter-run Chinook salmon were listed in 1990, major impacts to the population occurred from warm water releases from Shasta Dam, juvenile and adult passage constraints at the RBDD, water exports in the southern Delta, and entrainment at a large number of unscreened or poorly-screened water diversions. However, the naturally spawning component of this ESU has exhibited marked improvements in abundance and productivity in the 2000s (CDFW 2008). These increases in abundance are encouraging, relative to the years of critically low abundance of the 1980s and early 1990s; however, returns of several West Coast Chinook salmon and coho salmon stocks were lower than expected in 2007, and stocks remained low through 2009.

A captive broodstock artificial propagation program for Sacramento River winter-run Chinook salmon has operated since the early 1990s as part of recovery actions for this ESU. As many as 150,000 juvenile salmon have been released by this program, but in most cases the number of fish released was in the tens of thousands (Good *et al.* 2005).

According to the 2016 NMFS 5-year status review, the extinction risk of the winter-run Chinook salmon ESU has increased from moderate risk to high risk of extinction since the 2007 and 2010 assessments (NMFS 2016c). Based on the Lindley *et al*. (2007) criteria, the population is currently at high extinction risk. High extinction risk for the population was triggered by the hatchery influence criterion, with a mean of 66 percent hatchery origin spawners from 2016 through 2018. Several listing factors have contributed to the recent decline, including drought, poor ocean conditions, and hatchery influence.

In July 2014, NMFS released a final Recovery Plan for Sacramento River winter-run Chinook salmon (NMFS 2014). The Recovery Plan outlines actions to restore habitat, access, and improve water quality and quantity conditions in the Sacramento River to promote the recovery of listed salmonids.

2.2.2.2 Status of CV Spring-run Chinook Salmon

CV spring-run Chinook salmon was listed as a threatened species in 1999 (64 FR 50394) and the listing was updated in 2005 (70 FR 37160). The Central Valley spring-run Chinook ESU includes all naturally spawned populations of spring-run Chinook salmon in the Sacramento River and its tributaries in California, including the Feather River. The artificial propagation program at the Feather River Hatchery is also considered part of the ESU.

Historically, the predominant salmon run in the Central Valley was the spring-run Chinook salmon. Extensive construction of dams throughout the Sacramento-San Joaquin Basin has

reduced the Central Valley spring-run Chinook salmon run to only a small portion of its historical distribution. The Central Valley drainage as a whole is estimated to have supported Central Valley spring-run Chinook salmon runs as large as 600,000 fish between the late 1880s and 1940s (CDFW 1998). The ESU has been reduced to only three naturally-spawning populations that are free of hatchery influence from an estimated 17 historic populations. These three populations (spawning in three tributaries to the Sacramento River - Deer, Mill, and Butte creeks), are in close geographic proximity, increasing the ESU's vulnerability to disease or catastrophic events.

Central Valley spring-run Chinook salmon from the Feather River Hatchery (FRH) were included in the ESU because they are believed by NMFS to be the only population in the ESU that displays early run timing. This early run timing is considered by NMFS to represent an important evolutionary legacy of the spring-run populations that once spawned above Oroville Dam (70 FR 37160). The FRH population is closely related genetically to the natural Feather River population. The FRH's goal is to release five million spring-run Chinook salmon per year. Recent releases have ranged from about one-and-a-half to five million fish, with most releases below five million fish (Good *et al.* 2005).

According to the NMFS 5-year species status review (NMFS 2016d), the status of the CV spring- run Chinook salmon ESU, until 2015, has improved since the 2010 status review. The improved status is due to extensive restoration, and increases in spatial structure with historically extirpated populations (Battle and Clear creeks) trending in the positive direction. However, more recent declines of many of the dependent and independent populations, high pre-spawn and egg mortality during the 2012 to 2016 drought, uncertain juvenile survival during the drought are likely increasing the ESU's extinction risk. Escapement data show a continued overall decline in adult returns from 2014 through 2020 (CDFW 2021).

In July 2014, NMFS released a final Recovery Plan for CV spring-run Chinook salmon (NMFS 2014). The Recovery Plan outlines actions to restore habitat, access, and improve water quality and quantity conditions in the Sacramento River to promote the recovery of listed salmonids. Key actions for the Recovery Plan include conducting landscape-scale restoration throughout the Delta, incorporating ecosystem restoration into Central Valley flood control plans that includes breaching and setting back levees, and restoring flows throughout the Sacramento and San Joaquin River basins and the Delta.

2.2.3. North American Green Sturgeon

The green sturgeon is an anadromous, long-lived, and bottom-oriented fish species in the family Acipenseridae. Sturgeon have skeletons composed mostly of cartilage and lack scales, instead possessing five rows of characteristic bony plates on their body called "scutes." On the underside of their flattened snouts are sensory barbels and a siphon-shaped, protrusible, toothless mouth. Large adults may exceed 2 meters in length and 100 kilograms in weight (Moyle 1976). Based on genetic analyses and spawning site fidelity, NMFS determined that North American green sturgeon are comprised of at least two DPSs: Northern DPS consisting of populations originating from coastal watersheds northward of and including the Eel River ("Northern DPS green sturgeon"), with spawning confirmed in the Klamath and Rogue river systems; and Southern DPS consisting of populations originating from coastal watersheds south of the Eel River

("Southern DPS green sturgeon"), with spawning confirmed in the Sacramento River system (Adams *et al.* 2002).

Green sturgeon is the most marine-oriented species of sturgeon (Moyle 2002). Along the West Coast of North America, they range in nearshore waters from Mexico to the Bering Sea (Adams *et al.* 2002), with a general tendency to head north after their out-migration from freshwater (Lindley *et al.* 2011). While in the ocean, archival tagging indicates that green sturgeon occur in waters between 0- and 200-meters depth, but spend most of their time in waters between 20–80 meters and temperatures of 9.5–16.0°C (Nelson *et al.* 2010, Huff *et al.* 2011). Subadult and adult green sturgeon move between coastal waters and estuaries (Lindley *et al*. 2008, Lindley *et al.* 2011), but relatively little is known about how green sturgeon use these habitats. Lindley *et al.* (2011) report multiple rivers and estuaries are visited by aggregations of green sturgeon in summer months, and larger estuaries (e.g., San Francisco Bay) appear to be particularly important habitat. During the winter months, green sturgeon generally reside in the coastal ocean. Areas north of Vancouver Island are favored overwintering areas, with Queen Charlotte Sound and Hecate Strait likely destinations based on detections of acoustically-tagged green sturgeon (Lindley *et al.* 2008, Nelson *et al*. 2010).

Based on genetic analysis, Israel *et al.* (2009) reported that almost all green sturgeon collected in the San Francisco Bay system were Southern DPS. This is corroborated by tagging and tracking studies which found that no green sturgeon tagged in the Klamath or Rogue rivers (i.e., Northern DPS) have yet been detected in San Francisco Bay (Lindley *et al.* 2011). However, green sturgeon inhabiting coastal waters adjacent to San Francisco Bay include Northern DPS green sturgeon.

Adult Southern DPS green sturgeon enter the San Francisco Bay in later winter thought early spring, and migrate upstream to spawn in the Sacramento River watershed from April through early July, with peaks in activity influenced by variations in water low and temperature (Heublein *et al*. 2009, Poytress *et al*. 2015, Miller *et al*. 2020). After hatching larvae migrate downstream and metamorphose into juveniles. Juveniles spend their first few years in the Sacramento-San Joaquin Delta (Delta) and San Francisco estuary before entering the marine environment as subadults. Juvenile green sturgeon collected at the State and Federal water export facilities in the southern Delta are generally between 200 mm and 400 mm total length (TL) (Adams *et al*. 2002) which suggests Southern DPS green sturgeon spend several months to a year rearing in freshwater before entering the Delta and San Francisco estuary. Subadult green sturgeon spend several years at sea before reaching reproductive maturity and returning to freshwater to spawn for the first time (Nakamoto *et al.* 1995). Post-spawn outmigration the San Francisco Bay is variable, with some individuals migrating to the ocean within 2-10 days and others remaining within the estuary for several months after leaving upstream spawning habitat (Heublein *et al*. 2009, Miller *et al*. 2020)

During the summer and fall, an unknown proportion of the population of non-spawning adults and subadults enter the San Francisco estuary from the ocean for periods ranging from a few days to 6 months (Lindley *et al*. 2011). Some fish are detected only near the Golden Gate, while others move as far inland as Rio Vista on the lower Sacramento River in the Delta. The

remainder of the population appear to enter bays and estuaries farther north from Humboldt Bay, California to Grays Harbor, Washington (Lindley *et al.* 2011).

Green sturgeon feed on benthic invertebrates and fish (Adams *et al.* 2002). Radtke (1966) analyzed stomach contents of juvenile green sturgeon captured in the Sacramento-San Joaquin Delta and found the majority of their diet was benthic invertebrates, such as mysid shrimp and amphipods (*Corophium spp*). Manual tracking of acoustically-tagged green sturgeon in the San Francisco Bay estuary indicates they are generally bottom-oriented, but make occasional forays to surface waters, perhaps to assist their movement (Kelly *et al.* 2007). Dumbauld *et al.* (2008) report green sturgeon utilize soft substrate in estuaries, presumably feeding on benthic invertebrates. Data from mapping surveys conducted in Willapa Bay, Washington, showed densities of "feeding pits" (depressions in the substrate believed to be formed when green sturgeon feed) were highest over shallow intertidal mud flats, while harder substrates (e.g., sand) had no pits (Moser *et al.* 2017). Within the San Francisco estuary, green sturgeon are encountered by recreational anglers and during sampling by the California Department of Fish and Wildlife (CDFW) in the shallow waters of San Pablo Bay.

2.2.3.1 Status of North American Green Sturgeon

The Southern DPS of North American green sturgeon was listed as a federally threatened species in 2006 (71 FR 17757). The Southern DPS includes all spawning populations of green sturgeon south of the Eel River (exclusive), principally including the Sacramento River green sturgeon spawning population.

To date, little population-level data have been collected for green sturgeon. In particular, there are no published abundance estimates for either Northern DPS or Southern DPS green sturgeon in any of the natal rivers based on survey data. As a result, efforts to estimate green sturgeon population size have had to rely on sub-optimal data with known potential biases. Available abundance information comes mainly from four sources: 1) incidental captures in the CDFW white sturgeon monitoring program; 2) fish monitoring efforts associated with two diversion facilities on the upper Sacramento River; 3) fish salvage operations at the water export facilities on the Sacramento-San Joaquin Delta; and 4) dual frequency sonar identification in spawning areas of the upper Sacramento River. These data are insufficient in a variety of ways (short time series, non-target species, etc.) and do not support more than a qualitative evaluation of changes in green sturgeon abundance.

CDFW's white sturgeon monitoring program incidentally captures Southern DPS green sturgeon. Trammel nets are used to capture white sturgeon and CDFW utilizes a multiple-census or Peterson mark-recapture method to estimate the size of subadult and adult sturgeon population (CDFW 2002). By comparing ratios of white sturgeon to green sturgeon captures, estimates of Southern DPS green sturgeon abundance can be calculated. Estimated abundance of green sturgeon between 1954 and 2001 ranged from 175 fish to more than 8,000 per year and averaged 1,509 fish per year. Unfortunately, there are many biases and errors associated with these data, and CDFW does not consider these estimates reliable. For larval and juvenile green sturgeon in the upper Sacramento River, information is available from salmon monitoring efforts at the RBDD and the Glenn-Colusa Irrigation District (GCID). Incidental capture of larval and juvenile green sturgeon at the RBDD and GCID have ranged between 0 and 2,068 green sturgeon per

year (Adams *et al.* 2002). Genetic data collected from these larval green sturgeon suggest that the number of adult green sturgeon spawning in the upper Sacramento River remained roughly constant between 2002 and 2006 in river reaches above Red Bluff (Israel and May 2010). In 2011, rotary screw traps operating in the Upper Sacramento River at RBDD captured 3,700 larval green sturgeon which represents the highest catch on record in 16 years of sampling (Poytress *et al.* 2011).

Juvenile green sturgeon are collected at water export facilities operated by the California Department of Water Resources (DWR) and the Federal Bureau of Reclamation (BOR) in the Sacramento-San Joaquin Delta. Fish collection records have been maintained by DWR from 1968 to present and by BOR from 1980 to present. The average number of Southern DPS green sturgeon taken per year at the DWR facility prior to 1986 was 732; from 1986 to 2001, the average per year was 47 (70 FR 17386). For the BOR facility, the average number prior to 1986 was 889; from 1986 to 2001 the average was 32 (70 FR 17386). Direct capture in the salvage operations at these facilities is a small component of the overall effect of water export facilities on Southern DPS green sturgeon; entrained juvenile green sturgeon are exposed to potential high levels of predation by non-native predators, disruption in migratory behavior, and poor habitat quality. Delta water exports have increased substantially since the 1970s and it is likely that this has contributed to negative trends in the abundance of migratory fish that utilize the Delta, including the Southern DPS green sturgeon.

A Southern DPS population estimate of 17,723 total individuals (95% confidence interval =12,614-22,482) was developed by Mora *et al*. (2018) through Dual Frequency Identification Sonar (DIDSON) surveys of aggregation sites conducted from 2010-2015 in the upper Sacramento River. The NMFS Southwest Fisheries Science Center has updated the total population estimate to 17,723 (Dudley 2021). The DIDSON surveys and modeling will eventually provide population trend data.

According to the NMFS (2021) 5-year status review and the 2018 final recovery plan (NMFS 2018), some threats to the species have recently been eliminated, such as take from commercial fisheries and removal of some passage barriers. However, the species viability continues to be constrained by factors such as a small population size, lack of multiple populations, and concentration of spawning sites into just a few locations. The species continues to face a moderate risk of extinction. A recent method has been developed to estimate the annual spawning run and population size in the upper Sacramento River so species can be evaluated relative to recovery criteria (Mora *et al*. 2018).

In August 2018, NMFS released a final Recovery Plan for the Southern DPS green sturgeon (NMFS 2018), which focuses on fish screening and passage projects, floodplain and river restoration, and riparian habitat protection in the Sacramento River Basin, the Delta, San Francisco Estuary, and nearshore coastal marine environment as strategies for recovery.

2.2.4. Status of Critical Habitat

In designating critical habitat, NMFS considers, among other things, the following requirements of the species: 1) space for individual and population growth, and for normal behavior; 2) food, water, air, light, minerals, or other nutritional or physiological requirements; 3) cover or shelter;

4) sites for breeding, reproduction, or rearing offspring; and, generally; and 5) habitats that are protected from disturbance or are representative of the historic geographical and ecological distributions of this species (50 CFR 424.12(b)). In addition to these factors, NMFS also focuses on PBFs within the designated area that are essential to the conservation of the species and that may require special management considerations or protection (81 FR 7214).

2.2.4.1 Status of CCC Steelhead Critical Habitat

Critical habitat was designated for CCC steelhead on September 2, 2005 (70 FR 52488) and includes the following CALWATER Hydrologic Units: Russian River, Bodega, Marin Coastal, San Mateo Coastal, Bay Bridge, Santa Clara, San Pablo, and Big Basin. The PBFs for CCC steelhead critical habitat include freshwater spawning sites, freshwater rearing sites, freshwater migration corridors, and estuarine areas.

The condition of CCC steelhead critical habitat, specifically its ability to provide for their conservation, has been degraded from conditions known to support viable salmonid populations. NMFS has determined that present depressed population conditions are, in part, the result of the following human-induced factors affecting critical habitat: logging; agricultural and mining activities; urbanization; stream channelization; dams; wetland loss; and water withdrawals, including unscreened diversions for irrigation. Impacts of concern include alteration of streambank and channel morphology, alteration of water temperatures, loss of spawning and rearing habitat, fragmentation of habitat, loss of downstream recruitment of spawning gravels and large woody debris, degradation of water quality, removal of riparian vegetation resulting in increased streambank erosion, loss of shade (higher water temperatures) and loss of nutrient inputs (Busby *et al*. 1996, NMFS 2016b). Water development has drastically altered natural hydrologic conditions in many of the streams in the DPS. Alteration of flows results in migration delays, loss of suitable habitat due to dewatering and blockage; stranding of fish from rapid flow fluctuations; entrainment of juveniles into poorly screened or unscreened diversions, and increased water temperatures harmful to salmonids.

2.2.4.2 Status of CCV Steelhead Critical Habitat

Critical habitat was designated for CCV steelhead on September 2, 2005 (70 FR 52488) and includes stream reaches of the Feather, Yuba and American rivers, Big Chico, Butte, Deer, Mill, Battle, Antelope, and Clear creeks, the Sacramento River, as well as portions of the northern Delta. The PBFs for CCV steelhead critical habitat include freshwater spawning sites, freshwater rearing sites, freshwater migration corridors, and estuarine areas.

Many of the PBFs of CCV steelhead critical habitat are degraded and provide limited high-quality habitat. Passage to historical spawning and juvenile rearing habitat has been largely reduced due to dam construction throughout the Central Valley. Levee construction has also degraded the freshwater rearing and migration habitat and estuarine areas as riparian vegetation has been removed, reducing habitat complexity and food resources and resulting in many other ecological effects. Additionally, due to reduced access to historical habitat, genetic introgression is occurring because natural-origin fish are interacting with hatchery-origin fish, providing the potential to reduce the long-term fitness and survival of this species.

Although the current conditions of CCV steelhead critical habitat are significantly degraded, the spawning habitat, migratory corridors, and rearing habitat that remain in the Sacramento-San Joaquin River watershed and the Delta are considered to have high intrinsic value for the conservation of the species as they are critical to ongoing recovery efforts.

2.2.4.3 Status of Sacramento River Winter-run Chinook Salmon Critical Habitat

Critical habitat was designated for the Sacramento River winter-run Chinook salmon on June 16, 1993 (58 FR 33212). Designated critical habitat for Sacramento River winter-run Chinook salmon includes the Sacramento River from Keswick Dam, Shasta County (River Mile 302) to Chipps Island (River Mile 0), all waters from Chipps Island westward to Carquinez Bridge, all waters of San Pablo Bay, and all water of San Francisco Bay (north of the San Francisco/Oakland Bay Bridge).

PBFs for Sacramento River Winter-run Chinook and their associated essential features include:

1. Access from the Pacific Ocean to appropriate spawning areas in the upper Sacramento River.
2. The availability of clean gravel for spawning substrate.
3. Adequate river flows for successful spawning, incubation of eggs, fry development and emergence, and downstream transport of juveniles.
4. Water temperatures between 6 and 14˚C for successful spawning, egg incubation, and fry development.
5. Habitat areas and adequate prey that are not contaminated.
6. Riparian areas that provide for successful juvenile development and survival.
7. Access downstream so that juveniles can migrate from the spawning grounds to San Francisco Bay and the Pacific Ocean (58 FR 33212).

Winter-run Chinook salmon critical habitat has been degraded from conditions known to support viable salmonid populations. It does not provide the full extent of conservation values necessary for the recovery of the species. In particular, adequate river flows and water temperatures have been impacted by human actions, substantially altering the historical river characteristics in which the Sacramento River winter-run Chinook salmon evolved. Depletion and storage of streamflow behind large dams on the Sacramento River and other tributary streams have drastically altered the natural hydrologic cycles of the Sacramento River and Delta. Alteration of flows results in migration delays, loss of suitable habitat due to dewatering and blockage, stranding of fish from rapid flow fluctuations, entrainment of juveniles into poorly screened or unscreened diversions, and increased water temperatures harmful to salmonids. Other impacts of concern include alteration of stream bank and channel morphology, loss of riparian vegetation, loss of spawning and rearing habitat, fragmentation of habitat, loss of downstream recruitment of spawning gravels, degradation of water quality, and loss of nutrient input.

2.2.4.4 CV Spring-run Chinook Salmon Critical Habitat

Critical habitat was designated for CV spring-run Chinook salmon on September 2, 2005 (70 FR 52488). The geographical range of designated critical habitat includes stream reaches of the Feather, Yuba, and American rivers; Big Chico, Butte, Deer, Mill, Battle, Antelope, and Clear

creeks; and the Sacramento River downstream to the Delta, as well as portions of the northern Delta (70 FR 52488; September 2, 2005). The PBFs for CV spring-run Chinook salmon critical habitat include freshwater spawning sites, freshwater migratory habitat, freshwater rearing sites, and estuarine habitat.

Currently, many of the PBFs of CV spring-run Chinook salmon critical habitat are degraded and provide limited high-quality habitat. Factors that lessen the quality of migratory corridors for juveniles include unscreened or inadequately screened diversions, altered flows in the Delta and mainstem Sacramento River, scarcity of complex in-river cover, in-river predation, degraded water quality, suboptimal water temperatures, and the lack of floodplain habitat. Although the current conditions of CV spring-run Chinook salmon critical habitat are significantly degraded, the spawning habitat, migratory corridors, and rearing habitat that remain are considered to have high intrinsic value for the conservation of the species.

2.2.4.5 Status of North American Green Sturgeon Critical Habitat

Critical habitat was designated for the Southern DPS of green sturgeon on October 9, 2009 (74 FR 52300) and includes coastal marine waters within 60 fathoms depth from Monterey Bay, California to Cape Flattery, Washington, including the Strait of Juan de Fuca to its United States boundary. Designated critical habitat also includes the Sacramento River, lower Feather River, lower Yuba River, Sacramento-San Joaquin Delta, Suisun Bay, San Pablo Bay, and San Francisco Bay in California.

PBFs of designated critical habitat in estuarine areas are food resources, water flow, water quality, mitigation corridor, depth, and sediment quality. In freshwater riverine systems, PBFs of green sturgeon critical habitat are food resources, substrate type or size, water flow, water quality, migratory corridor, depth, and sediment quality. In nearshore coastal marine areas, PBFs are migratory corridor, water quality, and food resources.

The current condition of critical habitat for the Southern DPS of green sturgeon is degraded over its historical conditions. It does not provide the full extent of conservation values necessary for the recovery of the species, particularly in the upstream riverine habitat of the Sacramento River. In the Sacramento River, migration corridor and water flow PBFs have been impacted by human actions, substantially altering the historical river characteristics in which the Southern DPS of green sturgeon evolved. In addition, the alterations to the Sacramento-San Joaquin River Delta may have a particularly strong impact on the survival and recruitment of juvenile green sturgeon due to their protracted rearing time in brackish and estuarine waters.

2.2.5. Additional Threats to Listed Species and Critical Habitat

2.2.5.1 Global Climate Change

Another factor affecting the range wide status of CCC steelhead, CCV steelhead, winter-run Chinook salmon, CV spring-run Chinook salmon, Southern DPS green sturgeon, and aquatic habitat at large is climate change. Recent work by the NMFS Science Centers ranked the relative vulnerability of west-coast salmon and steelhead to climate change. In California, listed coho and

Chinook salmon are generally at greater risk (high to very high risk) than listed steelhead (moderate to high risk) (Crozier *et al.* 2019).

Impacts from global climate change are already occurring in California. For example, average annual air temperatures, heat extremes, and sea level increased in California over the last century (Kadir *et al*. 2013). Snowmelt from the Sierra Nevada has declined (Kadir *et al*. 2013). Listed salmon, steelhead and green sturgeon have likely already experienced some detrimental impacts from climate change through lower and more variable stream flows, warmer stream temperatures, and changes in ocean conditions. California experienced well below average precipitation during the 2012-2016 drought, as well as record high surface air temperatures in 2014 and 2015, and record low snowpack in 2015 (Williams *et al*. 2016). Paleoclimate reconstructions suggest the 2012-2016 drought was the most extreme in the past 500 to 1000 years (Williams *et al*. 2016 Williams *et al*. 2020, Williams *et al*. 2022). Anomalously high surface temperatures substantially amplified annual water deficits during 2012-2016. California entered another period of drought in 2020. These drought periods are now likely part of a larger drought event (Williams *et al.* 2022). This recent long-term drought, as well as the increased incidence and magnitude of wildfires in California, have likely been exacerbated by climate change (Williams *et al.* 2022, Diffenbaugh *et al.* 2015, Williams *et al*. 2019).

The threat to CCC steelhead, CCV steelhead, winter-run Chinook salmon, CV spring-run Chinook salmon and green sturgeon from global climate change is expected to increase in the future. Modeling of climate change impacts in California suggests that average summer air temperatures are expected to continue to increase (Lindley *et al.* 2007; Moser *et al*. 2012). Heat waves are expected to occur more often, and heat wave temperatures are likely to be higher (Hayhoe *et al*. 2004; Moser *et al*. 2012; Kadir *et al*. 2013). Total precipitation in California may decline and the magnitude and frequency of dry years may increase (Lindley et al. 2007; Schneider 2007; Moser *et al.* 2012). Similarly, wildfires are expected to increase in frequency and magnitude (Westerling *et al.* 2011; Moser *et al.* 2012). Increases in wide year-to- year variation in precipitation amounts (droughts and floods) are projected to occur (Swain et al. 2018). Estuarine productivity is likely to change based on changes in freshwater flows, nutrient cycling, and sediment amounts (Scavia *et al*. 2002; Ruggiero *et al.* 2010).

In marine environments, ecosystems and habitats important to juvenile and adult salmonids are likely to experience changes in temperatures, circulation, water chemistry, and food supplies (Brewer and Barry 2008; Feely 2004; Osgood 2008; Turley 2008; Abdul-Aziz *et al*. 2011; Doney *et al.* 2012). Some of these changes, including an increased incidence of marine heat waves, are likely already occurring, and are expected to increase (Frolicher, *et al.* 2018). In fall 2014, and again in 2019, a marine heatwave, known as “The Blob”, formed throughout the northeast Pacific Ocean, which greatly affected water temperature and upwelling from the Bering Sea off Alaska, south to the coastline of Mexico. The marine waters in this region of the ocean are utilized by salmonids for foraging as they mature (Beamish 2018). Although the implications of these events on salmonid populations are not fully understood, they are having considerable adverse consequences to the productivity of these ecosystems and presumably contributing to poor marine survival of salmonids.

2.2.5.2 Water Quality

Recently published work has identified stormwater from roadways as causing mortality of adult coho salmon in the wild (Scholz *et al.* 2011) and laboratory settings (McIntyre *et al.* 2018). Subsequent laboratory studies showed this morality also occurred in juvenile coho salmon (Chow *et al.* 2019) as well as to juvenile steelhead and Chinook salmon (Brinkmann *et al*. 2022). These recent publications have identified a degradation product of tires (6PPD-quinone) as the causal factor in this mortality (Tian *et al.* 2022, Brinkmann *et al*. 2022, Tian *et al*. 2020; Peter *et al*. 2018). The parent compound (6PPD) is widely used by multiple tire manufacturers and the tire shreds/dust that produce the degradation product have been found to be ubiquitous where both rural and urban roadways drain into waterways (Feist *et al*. 2018, Sutton *et al.* 2019).

2.3. Action Area

"Action area" means all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action (50 CFR 402.02). The action area for this consultation includes all areas that will be directly and indirectly affected by PG&E's routine maintenance activities at electrical facilities, gas line facilities, and access roads within the nine-county San Francisco Bay Area.[7] Figure 1 displays the locations of PG&E facilities in the O&M Program action area. Although O&M Program activities can occur at any of the locations in Figure 1, most PG&E facilities associated with freshwater streams are located in urban or "developed" areas where instream habitat and natural channel function are impaired. In tidal waters and wetlands, PG&E's electrical towers are primarily located adjacent to bridges and in wetland areas along the margin of the Bay.

2.4. Environmental Baseline

The "environmental baseline" refers to the condition of the listed species or its designated critical habitat in the action area, without the consequences to the listed species or designated critical habitat caused by the proposed action. The environmental baseline includes the past and present impacts of all Federal, State, or private actions and other human activities in the action area, the anticipated impacts of all proposed Federal projects in the action area that have already undergone formal or early section 7 consultations, and the impact of State or private actions which are contemporaneous with the consultation in process. The consequences to listed species or designated critical habitat from ongoing agency activities or existing agency facilities that are not within the agency's discretion to modify are part of the environmental baseline (50 CFR 402.02).

San Francisco Bay is the largest estuary on the west coast of North American in terms of surface area and it is also one of the most urbanized. The human population within the San Francisco Bay Area is approximately eight million (2020 census). In the past 150 years, the diking and filling of tidal marshes has decreased the surface area of the San Francisco Bay by 37 percent, which has diminished tidal marsh habitat, increased pollutant loadings to the estuary, and degraded shoreline habitat. Most shoreline areas are dominated by docks, shipping wharves,

[7] The nine Bay Area counties consist of Alameda, Contra Costa, Marin, Napa, San Francisco, San Mateo, Santa Clara, Solano, and Sonoma counties.

marinas, and miles of rock riprap for erosion protection. Most tributary streams have lost habitat through channelization, riparian vegetation removal, and water development. Dams blocking anadromy are present on most streams and the associated reservoirs are used for water supply, aquifer recharge, and/or recreational activities.

2.4.1. San Francisco Bay Estuary Description

The Bay receives inputs from the Sacramento and San Joaquin rivers, Bay Area tributary streams, stormwater runoff, and wastewater from municipal and industrial sources that vary in volume depending on the location and seasonal weather patterns. The freshwater outflow pattern is seasonal with the highest outflow occurring in the winter and spring. Local watersheds adjacent to the Bay contribute approximately 56 percent of the sediment delivered to the Bay, with the Delta and coastal sources contributing the remaining sediment supply (Barnard *et al.* 2013). Current and wave patterns in the estuarine portion of the action area are largely generated by the tides interacting with the bottom and shoreline configurations.

Central Bay, Suisun Bay, San Pablo Bay, and the South Bay all have shallow areas with mud to sand bottom, and deeper channels with mainly sand bottom. The mean water depth of the Central Bay is approximately 40 feet while the South Bay, San Pablo Bay and Suisun Bay have mean depths of 16 feet or less. Most of the Bay floor is comprised of sand and mud, overlying metamorphic and sedimentary bedrock. Bottom sediments are mud-dominated in shallower, low tidal energy areas. Sand is prevalent in deeper high tidal energy areas, such as the deeper portions of Central Bay and Suisun Bay, particularly within the main tidal channels where large waveforms are present along the Bay floor (Barnard *et al*. 2013). Both wind and tidal currents are strong in many parts of the estuary. The Carquinez Strait and Golden Gate are relatively narrow sections where tidal currents are particularly strong. Wind-driven waves throughout the estuary are particularly common during the summer and these waves re-suspend sediments and increase local turbidity. Salinity varies from freshwater values in Suisun Bay to oceanic values at the Golden Gate.

2.4.2. Bay Area Watersheds Description

Freshwater streams in action area (Table 5) drain to either San Francisco Bay or drain directly to the Pacific Ocean. The watersheds that drain to San Francisco Bay contain highly developed urban areas. Dams in upper watershed areas have been constructed for water development. Lower bayside reaches are typically characterized by hardened channels that have been re-aligned for flood control as they pass through heavily urbanized areas. However, some upper watershed areas remain relatively undeveloped and are protected in regional and State parks.

Over 90% of the annual freshwater that discharges into the San Francisco Bay comes from the Sacramento and San Joaquin rivers that combined, drain the Central Valley. The approximately 66 smaller watersheds that drain into the San Francisco Estuary contribute the remaining 10% of freshwater runoff (Leidy *et al.* 2017). Parallel-trending coastal and interior coastal mountains and hills surrounding the Bay are oriented along a general northwest to southeast axis. The largest watersheds draining to San Francisco Bay are Napa River (426 square miles) and Alameda Creek (700 square miles) (Leidy *et al.* 2017).

The action area also includes portions of the Russian River and the Pajaro River watersheds. The Russian River watershed encompasses approximately 1,500 square miles of forests, agricultural lands, and urban areas within Sonoma and Mendocino counties. About 95% of the watershed is in private ownership. The Russian River is about 110 miles long and flows from its headwaters near Redwood and Potter Valleys to the Pacific Ocean at the town of Jenner on the Sonoma Coast.

The Pajaro River watershed is approximately 1,300 square miles and it includes agricultural lands, natural areas, and urban development in Santa Clara, Santa Cruz, San Benito, and Monterey counties. The Pajaro River watershed's rivers, tributaries, and creeks ultimately drain into Monterey Bay.

The topography of the action area is extremely varied, with elevations ranging from sea level to 4,265 feet atop of Mount Hamilton in the Diablo Range. Overall, the climate of the action area is characterized by dry, mild summers and moist, cool winters. Temperatures are strongly influenced by the San Francisco Bay, the Pacific Ocean, and the various Bay Area mountain ranges, which results in a variety of microclimates. Coastside is generally mountainous and experiences a marine climate, characterized by cool, foggy summers and relatively wet winters. The Bayside features a flatter topography, and is generally warmer and sunnier than coastal areas.

2.4.3. Status of Listed Species and Critical Habitat in the Action Area

2.4.3.1 Status of Listed Anadromous Salmonids in the Estuarine Portion of the Action Area

The San Francisco Bay portion of the action area is used primarily as a migration corridor by listed CCC steelhead, CCV steelhead, CV spring-run Chinook salmon, and Sacramento River winter-run Chinook salmon. Adult salmonids migrate from the Pacific Ocean through the San Francisco Bay as they seek the upstream spawning grounds of their natal streams. Adult CCV steelhead migration through the Bay typically begins in fall and winter (McEwan and Jackson 1996). Adult CCC steelhead typically migrate through San Francisco Bay to their natal streams from December through April. Adult Sacramento River winter-run Chinook migrate through San Francisco Bay between December and May. Adult Central Valley spring-run Chinook salmon enter the Bay from the ocean for their upstream migration between February and April.

Juvenile (smolt) salmonids migrate from their natal streams through San Francisco Bay to the ocean. Emigration timing is highly variable among Sacramento River winter-run Chinook, CV spring-run Chinook, CCC steelhead and CCV steelhead smolts, but peak migrations downstream typically occur through the estuary during the late winter and spring months. To assess juvenile salmonid outmigration behavior and timing, a series of studies were performed from 2006 through 2010 with Central Valley late fall-run Chinook salmon and CCV steelhead smolts. Smolt-sized juveniles originating from Coleman National Fish Hatchery were tagged with acoustic transmitters and released in the Sacramento River to monitor their downstream movement to ocean-entry at the Golden Gate. Results showed that smolts generally transited the Bay rapidly in 2 to 4 days, yet also made repeated upstream movements, coinciding with incoming tidal flows (Hearn *et al*. 2013). Most Chinook and steelhead smolts were detected by

acoustic receivers located over deep, channelized portions of the Bay (Hearn *et al* 2013). Smolts detected at nearshore, shallow sites such as marinas, or up tributaries generally returned to the main channel to finish their migration (Hearn *et al*. 2013).

During the course of their downstream migration, juvenile listed salmon and steelhead may utilize estuarine waters for seasonal rearing, but available information suggests that fish are actively migrating and currently they do not reside for extended periods in San Francisco Bay (Hearn *et al*. 2010). Historically, the tidal marshes of the Bay provided a highly productive estuarine environment for juvenile anadromous salmonids. However, loss of habitat, changes in prey communities, and water-flow alterations and reductions have degraded habitat and likely limit the ability of the Bay to support juvenile rearing. MacFarlane and Norton (2002) found that fall-run Chinook experienced little growth, depleted condition, and no accumulation of lipid energy reserves during the relatively limited time the fish spent transiting the 40-mile length of the estuary. Sandstrom *et al*. (2013) found that CCC steelhead smolts emigrated more rapidly through the Bay than the Napa River and the ocean.

In contrast to demersal fish that are associated with the channel bottom, salmonids are pelagic fish and, as such, primarily occupy the water column and near surface when over deeper waters (Mari-Gold Environmental and Novo Aquatic Sciences 2009). Within the action area, listed salmon and steelhead are thought to typically display a preferential use of the middle and upper water column. Studies by Kjelson *et al*. (1982) in the Sacramento-San Joaquin Delta concluded juvenile Chinook salmon appear to prefer shallow water habitats near the shore and the upper portion of the water column (less than 10 feet deep).

2.4.3.2 Status of Listed Anadromous Salmonids in the Freshwater Portion of the Action Area

Adult listed Central Valley anadromous salmonids (CCV steelhead, CV Spring-run Chinook salmon, and Sacramento River winter-run Chinook salmon) migrate through the estuary and into the Sacramento River to spawn in the upper Sacramento River and its tributaries. Following emergence from redds, fry and juvenile rearing occurs in freshwater reaches in the upper Sacramento River watershed. These spawning and rearing sites in the upper Sacramento River watershed are outside of this project's action area and the O&M Program is not expected affect the spawning and freshwater rearing habitats of listed Central Valley anadromous salmonids.

For CCC steelhead, freshwater streams in the action area support migration, spawning, and rearing. Small populations of CCC steelhead occur in several Bay tributary streams including Arroyo Corte Madera del Presido, Corte Madera Creek, Napa River, Sonoma Creek, Petaluma River, Novato Creek, Pinole Creek, Coyote Creek, Guadalupe River, San Mateo Creek, San Francisquito Creek, and Stevens Creek (NMFS 2016b). North of San Francisco Bay, CCC steelhead are present in the Russian River Watershed. However, Coyote Valley Dam and Warm Springs Dam block access to upstream anadromous fish habitat, alter sediment transport dynamics, and degrade water flow and temperature within the Russian River portion of the action area. CCC steelhead are also present in the coastal streams that flow directly to the Pacific Ocean in Sonoma, Marin, and San Mateo counties. Although CCC steelhead are widely distributed throughout streams in the action area, abundance levels are far below recovery targets.

2.4.3.3 Status of Green Sturgeon in the Action Area

Green sturgeon are iteroparous, and adults pass through the San Francisco Bay during spawning, and post-spawning migrations. Pre-spawn green sturgeon enter the Bay between late February and early May, as they migrate to spawning grounds in the Sacramento River (Heublein *et al*. 2009, Miller *et al.* 2020). Post-spawning adults may be present in the Bay after spawning in the Sacramento River in the spring and early summer for months prior to emigrating into the ocean. Juvenile green sturgeon move into the Delta and San Francisco Bay early in their juvenile life history, where they may remain for 2-3 years before migrating to the ocean (Allen and Cech 2007; Kelly *et al*. 2007). Sub-adult and non-spawning adult green sturgeon utilize both ocean and estuarine environments for rearing and foraging. Due to these life-history characteristics, juvenile, sub-adult and adult green sturgeon may be present in San Francisco Bay year-round (Miller *et al*. 2020).

Although relatively little is known about green sturgeon distribution and abundance in the Bay, telemetry studies have been useful to understand habitat use during by juvenile, sub-adult and adult individuals. Chapman *et al.* (2019) conducted telemetry studies from 2009 to 2012 with 106 acoustic receivers deployed from the Benicia Bridge (Carquinez Strait) to the Port of Oakland to evaluate areas affected by dredging within the estuary. These results indicated that green sturgeon were present at designated dredge material placement sites and detected throughout the year (Chapman *et al*. 2019). Kelly *et al.* (2007) tracked green sturgeon movements in the Bay and found that sub-adults typically remain in shallower depths (less than 30 feet) and show no preference for temperature, salinity, dissolved oxygen, or light levels. Observations also suggest that there are two main types of movements of sub-adult green sturgeon in the estuary: directional and non-directional (Kelly *et al*. 2007). Kelly *et al*. (2020) recently described how two tagged green sturgeon utilized selective tidal transport to move throughout San Pablo Bay – swimming with the current near the surface in deeper high-current areas, and swam along the bottom in shallow areas with little current. This behavior is thought to maximize swimming efficiency and conserve energy.

Green sturgeon are encountered by recreational anglers and during sampling by CDFW in the shallow waters of San Pablo Bay. These fish are likely foraging on benthic prey and fish commonly found in soft-bottom habitats (ghost shrimp, crab, crangonid shrimp, and thalassinid shrimp) (Dumbauld *et al*. 2008). The CDFW surveys are used to estimate sturgeon (white and green) abundance, relative abundance, harvest rate, and survival rate in San Francisco Bay and the delta. Data from 2012 and 2013 show that green sturgeon abundance is low in Suisun and San Pablo bays relative to white sturgeon abundance. Green sturgeon make up approximately two to five percent of the total reported sturgeon caught in the greater Bay and lower delta. Green sturgeon catches were highest in Suisun Bay and San Pablo Bay, with very few green sturgeon reported in Central San Francisco Bay. However, this may be due to variances in fishing efforts in different locations in the Bay. Nonetheless, based on the available data, NMFS believes the overall abundance of green sturgeon in the action area is low. Freshwater habitats utilized by green sturgeon for spawning are located in the upper Sacramento River basin and are outside the action area of this project.

2.4.3.4 Status and Factors Affecting CCC Steelhead Critical Habitat in the Action Area

San Francisco Bay from the Golden Gate Bridge to the eastern end of Carquinez Strait (excludes Suisun Bay) is designated as critical habitat for CCC steelhead. Several freshwater streams within the action area are also designated as critical habitat for CCC steelhead. The PBFs of critical habitat for CCC steelhead in the estuarine portion of the action area have been degraded due to altered and diminished freshwater inflow, shoreline development, shoreline stabilization, non-native invasive species, discharge and accumulation of contaminants, loss of tidal wetlands, and periodic dredging for navigation. In the freshwater portion of the action area, PBFs of critical habitat for CCC steelhead are degraded by barriers that block migration, altered stream hydrology, loss of gravel and large wood in channels, bank stabilization, and modifications for flood control through urbanized areas. Urban and rural development in and adjacent to streams has substantially diminished habitat complexity, natural productivity, and ecological integrity in streams throughout the action area.

2.4.3.5 Status and Factors Affecting Winter-run Chinook Salmon Critical Habitat in the Action Area

Critical habitat for Sacramento River winter-run Chinook salmon includes the portion of the action area located in Suisun Bay, San Pablo and Central San Francisco Bay north of the San Francisco-Oakland Bay Bridge. Features of designated critical habitat for winter-run Chinook salmon in the action area essential for their conservation are habitat areas and adequate prey that are uncontaminated. These PBFs of designated critical habitat within the action area are degraded and limited. Habitat degradation in the action area is primarily due to altered and diminished freshwater inflow, shoreline development, shoreline stabilization, non-native invasive species, discharge and accumulation of contaminants, loss of tidal wetlands, and periodic dredging for navigation.

2.4.3.6 Status and Factors Affecting Green Sturgeon Critical Habitat in the Action Area

The San Francisco Bay portion of the action area is designated critical habitat for Southern DPS green sturgeon. PBFs for green sturgeon in estuarine areas include food resources, water flow, water quality, migratory corridor, water depth, and sediment quality. These PBFs for green sturgeon critical habitat in the action area are degraded. Habitat degradation is primarily due to altered and diminished freshwater inflow, shoreline development, shoreline stabilization, non-native invasive species, discharge and accumulation of contaminants, loss of tidal wetlands, and periodic dredging for navigation.

2.4.4. Climate Change in the Action Area

As described above in the Status of the Species and Critical Habitat section of this opinion (Section 2.2.5.1), climate change poses a threat to salmonid and sturgeon populations in central California. In the San Francisco Bay region, warm temperatures generally occur in July and August, but with climate change these events will likely begin in June and could continue through September (Cayan *et al*. 2012). Climate simulation models indicate the San Francisco region will maintain its Mediterranean climate regime for the 21st century; however, these models predict a high degree of variability in annual precipitation through at least 2050, leaving

the region susceptible to drought (Cayan *et al*. 2012). These models of future precipitation suggest that, during the second half of the 21st century in this region, most years will be drier than the historical annual average (1950-1999). As noted above in Section (2.2.5.1), California's recent long-term drought, as well as the increased incidence and magnitude of wildfires, have likely been exacerbated by climate change (Williams *et al.* 2022, Diffenbaugh *et al.* 2015, Williams *et al*. 2019).

2.4.5. Previous Section 7 Consultation in the Action Area

Numerous previous consultations pursuant to Section 7 of the ESA have occurred in the action area for a wide range of projects, including prior repairs at PG&E electrical infrastructure. For the majority of these projects, NMFS determined that they were not likely to adversely affect listed salmonids, green sturgeon or designated critical habitat. For the smaller number of projects with potential adverse effects on listed salmonids, green sturgeon, and/or designated critical habitat, NMFS determined that they were not likely to jeopardize the continued existence of listed fish nor adversely modify critical habitat. These formal consultations, where the proposed actions were likely to adversely affect ESA-listed fish species or their designated critical habitat, resulted in opinions containing RPMs to minimize the impacts of incidental take of listed fish species.

One complex formal consultation is the Long-Term Management Strategy (LTMS) for the Placement of Dredged Material in the San Francisco Bay Region. Similar to the proposed Program, the action area includes a large spatial area that overlaps with several ESA-listed fish species and their critical habitat. The LTMS Program also includes conditions for avoiding the migratory periods of listed salmonids to minimize impacts. The biological opinion for the LTMS Program was issued by NMFS to the Corps and the Environmental Protection Agency on July 9, 2015, and concluded the program of routine maintenance dredging in San Francisco Bay was not likely to jeopardize the continued existence of listed fish, or result in the destruction or adverse modification of designated critical habitat.

Research and enhancement projects resulting from NMFS' Section 10(a)(1)(A) research and enhancement permits and section 4(d) limits or exceptions could potentially occur in the action area. Salmonid and sturgeon monitoring approved under these programs includes juvenile and adult net surveys and tagging studies. In general, these activities are closely monitored and require measures to minimize take during the research activities.

2.5. Effects of the Action

Under the ESA, "effects of the action" are all consequences to listed species or critical habitat that are caused by the proposed action, including the consequences of other activities that are caused by the proposed action (see 50 CFR 402.02). A consequence is caused by the proposed action if it would not occur but for the proposed action and it is reasonably certain to occur. Effects of the action may occur later in time and may include consequences occurring outside the immediate area involved in the action (see 50 CFR 402.17). In our analysis, which describes the effects of the proposed action, we considered the factors set forth in 50 CFR 402.17(a) and (b).

The Corps proposes to issue an RGP that will authorize routine O&M activities on PG&E's natural gas and electrical transmission infrastructure throughout nine counties in the San Francisco Bay Area. Additionally, PG&E proposes to conduct maintenance on roads that provide access to these facilities and road maintenance will include the repair and replacement of culverts at stream crossings. O&M activities at electrical towers that would affect listed anadromous fish and designated critical habitat are located in tidal wetlands and tidal waters of San Francisco Bay. Gas line O&M and road maintenance activities are located in areas upland of San Francisco Bay and would affect freshwater streams with listed anadromous fish and designated critical habitat. The effects of PG&E's proposed O&M Program are presented below by activity type.

2.5.1. Effects of O&M Activities at Electrical Infrastructure

PG&E proposes routine maintenance the electrical transmission system in the Bay Area which consists of primary and secondary distribution lines that deliver electricity to customers. Electrical transmission lines are supported by steel-lattice towers, steel poles, and wooden poles. The majority of PG&E's electrical infrastructure in the Bay Area is located in terrestrial areas. No electrical infrastructure is located in freshwater streams. Measures proposed by PG&E in terrestrial areas are expected to prevent the discharge of contaminants and avoid disturbance of soils that could enter waterways with listed anadromous fish. Thus, electrical tower and pole repairs/replacements in terrestrial areas are anticipated to have no effect on listed anadromous fish or designated critical habitat, and this activity is not discussed further in this opinion. Similarly, no in-water work is required for line reconducting between poles and towers in terrestrial areas; thus, no effect on listed anadromous fish or designated critical habitat is anticipated with line reconductoring in terrestrial areas.

As described in Section 1.3.2 above, PG&E has categorized proposed activities at electrical transmission facilities as either "low impact" and "high impact". Proposed activities and their impact level categories are presented in Table 3. High impact activities would be conducted during the LOP (June 1 to November 30) when fewer listed species are likely to occur within the action area. Low impact activities would also be conducted between June 1 and November 30, but low impact activities may extend work until January 15, provided that these activities are initiated prior to November 30.

All electrical infrastructure work activities to be conducted under this RGP that will affect listed anadromous fish are located in tidally-influenced areas in San Francisco Bay; thus, the effects analysis presented in this section applies to the San Francisco Bay estuarine portion of the action area. All four listed anadromous salmonid species addressed in this opinion (CCC steelhead, CCV steelhead, CV spring-run Chinook salmon, and Sacramento River winter-run Chinook salmon) occur in San Francisco Bay during the winter and spring months. The Southern DPS of green sturgeon) occur in San Francisco Bay year-round. Additionally, all of San Francisco Bay is designated critical habitat for the Southern DPS of green sturgeon and portions of the Bay are designated as critical habitat for Sacramento River winter-run Chinook and CCC steelhead. See Section 2.4.3 of this opinion for additional information regarding the status of listed species and critical habitat in the estuarine portion of the action area.

2.5.1.1 Cofferdam Installation and Dewatering

Many O&M Program activities at electrical towers will require dewatering of the work site to facilitate construction. Specifically, tower foundation repairs and replacements can require the installation of a cofferdam to isolate the work area from tidal waters. Placement of a cofferdam has the potential to entrap listed fish during the final stages of installation when the area within the cofferdam is closed off.

PG&E proposes to scheduled cofferdam installation and closure activities during periods of low tide to minimize the amount of water and fish contained within the cofferdam. At most sites, low tide conditions will result in the site being naturally dewatered and there is little risk of fish entrapment when the cofferdam is closed at these shallow water locations. PG&E reports that 92% of the electrical tower foundations in San Francisco Bay are located in water depths at or above MLLW. At sites where water remains within the cofferdams following closure, pumps with fish screens will be deployed. As the area within the cofferdam is dewatered, fish collection will be performed with seines, hand nets, dipnets, and traps. Captured fish will be relocated to suitable aquatic habitat areas outside of the work area in adjacent estuarine waters.

Listed fish that avoid capture during dewatering activities and remain within the cofferdam are likely to be killed by stranding or contact with construction equipment. However, few fish are likely to avoid capture due to the limited amount of hiding cover within each work area. Listed anadromous salmonids are unlikely to be present in the estuary during the period when cofferdams are installed (i.e., June 1 to November 30). Thus, NMFS expects that the entrapment of listed salmon or steelhead in a cofferdam to be improbable. Green sturgeon in the estuary are generally larger than 16 inches in length and should be relatively easy to locate if entrapped within a cofferdam. Fish collections overseen by a qualified biologist are expected to effectively capture and relocate any green sturgeon that may be entrapped within a dewatered cofferdam (see Section 2.5.1.2 below).

Another manner by which fish may be harmed or killed during dewatering activities is to be entrained into the pumps used for dewatering. NMFS expects that entrainment or impingement of listed fish at dewatering pumps will be improbable because PG&E will place screens which meet NMFS intake screen criteria for anadromous salmonids on all water pumps.

Benthic (*i.e.*, substrate dwelling) aquatic macroinvertebrates (i.e., prey of listed fish species) within the Program site will be killed or their abundance reduced when benthic habitat is dewatered within a cofferdam. However, effects to aquatic macroinvertebrates resulting from dewatering will be temporary because construction activities will be relatively short-lived (i.e., not to exceed 35 days at an electrical tower). However, larger scale effects to the benthic community are expected from Program activities and are discussed in Section 2.5.1.6 of this opinion.

2.5.1.2 Fish Handling

During dewatering of areas internal to cofferdam sites, PG&E proposes to capture and relocate fish away from work sites to avoid mortality and minimize the possible stranding of fish within cofferdams. Fish will be captured by seines, hand nets, dip nets, and traps, then transported and

released to nearby suitable habitat. As presented above, listed anadromous salmonids are unlikely to be captured due to the timing of cofferdam installations. However, green sturgeon are present in the estuary year-round and may be entrapped as a cofferdam is closed. Data to precisely quantify the number of green sturgeon that will be collected and relocated from cofferdams is not available, but is expected to be low due to the relatively small number of green sturgeon within the estuary, their wide distribution throughout the estuary, and they are likely to respond behaviorally to construction activities by swimming away from active work sites.

Fish relocation activities pose a risk of injury or mortality to rearing juvenile fish. Any fish collecting gear, whether passive (Hubert 1996) or active (Hayes *et al*. 1996) has some associated risk to fish, including stress, disease transmission, injury, or death. The amount of unintentional injury and mortality attributable to fish capture varies widely depending on the method used, the ambient conditions, and the expertise and experience of the field crew. Potential stress, injury, and mortality of captured and handled green sturgeon during fish relocation will be lessened by the use of qualified biologists. Despite protective measures, NMFS expects the capture, handling and transport of fish will result in stress and potentially injury of a small number of green sturgeon individuals.

Information regarding the mortality of green sturgeon associated with capture and handling is available from annual reports submitted by researchers operating under ESA section 10(a)(1)(A) permits and Exemption 1 of the Southern DPS green sturgeon 4(d) rule. These reports indicate mortalities of green sturgeon associated with handling are very low. The June 2, 2022, NMFS biological opinion for evaluation of research programs submitted for consideration under the ESA's section 4(d) Rule summarized ten years of annual reporting by sturgeon researchers (NMFS 2022). Compilation of these reports showed no mortalities of adult green sturgeon in the ten-year period extending from 2011-2020. Mortalities of juvenile green sturgeon were limited to one event in 2016 where 77 juvenile green sturgeon were captured and 10 were killed unintentionally. All other researchers reported zero mortalities associated with the capture of juvenile green sturgeon in the 10-year period from 2011-2020 (NMFS 2022). Based on this information, it is anticipated that the collection and relocation of adult and juvenile green sturgeon during PG&E's relocation of fish from dewatered cofferdams will result in no mortalities absent an unintentional accident; although stress and sublethal injury will temporarily affect individuals. Recovery of handled individuals is expected to be rapid following relocation in waters adjacent to work sites.

2.5.1.3 Underwater Sound

Elevated levels of underwater sound levels are expected during pile driving in tidal waters. Sheet piles will be installed for cofferdam construction and steel piles installed for tower repairs/replacements. PG&E has proposed prioritizing the use of vibratory hammers, but may also utilize helical pile drivers and impact hammers to install piles.

Fish may be injured or killed when exposed to impulsive sound sources such as those associated with pile driving of steel piles by impact hammers. Pathologies of fish associated with very high sound level exposure and drastic changes in pressure are collectively known as barotraumas. These include hemorrhage and rupture of blood vessels and internal organs, including the swim bladder and kidneys. Death can be instantaneous, occur within minutes after exposure, or occur

several days later. Fish can also die when exposed to lower, continuous sound pressure levels if exposed for longer periods of time. Hastings (1995) found death rates of 50 percent and 56 percent for gouramis (*Trichogaster* sp.) when exposed for two hours or less to continuous sound at 192 decibels (dB) root-mean-square pressure (RMS) (re: 1micropascal [μPa]) at 400 Hertz (Hz) and 198 dB (re: 1[μPa]) at 150 Hz, respectively, and 25 percent for goldfish (*Carassius auratus*) when exposed to sounds of 204 dB (re: 1 μPa) at 250 Hz. Hastings (1995) also reported that acoustic "stunning" a potentially lethal effect resulting in a physiological shutdown of body functions, immobilized gourami within eight to thirty minutes of exposure to these sound levels.

Hearing loss in fishes can occur from exposure to high intensity sounds, which can over-stimulate the auditory system of fishes and may result in temporary threshold shifts. A temporary threshold shift is considered a non-injurious temporary reduction in hearing sensitivity. Physical injury may also occur for fish exposed to high levels or continuous sound, manifested as a loss of hair cells, located on the epithelium of the inner ear (Hastings and Popper 2005). These hair cells are capable of sustaining injury or damage that may result in a temporary decrease in hearing sensitivity. However, this type of noise-induced hearing loss in fishes is generally considered recoverable, as fish possess the ability to regenerate damaged hair cells (Lombarte *et al*. 1993, Smith *et al*. 2006). Permanent hearing loss has not been documented in fish. Even if threshold shifts in hearing do not occur, loud sounds can mask the ability of fish to hear their environment. This effect from loud sound exposure is referred to as acoustic or auditory masking. Masking generally results from an unwanted or unimportant sound impeding a fish's ability to hear sounds of interest, such as sounds made by prey or predators.

Underwater sound exposures have also been shown to alter the behavior of fishes (see review by Hastings and Popper 2005). The observed behavioral changes include startle responses and increases in stress hormones. Exposure to pile driving sound pressure levels may also result in "agitation" of fishes indicated by a change in swimming behavior detected by Shin (1995) or "alarm" detected by Fewtrell (2003). Other potential changes include reduced predator awareness and reduced feeding. The potential for adverse behavioral effects will depend on a number of factors, including the sensitivity to sound, the type and duration of the sound, as well as life stages of fish that are present in the areas affected by underwater sound produced during pile driving. A fish that exhibits a startle response to a sudden loud sound may not necessarily be injured, but it is exhibiting behavior that suggests it perceives a stimulus indicating potential danger in its immediate environment. However, fish do not exhibit a startle response every time they experience a strong hydroacoustic stimulus.

In order to assess the potential effects to fish exposed to pile driving sound, a coalition of federal and state resource and transportation agencies along the West Coast, the Fisheries Hydroacoustic Working Group (FHWG), used data from a variety of sound sources and species to establish interim acoustic criteria for the onset of injury to fishes from impact pile driving exposure (FHWG 2008). Most historical research has used peak pressure to evaluate the effects on fishes from underwater sound. Current research, however, suggests that sound exposure level (SEL), a measure of the total sound energy expressed as the time-integrated, sound pressure squared, is also a relevant metric for evaluating the effects of sound on fishes. An advantage of the SEL metric is that the acoustic energy can be accumulated across multiple events and expressed as the cumulative SEL (cSEL). Therefore, a dual metric criteria was established by the FHWG and

includes a threshold for peak pressure (206 dB) and cSEL (187 dB for fishes 2 grams or larger and 183 dB for fishes smaller than 2 grams). Injury would be expected if either threshold is exceeded. There is uncertainty as to the behavioral response of fish to underwater sound produced when driving piles in or near water. Until new information indicates otherwise, NMFS believes a 150 dB RMS threshold for behavioral responses for green sturgeon and listed salmonids is appropriate.

Different types of piles (e.g., wood, steel, concrete) and different drivers (e.g., impact, vibratory, helical) result in wide range of underwater sound levels. Impact hammers produce the highest elevated underwater sound levels, particularly when used in combination with steel piles. Vibratory hammers produce less sound than impact hammers and are often employed as a measure to reduce the sound generated by pile driving, and in turn, the potential for adverse effects on fish (Buehler *et al.* 2015). Based on the results of hydroacoustic monitoring conducted in San Francisco Bay (Molnar *et al.* 2020), use of vibratory hammers is not expected to produce sound levels that exceed the dual metric criteria described above. Similarly, the use of helical pile driving is not expected to produce sound levels that will exceed the dual metric criteria because this method of installation screws piles into the substrate instead of being driven with a hammer. Sheet piles for cofferdam construction will only be installed by vibratory hammer.

2.5.1.4 Pile Driving in Tidal Waters

As described in Section 1.3.2 of this opinion, high impact activities, such as the use of an impact hammer or dewatering, would be scheduled to occur between June 1 and November 30 to avoid overlap with the primary migratory periods for listed steelhead and salmon in San Francisco Bay. However, unforeseen circumstances may lead to the Program continuing and completing some activities after November 30. Listed salmon and steelhead are generally not present in the Bay until the winter and spring months; thus, PG&E Program activities that continue after November 30 will exposed listed anadromous salmonids to elevated levels of underwater sound. However, O&M Program activities may only extend a maximum of six additional weeks after November 30 because all work must be completed each year by January 15. Green sturgeon, both juveniles and adults, will occur in the action area year-round and would potentially be exposed to the effects of pile driving throughout the year.

For the purposes of this analysis we have used the maximum distances peak SPLs and cSELs could travel as a reasonable worst-case scenario. The highest sound levels associated with the Program's construction activities will occur during the driving of the 60-inch and 72-inch steel pipe piles with an impact hammer, and thus, impact the largest area. During implementation of the Program, tower repairs and replacements could occur at as many as 17 sites per year, and PG&E will utilize piles as large as 72-inches in diameter. Therefore, our analysis assumes that the largest and loudest piles (60-inch and 72-inch) will be used at up to 17 sites per year. In the project's biological assessment, PG&E examined hydroacoustic monitoring results for similar sized piles and in similar conditions presented in the Technical Guidance for the Assessment of Hydroacoustic Effects of Pile Driving on Fish (Molnar *et al.* 2020).

To estimate the peak SPL and cSEL that will occur during pile driving at PG&E tower foundation repair/replacement sites, NMFS used proxy sound levels contained in the NMFS Optional Multi-Species Pile Driving Calculator, Version 1.2-Multi-Species 2022

(https://media.fisheries.noaa.gov/2022-08/BLANK%20Multi-Species%28AUGUST%202022%29PUBLIC_OPR1.xlsx). Most of the proxy values presented in the NMFS Optional Multi-Species Pile Driving Calculator were obtained from Molnar *et al.* (2020). We used this calculator because it provides a conservative and consistent method for estimating sound pressure levels at distance from pile driving, and is appropriate for projecting underwater sound levels at multiple locations throughout the San Francisco Bay

Calculator results are presented in Table 7 and show estimates of distance from a pile to peak SPLs and cSELs (*i.e.,* NMFS dual metric criteria) during impact hammer pile driving of steel piles ranging from 16 inches to 72 inches in diameter. Proxy values were selected from pile driving projects with the same pile type/size and similar water depths. The underwater sound estimates in Table 7 also incorporate sound attenuation by use of an air bubble curtain or cofferdam. Air bubble curtains are constructed by the placement of one or more horizontal concentric rings of perforated tubing around the pile. Air is pumped through the tubes and into the rings to emit a curtain of bubbles that encapsulate the pile. To optimize the sound attenuation capability of the curtain, the amount of bubbles and thickness of the curtain are maximized by adjusting the flow of compressed air delivered to the perforated tubing. If a cofferdam is used, dewatering of the area around the pile will attenuate sound propagation during pile driving. Therefore, the sound level estimates presented in Table 7 include 5 dB of sound attenuation. It should be noted that hydroacoustic monitoring of individual projects have reported sound attenuation levels from bubble curtains as high as 20 dB (Molnar *et al.*, 2020); however, the implementation of bubble curtains and the corresponding attenuation are not consistent. Cofferdams are thought to provide as great, if not greater, attenuation than bubble curtains; however, some acoustic monitoring has provided mixed results. Due to these inconsistencies, no more than 5 dB attenuation is recommended by Molnar *et al.* (2020) when estimating the sound attenuation benefits of air bubble curtains and cofferdams.

Table 7. Projected Impact Hammer Sound Levels with Steel Piles*

Steel Pile Size	Distance (ft) to 206 dB peak	Distance (ft) to 187 dB accumulated SEL/day	Distance (ft) to 150 dB RMS
16-inch	0	30	243
20-inch	20	446	4,458
24-inch	10	552	7,065
36-inch	20	827	7,065
60-inch	30	1,778	15,226
72-inch	30	1,309	15,226

*5 dB reduction assumed for sound attenuation with use of air bubble curtains or cofferdams. All examples in water depths $\leq$ 17 feet and calculations are for 2,000 strikes/day.

The calculator utilized by NMFS predicts SPLs from a pile driven with an impact hammer during O&M Program activities could exceed the 206 dB peak single strike threshold for a distance of up to 30 feet. At this close range, several factors make it unlikely that listed salmonids or green sturgeon will be adjacent to a pile during driving with an impact hammer. If a cofferdam is deployed, PG&E will use plywood or metal sheets to dewater the work site and fish

will not have access to the area immediately surrounding the pile. If a bubble curtain is used, placement of the curtain will occupy about 5-10 feet of the radial distance outward from the pile. Activation of the air bubble curtain prior to the initiation of pile driving is expected to startle fish adjacent to the pile and likely result in a flight response. Although most fish are likely to perceived these construction activities as a stimulus indicating potential danger in its immediate environment, not all fish may flee the area. Thus, there remains a distance up to 30 feet from a pile where peak sound levels are expected to exceed 206 dB and a small number of listed fish in this area are expected to be injured or killed by barotrauma.

In addition to peak sound levels exceeding 206 dB, cSEL is expected to result in injury or mortality of listed fish and cSEL will extend for a significantly greater distance from the pile. In general, the larger the pile diameter, the greater the distance and larger the area impacted by underwater sound levels during driving with an impact hammer. Information available to estimate cSEL for this Program indicates the greatest distance will occur during the driving of 60-inch piles (Table 7). The calculator predicts the extent of SPLs above a cSEL of 187 dB would extend up to a radial distance of approximately 1,778 feet from a 60-inch pile, and encompass the active working area under and around each pile location. For 72-inch piles, cSEL of 187 dB is projected to extend to a distance of 1,309 feet. For the purposes of this analysis, the zone of potential injury or mortality to listed fish is associated with a cSEL equal to or greater than 187 dB and is defined as the area in which fish could experience a range of barotraumas, including the damage to the inner ear, eyes, blood, nervous system, kidney, and liver. These injuries have the potential to result in the mortality of an individual fish either immediately or later in time.

Based on the foraging behavior and movements of green sturgeon within San Francisco Bay, some individuals are expected to be exposed to elevated sound levels during pile driving activities at PG&E electrical tower work sites in the San Francisco, San Pablo and Suisun bays. Similarly, if the Program needs to complete work with an impact hammer outside of the LOP, then listed salmonids would also be subjected to elevated sound levels. NMFS estimates that only a very small number of threatened Southern DPS green sturgeon would likely be injured or killed by the proposed pile driving because few individuals are likely to be exposed to a cSEL of 187 dB or greater. To incur injury or mortality, an individual fish would need to remain continuously within the zone of cSEL (see Table 7) for an extend period of time during pile driving. Thomas *et al*. (2022) examine the movement patterns of juvenile green sturgeon in San Francisco Bay and concluded that there are multiple behavioral movement patterns and a broad use of regional habitats. With this widespread distribution of green sturgeon throughout the Bay, pile driving activities by the O&M Program may expose sturgeon to the impacts of pile driving at any of the electrical tower work sites.

Similarly, NMFS estimates that a very small number of listed salmonids are likely to be injured or killed by high cSEL during the driving of steel piles, because this high impact activity would generally not occur when migrating salmonids are present in San Francisco Bay. Pile driving that occurs after November 30 will overlap with the adult upstream migration periods of Sacramento River winter-run Chinook salmon, CCV steelhead and CCC steelhead. However, adult upstream migrating Chinook and steelhead rapidly pass through the Bay on their way to their natal spawning streams. Adults salmonids in the Bay also make little use of shallow and nearshore

habitats where most pile driving will occur, and therefore, will be exposed to injurious levels of underwater sound in very small numbers. Juvenile and smolt listed anadromous salmonids are more likely to use nearshore habitats in the Bay for rearing and foraging, but the work window will prohibit pile driving activities from occurring after January 15 when juvenile and smolt salmonids are most likely to be present in the Bay.

Within the zone of cSEL of 187 dB (e.g., up to a maximum of 1,778 feet with a 60-inch pile being driven), most exposed listed fish are unlikely to remain in the same location to experience the full duration of a pile driving event due to tidal currents and behavioral movements. However, a few listed fish individuals could remain stationary long enough to be exposed to levels which cause injury or mortality. Although no data are available to quantify the risk of exposure to the cSEL threshold of 187 dB, some listed salmonids and sturgeon are expected to be injured or killed due to the large number of PG&E facilities throughout the action area that may be repaired or replaced during the 10-year duration of the proposed O&M Program.

PG&E also proposes to utilize vibratory hammers and helical pile driving. Vibratory hammers use counter-rotating eccentric weights to transmit vertical vibrations into the pile, causing the sediment surrounding the pile to liquefy and allow the pile to penetrate the substrate. The vibratory hammer produces sound energy that is spread out over time and is generally 10 to 20 dB lower than impact pile driving (Molnar *et al.* 2020). Based on the results of hydroacoustic monitoring of vibratory hammer pile installations (Molnar *et al.* 2020), the sound levels generated by vibratory hammer use over the course of this Program will be considerably below the injury and mortality thresholds for both single strike and cSEL. Helical pile driving involves turning, or screwing, large piles into the substrate instead of using a hammer. This is a relatively new technology and sound levels associated with this method are expected to be less than those associated with pile driving hammers (Byrne and Houlsby (2015). Effects associated with vibratory hammers and helical pile driving during O&M Program activities are expected to be temporary behavioral effects that are discussed below.

Beyond the zone of potential injury or mortality, sound levels are projected to exceed 150 dB RMS to a maximum distance of 15,226 feet during the impact driving of 60-inch and 72-inch steel piles. Fish may demonstrate temporary abnormal behavior within this zone during pile driving indicative of stress or exhibit a startle response. A fish that exhibits a startle response may not be injured, but display behavior that suggests it perceives a stimulus indicating potential danger in its immediate environment. The behavioral impact zone is approximately 16,000 acres for the 60-inch and 72-inch diameter piles.

If listed fish enter or transit the behavior impact zones described above during pile driving, there could be behavioral reactions. Fish may leave the area or avoid the area due to the elevated underwater sound levels. As noted above, many fish species demonstrate an avoidance reaction in the near-field (Dolat 1997). While behavioral impacts of ESA-listed fish during pile driving have not been specifically studied, NMFS anticipates that listed fish species, like other fish studied, will exhibit startle and avoidance behavioral reactions by swimming away from the work site. If elevated SPLs during pile driving result in a level of disturbance that causes salmonids and green sturgeon to leave or avoid the zone of behavioral impacts, foraging and migrating could be interrupted. Assuming the worst-case scenario, elevated sound levels could

render the behavioral impact zone unusable by listed fish during the hours when pile driving operations are underway.

For the Program's use of an impact hammer to install steel piles, no more than 2,000 strikes would be applied per day at each work site. As described above in Section 2.4, the action area provides soft bottom, sub-tidal foraging habitat for green sturgeon and juvenile listed salmonids forage within the upper portion of the water column. This temporal loss of foraging area will affect green sturgeon. Individuals could be displaced from preferred forage areas until each day's pile driving activities have concluded.

Similar to foraging behavior, the zone of behavioral impacts during pile driving may affect the migration of adult salmonids and green sturgeon. In particular, impact hammer pile driving at electrical tower sites within narrow channels or confined sloughs could create a zone of behavioral impacts that spans the channel width, and cause delays and disruption of migration movements. Based on the location of PG&E's electrical towers in San Francisco Bay (Figure 1), the zone of behavioral impacts during pile driving could span the width of Mare Island Strait and the lower Napa River. Migrating listed fish attempting to pass through the zone of behavioral effects during the period of 60- and 72-inch pile driving may temporarily stop migrating or shift their migration path.

If a behavioral response results in a delay/shift in migration or movement away from foraging areas, the duration of these behavioral effects is expected to be short because the Program will only use one impact hammer at a time with no more than 2,000 strikes per day. Depending on the site and type of pile, an impact hammer typically strikes the pile at a rate of once every 1.5 to 2 seconds (Molnar *et al.* 2020). Thus, pile driving events and the associated elevated underwater sound levels will be brief. These short temporary delays/detours to migration and displacement from foraging areas within the zone of behavioral impacts are not expected to result in adverse effects because fish are expected to safely return to these areas and continue migration movements when pile driving ceases. Additionally, high ambient levels of underwater sound in San Francisco Bay are likely to mask the noise of pile driving in the zone of behavioral influence as presented below.

In San Francisco Bay, ambient sound levels are reported to range from 120-155 dB peak (Strategic Environmental Consulting, Inc. 2004, as reported in Molnar *et al.* 2020). Thus, ambient sound levels in the action area are likely similar at times to the 150 dB RMS levels anticipated to occur inside the zone of behavioral effects during pile driving. With this level of ambient sound in the environmental setting of San Francisco Bay, elevated sound levels due to this Program's activities within the zone of behavioral effects may be hard to distinguish from other anthropogenic sources of sound, such as commercial vessels and recreational boats. Thus, elevated sound levels of 150 dB RMS originating from the installation of steel piles by this Program may not result in an avoidance response by listed fish. If there are behavioral responses, the effects of 150 dB RMS will be short term and the temporary delays to migration or displacement from a foraging area are expected to be negligible on listed fish. Based on the above, the temporary behavioral effects described above during pile driving are not expected to result in adverse effects to green sturgeon and listed anadromous salmonids.

Program O&M activities may also install wooden piles to repair or replace electrical infrastructure in the action area. Wooden piles are typically installed with a drop hammer and a cushion block is used between the hammer and the pile. Hydroacoustic monitoring of wooden pile installations have occurred in San Francisco Bay and results reported in Molnar *et al*. (2020). Monitoring results indicated that underwater SPLs from wood piles installed with an impact hammer do not reach the dual metric criteria for fish injury or mortality. Peak sound levels at 33 feet from the pile were generally in the range of 170 to 180 dB, and RMS levels generally ranged from 160 to 170 dB. Therefore, installation of wood piles by the Program are not expected to result in the injury or mortality of listed fish; however, elevated underwater sound levels during the installation of wooden piles will disturb listed fish and result in the disturbance effects described above for steel piles.

PG&E also proposes to use concrete piles at some locations for Program activities. Concrete piles would be cast in place using a hollow steel pile as the casing or form. Thus, installation of a concrete pile would always be preceded by the driving of a hollow steel pile and the effects of steel pile installation are described above. Filling of the hollow steel pile with concrete may affect water quality and potential effects of concrete use by the Program are presented below in Section 2.5.1.5 of this opinion.

2.5.1.5 Line Reconductoring in Tidal Waters

To perform line reconductoring between electrical towers in tidal waters, the O&M Program may use barges and/or helicopters. Work crews install replacement conductors by temporarily splicing them to the ends of the existing conductors and pulling them through travelers (i.e., pulleys) attached to the arms of the towers or pole cross-arms. Reconductoring typically is conducted in 2 to 3-mile sections and on-water pull sites will be located on work barges. Aside from utilizing a work barge, no in-water work is associated with line reconductoring activities.

During line reconductoring activities in shallow water areas, barges will utilize periods of high tide to minimize contact with the bottom of San Francisco Bay, as the barges must navigate along the transmission line in a manner that allows crews to work from the barge platform. When the barges are not in use, they will be docked at existing marina/dock facilities or landed in areas that avoid disturbance of submerged aquatic vegetation and wetland vegetation (NOAABA-AMM-01). For these reasons, disturbance of the substrate by work barges during line reconductoring is expected to be minimal. Benthic habitat disturbance by barges and other O&M activities is discussed further in Section 2.5.1.7 below. Because barges move slowly when working or relocating to and from work sites, any fish swimming near the surface that encounter a barge would be able to easily avoid the barge. Thus, NMFS believes it improbable that any listed fish would be struck by a barge. Any changes in habitat caused by shading from the barge on the water's surface would be minimal and temporary.

Use of helicopters during line reconductoring will result in elevated levels of sound in the air above the water surface. The extent of transmission of this sound to areas underwater is unknown but may be detected by listed fish in Bay waters. As discussed above in Section 2.5.1.3, sound exposures have been shown to alter the behavior of fishes (see review by Hastings and Popper 2005). Observed behavioral changes include startle responses and increases in stress hormones. With high levels of ambient sound in San Francisco Bay (reported to range from 120-155 dB

peak [Strategic Environmental Consulting, Inc. 2004, as reported in Molnar et al. 2020]), any elevated underwater sound levels due to operation of helicopters during line reconductoring are expected to have negligible effects on the behavior of listed salmonids and green sturgeon. If there are behavioral responses, the effects are anticipated to be short term and temporary.

2.5.1.6 Water Quality

Water quality in the estuarine portion of the action area may be degraded at electrical infrastructure work sites during the Program's construction activities. Disturbance of soft bottom sediments during the removal of existing piles and installation of new piles, and the construction of cofferdams is expected to result in temporary increased levels of turbidity. Additionally, water quality may be degraded through the suspension of sediment-associated contaminants in the water column. Program activities also include the use of concrete at tower foundations and to construct concrete piles.

Water quality in the freshwater portion of the action area may be affected by the O&M Program's access road maintenance activities. The effects of routine road maintenance activities on water quality are presented in Section 2.5.3 below.

Turbidity and Suspended Sediment

High concentrations of suspended sediment can disrupt normal feeding behavior (Cordone and Kelley 1961, Bjornn *et al*. 1977, Berg and Northcote 1985, Benfield and Minello 1996), reduce growth rates (Crouse *et al*. 1981, Nightingale and Simenstad 2001), and increase plasma cortisol levels (Servizi and Martens 1992). High and prolonged turbidity concentrations can reduce dissolved oxygen in the water column, result in reduced respiratory functions, reduce tolerance to diseases, and can also cause fish mortality (Sigler *et al*. 1984, Berg and Northcote 1985, Gregory and Northcote 1993, Velagic 1995, Waters 1995). Even small pulses of turbid water can cause salmonids to disperse from established territories (Waters 1995), which can displace fish into less suitable habitat and/or increase competition and predation, thus decreasing chances of survival.

As piles are driven and removed from the Bay substrate by the Program, fine-grain sediments such as clay and silt material will be disturbed and generate increased levels of turbidity in the adjacent water column. Sheet piles and plywood installed for the construction of temporary cofferdams will also disturb the Bay floor and distribute sediment into the water column. The extent of turbidity plumes resulting from Program construction will depend on the substrate, tide, currents, and wind conditions during these activities.

Based on observations of similar pile and cofferdam activities in the San Francisco Bay, increased levels of suspended sediment and turbidity during this Program's construction activities are anticipated to be minor, localized, and short-term. With strong tidal currents in the majority of the action area, any elevated levels of suspended sediment or turbidity are anticipated to rapidly return to background levels after work ceases. In areas with lower rates of tidal exchange, elevated levels of suspended sediments and turbidity will be detectable for two or three tidal cycles prior to returning to ambient levels.

Based on the anticipated extent and levels of turbidity associated with construction activities by the Program, the effects are not expected to result in harm or injury, or behavioral responses that impair migration, foraging, or make listed fish more susceptible to predation. If fish temporarily relocate from areas of increased turbidity, habitat of similar value is available in the surrounding waters adjacent to the PG&E work sites in the action area. Adjacent habitat areas also provide adequate carrying capacity to support individual fish that are temporarily displaced during in-water construction activities that cause increases in turbidity and suspended sediment. For these reasons, the potential effects on listed fish species of minor and localized areas of elevated turbidity and suspended sediment associated with this Program's construction activities are expected to be negligible.

Contaminants

As described above in the Environmental Baseline, water and sediment quality within the action area are affected by stormwater runoff, industrial activities, and other urban influences. Dillon and Moore (1990) reported that major pollutant sources for the San Francisco Bay include the freshwater flow from the Sacramento-San Joaquin River systems, over 50 waste treatment plants, and about 200 industries which are permitted to discharge directly into the Bay (citing Luoma and Phillips 1988). Tire shreds/dust that produce a degradation product (6PPD-quinone) have been found to be ubiquitous where urban roadways drain into waterways (Feist *et al*. 2018, Sutton *et al.* 2019). Environmental contaminants discharged into aqueous systems tend to associate with particulate material in the water column and with consolidated bedded sediments. However, since the U.S. Environmental Protection Agency started the National Pollutant Discharge Elimination System in 1972, water quality in San Francisco Bay has improved considerably.

During the installation and removal of piles and cofferdams, bottom sediments will be suspended and contaminants may be released to the water column. However, based on the types of activities conducted by the Program, the short duration of activities at each work site, and equipment to be used, the suspended plumes of sediment and potential contaminants released during construction are expected to be localized and short-term. Any minor and localized elevations in contaminants which might result from those suspended plumes are expected to be quickly diluted by tidal circulation to levels that are negligible for ESA-listed fish species.

Equipment refueling, fluid leakage, equipment maintenance, and construction activities near open waters pose some risk of contamination of aquatic habitat and subsequent injury or death to listed fish. Oils and similar substances from construction equipment can contain a wide variety of polycyclic aromatic hydrocarbons (PAH) and metals. Both can result in adverse impacts to fish. The Program will have in place spill and prevention measures designed to avoid contamination from equipment refueling, leakage, maintenance or other activities. NMFS anticipates the Program's proposed measures to prevent contamination will adequately protect water quality and avoid adverse effects by contaminants on listed fish.

Use of Concrete

The repair or replacement of tower foundations will involve the pouring and curing of concrete, which can result in increased pH levels in adjacent waters. Exposure to variations in pH in the aquatic environment can result in impacts to fish in the form of gill damage, disruption of

sodium balance, ammonia excretion or in some cases the increased toxicity of other elements in the aquatic environment (McLeay and Associates 1983, Baekken 2014, Foldvik *et al.* 2022). As described in Section 1.3.5, the release of uncured concrete into the water would not be allowed during repair or replacement of electrical infrastructure. All concrete will be contained within forms, for at least 24 hours, to prevent wet concrete from leaching into the aquatic environment. With implementation of the Program's proposed avoid and minimization measures, the risk of increased pH and subsequent impacts to fish and other aquatic organisms in the estuary would be avoided.

2.5.1.7 Benthic Habitat

Disturbance of benthic habitat by PG&E O&M activities has the potential to affect foraging and prey availability for listed fish. Green sturgeon forage throughout the estuarine portion of the action area on demersal fish and benthic invertebrates. Radtke (1966) analyzed stomach contents of juvenile green sturgeon captured in the Sacramento-San Joaquin Delta and found the majority of their diet was benthic invertebrates, such as mysid shrimp and amphipods (*Corophium* spp). In San Francisco Bay, green sturgeon are known to forage in shallow tidal flats dominated by burrowing shrimp and other benthic prey (Dumbauld *et al.* 2008).

For Chinook salmon and steelhead, research indicates salmonid juveniles that use the estuary for rearing appear to prefer shallow water habitats near the shore and the upper portion of the water column (less than 10 feet deep) (Kjelson *et al.* 1982). In the action area of this project, salmonid juveniles have been observed rapidly migrating to the ocean (MacFarlane and Norton 2002), but some juvenile Chinook and steelhead are likely to forage during their migration through San Francisco Bay and feed upon prey items nearshore and in the upper water column. Prey organisms in the upper water column are unlikely to be affected by the Program's activities that disturb benthic habitats. Although benthic disturbance near the shoreline and in tidal marshes have the potential to impact prey of juvenile salmonids in the estuary.

Several proposed O&M Program activities are likely to disturb benthic habitats and the associated community of benthic organisms. The Program's installation and removal of cofferdams and pilings are expected to injure and kill benthic invertebrates that are directly in the footprint of these activities. Cofferdams will temporarily close-off areas and benthic habitat within the enclosures will be disturbed. Work barges that rest on the substrate during low tide will disturb benthic habitat; however, disturbance of the substrate by barges is expected to be minimal and barges in shallow areas will be placed to avoid disturbance of submerged aquatic vegetation and wetland vegetation (NOAABA-AMM-01). Permanent loss of benthic habitat will result from fill associated with new and expanded tower foundations and boardwalks. However, in some instances the installation of these structures will include removal of older, existing structures and there may be little change in the total area of infrastructure on the bay floor. Placement of mats on the substrate during work activities will temporarily cover areas that contain burrowing benthic invertebrates.

At individual work sites the extent of impacts to the benthic community is expected to be small areas immediately surrounding each tower repair/replacement project; although the area affected will be larger if a cofferdam is constructed. PG&E estimates the average footprint of impact at each site is limited to 500 square feet; however, due to the large number of facilities, the

Program's biological assessment estimates proposed activities will annually result in temporary impacts of up to 0.58 acre of habitat (PG&E 2022). Permanent impacts associated with the repositioning/relocation of tower footings and foundations are anticipated to be approximately 0.08 acre of surface area annually (Table 6).

For aquatic benthic invertebrates injured and lost to construction disturbance, sites are expected to be re-colonized within a few months from adjacent undisturbed areas. Although as many as 17 sites may have work performed in a single year, the sites are dispersed throughout a large geographic area and impacts are primarily temporary. NMFS does not expect this temporary loss of benthic prey in the action area will prevent sturgeon and listed salmonids from finding suitable forage at the quantities and quality necessary for normal behavior (e.g., maintenance, growth, reproduction). Permanent loss of benthic habitat where foundations and/or tower footings are relocated is also not expected to adversely affect prey availability and foraging by listed fish because the area impacted is low (approximately 0.08 acre per year), and in some instances abandoned electrical infrastructure will be removed.

To mitigate for permanent impacts to habitat, PG&E intends to contribute funds that will be used for projects to improve fish passage and/or fish habitat within San Francisco Bay and freshwater migratory corridors within the greater San Francisco Bay Area. These mitigation projects would obtain approval from the Corps through separate permits and their effects are not considered in this opinion because they will be addressed in future consultations pursuant to section 7 of the ESA.

2.5.1.8 Effects of O&M Activities at Electrical Infrastructure on Critical Habitat

As described in Section 2.5.1 of this opinion, the O&M Program includes maintenance of electrical transmission lines that are supported by steel-lattice towers, steel poles, and wooden poles. The majority of PG&E's electrical infrastructure in the Bay Area is located in terrestrial areas. No electrical infrastructure is located in freshwater streams and no electrical infrastructure maintenance activities would be conducted in streams. Measures proposed by PG&E in terrestrial areas during work on electrical towers and poles are expected to prevent the degradation of water quality in streams designated as critical habitat for listed anadromous fish. Thus, electrical tower and pole repairs/replacements in terrestrial areas are anticipated to have no effect on designated critical habitat.

Electrical infrastructure O&M activities authorized by this RGP that will affect critical habitat for listed anadromous fish are located in tidally-influenced areas in San Francisco Bay. The San Francisco Bay estuarine portion of the action area is designated as critical habitat for Southern DPS green sturgeon, Sacramento River winter-run Chinook salmon, and CCC steelhead (see Section 2.4.3 of this opinion). Program activities are expected to temporarily alter water quality and impact benthic habitat at work sites in designated critical habitat.

Water Quality

The effects of Program construction activities on water quality are discussed above in Section 2.5.1.5 of this opinion and also apply to designated critical habitat in the action area. As described above, the effects of the proposed Program will result in increased levels of turbidity

and the suspension of sediment-associated contaminants. The impacts on water quality from turbidity and contaminants are not expected to degrade PBFs of ESA-listed fish species because the level of potential contaminants and turbidity is low, and both turbidity and contaminant-laden sediments are expected to be further dispersed (levels reduced) by tides and currents in the action area. The effects of the degradation product (6PPD-quinone) associated with tire shreds are unlikely to be exacerbated by O&M Program activities. Thus, effects of degraded water quality on designated critical habitat are expected to be short-term, minor, and localized.

Benthic Community

The effects of Program activities on benthic habitat are discussed above in Section 2.5.1.6 of this opinion. The Program's installation and removal of cofferdams and pilings are expected to injure and kill benthic invertebrates which could degrade the PBFs of critical habitat associated with foraging. In areas where benthic habitat disturbance is temporary, benthic invertebrates are expected to re-colonize work sites within a few months. Permanent impacts associated with the relocation or expansion of electrical tower foundations would result in the loss of benthic habitat and are estimated to be up to 0.08 acres annually. This permanent habitat loss will be dispersed throughout a large geographic area and sites are non-contiguous. For the reasons presented above and in Section 2.5.1.6 of this opinion, the small disconnected areas of permanent benthic habitat loss by the 10-year program will degrade PBFs of designated critical habitat for the Southern DPS green sturgeon, Sacramento River winter-run Chinook salmon, and CCC steelhead, but not significantly compromise the value of foraging habitat in this large geographic area.

2.5.2. Effects of O&M Activities at Natural Gas Infrastructure

Natural gas infrastructure O&M work activities to be conducted under this RGP that will affect listed anadromous fish are primarily located in the channels of freshwater streams upland from San Francisco Bay, but a small number of gas lines are located in tidal wetlands or estuarine waters (see Table 5 for waterways with gas line crossings). Of the five listed anadromous fish species addressed in this opinion, only CCC steelhead and their designated critical habitat occur in the freshwater portion of the action area. Gas line activities in tidal areas affect CCC steelhead and will also affect CCV steelhead, Sacramento River winter-run Chinook, CV spring-run Chinook, and Southern DPS green sturgeon.

Natural gas line O&M activities consist of site-specific erosion measures over pipelines, pipeline recoating, pipeline replacement, valve recoating, and valve replacement. These activities will affect listed anadromous fish and/or designated critical habitat at gas line crossings in freshwater channels and in tidal wetland areas. PG&E's pre-construction notifications for individual O&M activities will identify specific locations and specify whether or not listed anadromous fish or designated critical habitat may be present at gas line crossing work sites.

The proposed O&M activities associated with gas line infrastructure generally involve the excavation of materials to expose the gas line or valve, performing the recoating or replacement work (valve or pipeline), and then replacing the excavated materials to re-bury the pipeline. For site-specific erosion protection, biodegradable jute netting and other non-hardscape materials will be placed on exposed sections of pipeline in the stream channel to prevent further erosion. PG&E proposes to limit O&M activities associated with gas line crossings at waterways with

listed anadromous fish to periods when the work sites are naturally dry (see NOAABA-AMM-13). By restricting gas line maintenance to sites that are naturally dry, no dewatering with cofferdams will be required. and the potential adverse effects associated with excavation and trenching in wetted areas will be avoided.

Some gas line crossing sites included in Table 5 are located on waterways that do not seasonally dewater during the dry season and these locations are specified on the table as "likely to support year-round flow". At these sites, traditional excavating and trenching methods will not be conducted and PG&E will develop alternative methods for repairing or replacing gas lines. The RGP will not authorize in-water work at these pipeline crossing sites. With PG&E only employing methods that avoid work in channels at crossings with year-round flow, no effects to listed anadromous salmonids and green sturgeon are anticipated at these sites with year-round flow.

Effects on Fish

In tidal wetlands, work on gas line infrastructure would only be performed at sites that are located in high marsh areas. Some high marsh areas would be inducted at extreme high tides, but O&M Program work activities would be scheduled to avoid extreme tide events and be completed without effecting tidal waters. Similarly, on freshwater streams O&M activities on gas lines would be scheduled for the dry season when work sites are naturally dry. No dewatering would be performed to conduct these O&M activities. Under all water year conditions, O&M activities would be scheduled to ensure work is performed when anadromous salmonid streams contain no flowing water at work sites. At gas line valves, excavation of soils to expose valves located near waterways with listed anadromous fish would be performed without disturbing the stream or tidal channel. If work activities impact riparian vegetation, sites will be revegetated with native plant species in a manner consistent with maintaining safety at PG&E's infrastructure.

By avoiding periods when work sites may be inducted by high tides and only working in stream channels that contain no flowing water, no listed fish will be present during work activities on natural gas infrastructure. Construction activities are expected to proceed with no immediate effects on listed fish and no discharge of construction debris into waters with listed fish because no water will be present. O&M activities would be completed before the return of tidal inundation in estuarine areas and prior to the return of fall/winter surface flow in freshwater streams. Thus, no impacts to listed fish would occur during construction activities on gas line infrastructure.

Water Quality

Post-construction, minor turbidity will occur in waters at work sites when the site is re-watered during the following wet season with rainfall or during extreme high tide events in tidal wetlands; however, PG&E's use of erosion control measures and plantings of native vegetation are expected to minimize the mobilization of sediments from areas disturbed by construction activities. The resulting increase in turbidity levels in the waterways is expected to be minor and rapidly dissipate to ambient levels. For these reasons, the effects of O&M activities at gas line infrastructure on listed anadromous fish from changes in water quality in the action area are expected to be negligible.

Channel Form and Function

Site-specific erosion solutions on gas line crossings in waterways with listed anadromous fish could contribute to the long-term preclusion of natural fluvial and geomorphic processes. For example, in most low gradient streams the channel will naturally "meander", eroding laterally to dissipate its hydraulic energy while creating a sinuous longitudinal course. Stream meandering efficiently regulates the erosive forces by lengthening the channel and reducing stream gradient, thus controlling the ability of the stream to entrain and transport available sediment. Meandering streams also create and maintain both the hydraulic and physical components of instream habitat used by fish and other aquatic species. Specific to salmon and steelhead, a meandering, unconstrained stream channel sorts and deposits gravel and other substrate necessary for optimal food production and spawning success, maintains a healthy and diverse riparian corridor that supplies large woody debris to the channel, and inundates adjacent floodplain habitat during appropriate winter/spring flows (Spence *et al.* 1996).

Proposed site-specific erosion solutions at gas line crossings could result in small-scale permanent alteration of channel morphology by altering the physical land/water interface (i.e. streambank) that provides shelter, food, and other ecosystem benefits to aquatic species, including juvenile salmonids. Channel hydraulics could also be affected at erosion solution sites if the channel width is reduced. Channel constrictions, particularly with hardscape, can increase water velocities and cause corresponding increases in shear stress and degradation along stream banks (Simon and Johnson 1999).

For erosion protection actions authorized by this RGP in waterways with listed anadromous fish, PG&E would not utilize hardscape materials. Erosion protection projects would not span more than 20 percent of the active channel width and not exceed 500 square feet per site. Materials, such as jute netting, straw waddles, native plants and hydroseeding will be placed in the channel in a manner that avoids the constriction of flow and will not increase water velocities (NOAABA-AMM-14). These limits on the extent of erosion protection actions will avoid channelization and impairment of natural channel processes. These measures will also ensure fish passage and bedload transport persist in the channel. No significant effects to channel morphology and hydraulic conditions are anticipated by the O&M Program's erosion protection actions on freshwater stream and tidally influenced areas because hardscape will not be used and no erosion protection will be placed in at least 80 percent of the active channel width. Stream channels and tidal sloughs at and adjacent to work sites are anticipated to continue to maintain existing features that provide complex rearing, feeding, spawning, and shelter habitat. Based on the proposed measures and limits for erosion protection activities at gas line crossings, this O&M Program element is expected to have minimal impacts on natural channel functions and habitat condition for anadromous fish in streams throughout the action area.

Riparian Vegetation

O&M Program activities at gas line crossings will result in the removal or disturbance of existing riparian vegetation. Riparian vegetation helps maintain suitable stream habitat conditions for anadromous salmonids. Riparian zones and aquatic vegetation serve important functions in stream ecosystems, such as providing shade (Poole and Berman 2001), sediment storage and filtering (Cooper *et al*. 1987, Mitsch and Gosselink 2000), nutrient inputs (Murphy and Meehan

1991), water quality improvements (Mitsch and Gosselink 2000), channel and streambank stability (Platts 1991), habitat heterogeneity (Bryant 1983, Lisle 1986, Shirvell 1990), and refugia (Bustard and Narver 1975, Wesche *et al.* 1987, Murphy and Meehan 1991). Riparian vegetation disturbance and removal can degrade these ecosystem functions and impair stream habitat. Riparian canopy is considered a primary driver of stream temperature (Poole and Berman 2001). Removal of riparian vegetation increases stream exposure to solar radiation, leading to increases in stream temperature.

Under this RGP, instream and streamside riparian vegetation will be removed from channels to facilitate maintenance activities at PG&E infrastructure. A reduced amount of riparian vegetation often leads to reduced amount of cover used by salmonids (Bisson *et al*. 1988; Bjornn and Reiser 1991) and increases in stream temperature. The effects of riparian disturbance by PG&E O&M activities are expected to be minor because the area of impact at individual work sites is relatively small and sites will be re-vegetated post-construction with appropriate native species (NOAABA-AMM-16). Furthermore, the small number of projects on streams each year (two erosion protection; two pipeline re-coatings, two pipeline replacements, and one valve recoating/replacement) are distributed throughout all the streams in the nine-county action area. This wide distribution will limit the aggregate impacts on riparian zones and no adverse effects to stream ecosystem function are anticipated over the 10-year period of this RGP. Reseeding and revegetating disturbed areas following construction will reduce impacts to largely short-term periods. Disturbed areas are expected to regain lost shading and ecosystem function within a few years following construction.

In tidally-influence areas, the O&M Program's measure to revegetate areas subject to riparian vegetation impacts applies (NOAABA-AMM-16). Regarding eelgrass, beds of this seagrass occur throughout San Francisco Bay. Eelgrass beds are comprised of dense grass-like shoots that provide year-round fish habitat in soft sediments of the lower intertidal and shallow subtidal areas, providing three-dimensional structure in sandy or muddy soft bottom habitat, adding to fish forage and rearing habitat. The O&M Program proposes to avoid activities in all eelgrass beds and will comply with the NOAA Fisheries' California Eelgrass Mitigation Policy and Implementing Guidelines (NOAA Fisheries 2014), when activities are located adjacent to eelgrass (NOAABA-AMM-07). These measures in tidal areas are expected to reduce impacts to riparian vegetation to short-term periods and avoid impacts to eelgrass.

Critical Habitat

Proposed maintenance at gas line crossings has the potential to affect critical habitat through impacts to water quality, impacts to riparian vegetation, impair natural channel processes, and reduce habitat complexity. As discussed above, work will only be performed in dry channels and effects to water quality will be limited to minor increases in turbidity when project sites are re-watered during the following wet season with rainfall. Riparian vegetation will also be impacted by construction activities; however, PG&E will replant work sites with appropriate native species post-construction to mitigate for impacts to riparian vegetation. In tidal areas, work activities will not be performed within eelgrass beds. Site-specific erosion solutions also have the potential to impact designated critical habitat by reducing instream features that provides shelter, food, and other ecosystem benefits to aquatic habitat. For erosion solutions installed by PG&E under this RGP, projects will not include hardscape in streams with CCC steelhead critical

habitat and will not exceed more than 20 percent of the active channel width. Additionally, erosion solutions will not exceed a project footprint area of 500 square feet on streams with listed anadromous salmonids. These measures are expected to largely avoid adverse effects to instream habitat and natural channel functions because no hardscape will be used and work sites are small. Fish passage will be unaffected because erosion solutions materials will be placed in the channel in a manner that does not constrict flow and will not increase water velocities. Based on the above, the effects of O&M projects at natural gas line crossings conducted by PG&E under this RGP are expected to be negligible on designated critical habitat for CCC steelhead.

2.5.2.1 Gas Pressure Limiting Station Construction

In addition to the gas line O&M activities presented above, PG&E proposes to install new pressure limiting stations on natural gas lines. A typical pressure limiting station is constructed within a footprint of approximately 250 feet by 100 feet and all stations are place in upland areas. Pressure limiting stations will not be located in tidal waters or freshwater streams. The O&M Program has proposed sufficient measures during construction activities to prevent the discharge of contaminants and disturbed sediments from entering waterways with listed anadromous fish and designated critical habitat. Accordingly, proposed O&M Program activities associated with construction of pressure limiting stations are anticipated to have no effect on listed anadromous fish or designated critical habitat.

2.5.3. Effects of O&M Activities on Access Roads

The O&M Program proposes to perform routine maintenance on roads that provide access to PG&E's natural gas and electrical infrastructure facilities. Routine road maintenance activities will primary occur in upland areas and the majority of activities will have no effect on waterways in the action area. However, there will be repair and replacement of culverts at stream crossing on non-public roadways within the nine-county Program area. The locations of culvert work at road crossings are not known at this time, but could include streams that support CCC steelhead and/or designated critical habitat for CCC steelhead. CCV steelhead, CV spring-run Chinook salmon, Sacramento River winter-run Chinook salmon, and Southern DPS green sturgeon do not occur in freshwater streams in the action area; therefore, culvert repairs and replacements will have no effect on these four listed fish species.

As with gas line work at stream crossings, construction activities associated with culvert repairs and replacements will not occur in flowing waters on streams with CCC steelhead or their designated critical habitat. PG&E proposes to only conduct culvert maintenance activities when the work sites are naturally dry. No stream dewatering or cofferdams will be used to dewater work sites for road maintenance and culvert repair/replacement. In addition, PG&E will ensure that all culvert repair and replacements in waterways with listed anadromous fish and/or critical habitat will be designed to meet the most current NMFS guidelines for fish passage at stream crossings (NOAABA-AMM-15). Additionally, PG&E proposes to limit the number of culvert repair/replacement projects to a maximum of two per year on streams with CCC steelhead and/or critical habitat.

If temporary bridges are installed, the structure will be clear span and no effects within the channel are anticipated because the bridge ends will be placed on existing roads outside the

channel. Temporary bridges will only remain in place during O&M activities which will range from a few days to 24 weeks. As a clear span structure with no structural elements extending into the channel, stream habitat, water quality, and fish passage are expected to remain unaffected while the temporary bridge is in place. Use of a crane to place and remove the temporary bridge will also avoid disturbance of the channel.

Effects on Fish during Construction

By limiting work at culverts to periods when the work sites are naturally dry, no flowing water and no listed fish will be present during work activities. Construction activities are expected to proceed with no effects to CCC steelhead and no discharge of construction debris into flowing water because no water will be present. O&M activities would be completed prior to the return of fall/winter surface flow in freshwater streams. Thus, no impacts to CCC steelhead are expected to occur during construction activities associated with culvert repairs and replacement.

Water Quality

Post-construction, minor turbidity will occur in waters downstream of culvert work sites when the site is re-watered during the following wet season with rainfall. Some disturbed soils will be discharged into the stream, but use of erosion control measures and plantings of native vegetation are expected to minimize the mobilization of sediments from areas disturbed by construction activities. The resulting increase in turbidity levels in the waterways is expected to be minor and rapidly dissipate to ambient levels. For these reasons, the effects of O&M Program activities at culverts on water quality in the action area are expected to be negligible for CCC steelhead.

Water quality in the freshwater portion of the action area may also be affected by maintenance activities associated with roadway drainage systems. Stormwater runoff from roads drain to waterways with listed anadromous fish and designated critical habitat. These drainage systems carry tire shreds/dust with the degradation product (6PPD-quinone) from roadways to waterways. All freshwater life stages of listed salmonids within the action area are exposed to degraded water quality due to stormwater runoff from roadways, including roads used by PG&E to access their facilities. Although the O&M Program will not construct new roads, PG&E does have maintenance agreements for roads that include drainage systems. While these roads will continue to convey stormwater runoff to streams, NMFS anticipates such runoff will be unlikely to contain large amounts of toxic materials because traffic on these roads will likely be very light and may only be sporadic. As mentioned in Section 2.2.5.2 of this opinion, recent publications have identified a degradation product of tires (6PPD-quinone) as the causal factor in salmonid mortality at concentrations of less than a part per billion (Tian *et al*. 2022, Brinkmann *et al.* 2022, Tian *et al.* 2020; Peter *et al*. 2018). Access roads to PG&E facilities include both public and private ownership. Some roads are located on State and Federal lands. Road maintenance activities conducted under this RGP would not change existing ownership, vehicle traffic levels, or drainage patterns. New roadway construction is not permitted by the RGP. For these reasons, the O&M Program is not expected to contribute meaningful amounts of contaminant loading in waterways of the action area.

Stream Channel Conditions and Fish Passage

By design, bridges and culverts stabilize stream channels at road crossings and prevent lateral channel migration, effectively forcing streams into a simplified linear configuration. Without the ability to move laterally, stream channels tend to erode and deepen vertically (Leopold 1968; Dunn and Leopold 1978). The resulting channel may fail to create and maintain aquatic and riparian habitat through lateral migration, and can instead impair groundwater/stream flow connectivity and repress floodplain and riparian habitat function. Simplified stream reaches typically produce limited macroinvertebrate prey and provide poor functional habitat for rearing juvenile salmonids (Florsheim *et al*. 2008). The Program's proposed maintenance of road crossings by repairing and replacing culverts are expected to maintain the current channel alignments and maintain existing simplification of stream habitat adjacent to culverts.

Culverts can also have significant adverse effects on fish passage. Culverts commonly clog with debris, particularly when undersized. Clogged culverts can physically prevent fish and streamflow from passing at road crossings. Culverts also concentrate flow and accelerate water velocities to levels that exceed the swimming abilities of steelhead, resulting in an impediment to migration. To ensure culverts repaired and replaced by the O&M Program on streams with CCC steelhead, culverts must be designed to conform with NMFS fish passage guidelines for anadromous salmonids at stream crossings (NOAABA-AMM-15). Culvert project designs will be presented to NMFS and the Corps in Pre-Construction Notification packages for NMFS review prior to construction. Via this implementation procedure, all culvert repairs and replacements by the Program will be designed and constructed to ensure fish passage is not impaired. In some cases, the Program's repair and replacement of culverts would improve fish passage conditions over the baseline condition where existing culverts are poorly designed or undersized.

Riparian Vegetation

As described above for work activities at gas line crossings, culvert projects will result in the removal or disturbance of existing riparian vegetation. Riparian vegetation provides several essential functions to maintain suitable habitat and water quality conditions on streams with anadromous salmonids (see Section 2.5.3 of this opinion). Per NOAABA-AMM-16, the Program will revegetate culvert work sites with appropriate native plant species to compensate for riparian vegetation impacts. Revegetation actions are expected to reduce impacts to the riparian zone and restore the ecosystem functions of the riparian zone within a few years following construction. Furthermore, the small number of culvert projects on steelhead streams each year (no more than two per year) will limit the aggregate impacts on riparian zones and no adverse effects to riparian ecosystem function are anticipated over the 10-year period of this RGP.

Critical Habitat

Proposed culvert repair/replacement work has the potential to affect critical habitat through impacts to water quality, impacts to riparian vegetation, and impairment of fish passage. As presented above, work will only be performed in dry channels and effects to water quality will be limited to minor increases in turbidity when project sites are re-watered during the wet season with rainfall. Riparian vegetation will also be damaged and removed by construction activities; however, PG&E will replant work sites with appropriate native species post-construction to mitigate for impacts to riparian vegetation. Culverts constructed on streams can impair fish

passage, stream flow, and bedload transport. To ensure culvert projects do not adversely affect critical habitat, PG&E proposes to design culverts to conform with NMFS guidelines for fish passage at stream crossings. Based on the above, the effects of culvert projects conducted by PG&E under this RGP are expected to be negligible on designated critical habitat for CCC steelhead.

2.6. Cumulative Effects

"Cumulative effects" are those effects of future State or private activities, not involving Federal activities, that are reasonably certain to occur within the action area of the Federal action subject to consultation [50 CFR 402.02 and 402.17(a)]. Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the ESA.

Some continuing non-Federal activities are reasonably certain to contribute to climate effects within the action area. However, it is difficult if not impossible to distinguish between the action area's future environmental conditions caused by global climate change that are properly part of the environmental baseline *vs.* cumulative effects. Therefore, all relevant future climate-related environmental conditions in the action area are described earlier in the discussion of environmental baseline (Section 2.4).

Potential non-Federal actions affecting the action area in the future could include State angling regulation changes, voluntary or State sponsored upslope habitat restoration activities, discharge of stormwater and agricultural runoff, and continued development, including building of private roads, wells, and land use change. Urban development, including rural residential and agricultural development is likely to continue throughout the greater San Francisco Bay Area. NMFS assumes the rate of such development would be similar to that observed in the last decade.

2.7. Integration and Synthesis

The Integration and Synthesis section is the final step in assessing the risk that the proposed action poses to species and critical habitat. In this section, we add the effects of the action (Section 2.5) to the environmental baseline (Section 2.4) and the cumulative effects (Section 2.6), taking into account the status of the species and critical habitat (Section 2.2), to formulate the agency's biological opinion as to whether the proposed action is likely to: (1) reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing its numbers, reproduction, or distribution; or (2) appreciably diminish the value of designated or proposed critical habitat as a whole for the conservation of the species.

The action area of this project encompasses nine counties in the San Francisco Bay Area.[8] CCC steelhead, CCV steelhead, CV spring-run Chinook salmon, Sacramento River winter-run Chinook salmon, and Southern DPS green sturgeon occur in the San Francisco Bay estuarine portion of the action area. Of these species, only CCC steelhead are present in the freshwater

[8] The nine Bay Area counties consist of Alameda, Contra Costa, Marin, Napa, San Francisco, San Mateo, Santa Clara, Solano, and Sonoma counties.

streams portion of the action area. All the above listed fish species have experienced serious declines in abundance, and long-term population trends suggest a negative growth rate. Human-induced factors have reduced populations and degraded habitat, which in turn has reduced the population's resilience to natural events, such as droughts, floods, and variable ocean conditions. Global climate change presents another real threat to the long-term persistence of the population, especially when combined with the current depressed population status and human caused impacts. Within the Program's action area, the effects of shoreline development, bank stabilization, water development, flood control, and urbanization are evident. These activities have degraded instream habitat conditions, reduced water quality, contaminated sediment, altered the hydrology of streams, precluded access into some watersheds, and limited access in other watersheds. Drought conditions from 2012 to 2022 exacerbated these impacts by increasing water temperatures and stream-drying, limiting habitat connectivity in the freshwater portion of the action area.

As described in the Effects of the Action (Section 2.5), several proposed O&M Program activities are expected to adversely affect listed anadromous salmonids, green sturgeon, and their habitat. These activities are associated with electrical infrastructure maintenance in San Francisco Bay, and consist of the following: pile driving, cofferdam construction, permanent loss of benthic habitat, and fish collection and relocation. PG&E proposes to limit impact hammer driving and cofferdam installation to the period between June 1 and November 30 of each year (referred to as the "limited operating period" [LOP]). However, there may be some projects where the cofferdam will remain installed past November 30 and pile driving operations would also continue past November 30. Threatened green sturgeon juveniles, sub-adults and adults are present in San Francisco Bay year-round and will be subjected to adverse effects by O&M Program activities at any time of year. Listed salmon and steelhead are generally not present in the Bay until the winter and spring months; thus, PG&E Program activities that continue after November 30 will adversely affect listed anadromous salmonids. However, O&M Program activities may that may result in adverse effects only extend a maximum of six additional weeks from November 30 because work must be completed each year by January 15.

Injury or mortality of green sturgeon, steelhead, and salmon due to barotrauma will occur during the use of impact hammers at some project sites. NMFS expects the number of PG&E maintenance projects at electrical towers that create conditions with barotrauma effects will be small because the majority of pile driving work will be performed at shallow water sites that naturally dewatered at low tide (approximately 92% of the tower sites are located above MLLW). Sound levels attenuate quickly in shallow water, but some electrical tower sites are located in deeper water. When 60-inch and 72-inch piles are installed by impact hammer in water, the zone of physical injury and mortality adjacent to the pile could extend as far as 1,778 feet due to cSEL above 187 dB. The zone of physical injury and mortality will be less when smaller piles are installed by an impact hammer (see Table 7). As described above in Section 2.5.1.4, only a few listed fish are expected to incur injury or mortality from cSEL when they are continuously exposed to high underwater sound levels in this zone by multiple impact hammer pile strikes. Injury and mortality due to exposure to peak sound levels at and above 206 dB will also occur, but will not extend beyond 30 feet from a pile being installed. The area of injury or mortality associated with peak SPLs is reduced for smaller diameter steel piles.

The use of vibratory hammers to install piles and install cofferdams will not create underwater sound levels that are harmful to listed fish. Vibratory hammers generate lower sound levels with different wave forms than impact hammers (Buehler *et al*. 2015). During use of vibratory hammers, sound levels are not expected to exceed the dual metric criteria for injury and mortality of fish established by the FHWG (*i.e*., peak pressure of 206 dB and cSEL of 187 dB).

Vibratory hammers and impact hammers can also create noise that startle fish and result in temporary dispersal from habitats adjacent to work sites. Behavioral effects during impact hammer pile driving will extend up to 15,226 feet. The zone of behavioral effects will be less for vibratory hammers. If listed green sturgeon, salmon, or steelhead were to react behaviorally to the sound produced by impact hammers or vibratory pile driving, adequate water depths and area within adjacent open waters of San Francisco Bay are expected to provide fish sufficient area to disperse. When pile driving ceases each day, elevated underwater sound levels will conclude and these habitat areas will become available again without disturbance.

Sections 2.5.1.1 and 2.5.1.2 describe the impacts associated with the installation of cofferdams, dewatering work sites, and fish collection/handling. NMFS anticipates that a very small number of green sturgeon will be collected during dewatering events and collection of listed anadromous salmonids is improbable for several reasons. First, cofferdam installation and dewatering will not be initiated after November 30 and listed salmonids are unlikely to be present prior to that time. Second, the majority of work sites where cofferdams will be deployed are located in very shallow water and the sites will naturally dewater at low tide. Closure of cofferdams during periods of low tide will avoid entrapping water and fish. Finally, although green sturgeon will be present during cofferdam construction, construction activities are likely to cause green sturgeon to flee work sites prior to closure of cofferdams. If green sturgeon are collected and relocated for cofferdam construction, they would be subject to injury but mortality is unlikely. A compilation of 10 years of reports submitted to NMFS by fishery researchers indicates collection, handling, and relocation of green sturgeon by qualified biologists rarely results in mortality.

Benthic habitat will be disturbed by Program activities at work sites during construction. Temporary mats will be placed on the substrate to create a work area for personnel and equipment. Barges would temporarily rest on the bottom at low tide. Areas internal to cofferdams will be dewatered and subjected to disturbance by equipment and personnel. These impacts are expected to be temporary disturbance that will recover rapidly following O&M activities due to the small footprint of individual work sites and limited to the surface of the substrate. Any elevated levels of turbidity during disturbance of the substrate are anticipated to not extend beyond one or two tide cycles. Upon removal of cofferdams, mats, and work barges, minimal changes to the surface elevation of the bottom are expected. For these reasons, the potential effects of localized areas of elevated turbidity and benthic habitat disturbance associated with O&M Program activities in San Francisco Bay are expected to be negligible for ESA-listed fish. Permanent loss of benthic habitat is expected when tower footings and foundations are re-located, but the overall area impacted by the program is estimated to be very small (0.08 acres per year) and not adversely affect prey availability and foraging by listed fish. At some sites, abandoned footings and piles will be removed and result in no net increase in the extent of fill in the Bay.

In waterways upstream from San Francisco Bay, freshwater streams with threatened CCC steelhead and designated critical habitat will be affected by the O&M Program's maintenance activities at natural gas line crossings and culvert repair/replacements on access roads. PG&E will only perform work in these stream channels when work sites are seasonally dry. With no flowing water during these construction and maintenance activities, no effects to threatened CCC steelhead are anticipated during construction. The program has also incorporated measures including no placement of new hardscape materials, replanting of native riparian vegetation, and annual limits upon the number and size of projects to ensure O&M activities do not adversely affect steelhead habitat in streams of the action area. Culvert repairs and replacements will be designed to conform with NMFS guidelines for fish passage at stream crossings.

Designated critical habitat for Southern DPS green sturgeon, CCC steelhead, and Sacramento River winter-run Chinook salmon occurs in the action area. While conditions vary across the DPSs, critical habitat is generally impaired by channel modification, habitat alteration and fragmentation, dams and water diversions, groundwater extraction, and estuarine habitat loss. These factors also affect designated critical habitat in the action area of this project.

The estuarine portion of the action area includes areas designated as critical habitat for Southern DPS green sturgeon, CCC steelhead, and Sacramento River winter-run Chinook salmon. Effects to critical habitat in San Francisco Bay include temporary degradation of water quality, benthic disturbance, and elevated levels of underwater sound. A small amount of benthic habitat at widely dispersed sites is also expected to be permanently lost due to relocation or replacement of electrical tower foundations and pilings; however, these permanent impacts to benthic habitat are not expected to exceed 0.08 acre per year at all work sites combined.

Within the freshwater portion of the action area, several streams are designated critical habitat for CCC steelhead. O&M Program activities will affect freshwater CCC steelhead critical habitat at gas line crossings and culverts on streams; however, proposed measures at stream crossing are anticipated to avoid adverse effects to CCC steelhead critical habitat. Measures include prohibiting use of hardscape for erosion protection, limiting the extent of scour protection to not exceed 20 percent of the channel width, and all culverts will be designed to provide unimpeded fish passage by conforming with NMFS guidelines for salmonid passage at stream crossings. The O&M Program will maintain access roads, including existing drainage systems that convey stormwater runoff from roadways. PG&E's maintenance of stormwater drainage on some of these roads is unlikely to meaningfully increase the amount of contaminants from roadways to streams. After considering the O&M Program's measures for work in streams with CCC steelhead critical habitat, NMFS concludes that the value of critical habitat as a whole for species conservation will not be appreciably reduced.

Regarding future climate change effects in the action area, California could be subject to higher average summer air temperatures and lower total precipitation levels. The Sierra Nevada snow pack is likely to decrease by as much as 70 to 90 percent by the end of this century under the highest emission scenarios modeled. Reductions in the amount of rainfall would reduce stream flow levels in rivers of the action area. Estuaries may also experience changes in productivity due to changes in freshwater flows, nutrient cycling, and sediment amounts. California's most recent period of drought began in approximately 2012. This long-term drought, as well as the

increased incidence and magnitude of wildfires in California, have likely been exacerbated by climate change (Williams *et al*. 2019, Williams *et al.* 2020, Williams *et al*. 2022, Diffenbaugh *et al*. 2015,). For PG&E's O&M Program, the immediate effects of construction activities would occur over the next five to 10 years, and the long-term effects of climate change are unlikely to be detected within this time frame. If these effects of climate change are detected over the short term, they will likely materialize as moderate changes to the current climate conditions with the action area. These changes may place further stress on ESA-listed fish populations. Most of the effects of the proposed action are likely to occur during these nearer term climate change effects (droughts with occasional years of heavy rainfall) as described in the Environmental Baseline Section of this opinion (Section 2.4). Long-term impacts from the proposed action are limited to very small areas of permanent habitat loss in the action area and, thus are unlikely to exacerbate the impacts of climate change on listed species and their critical habitat. Considering the above, we do not expect climate change to alter conditions in the action area beyond the scope already considered in this opinion.

While PG&E's O&M Program will result in adverse effects to listed fish during pile driving and cofferdam construction, we expected these losses to be very small fraction of the ESU and DPS populations. Benthic habitat losses due to new and expanded tower foundations and pilings are also expected to be very small (0.08 acres year) in relation to the amount of estuarine habitat area in San Francisco Bay. In consideration of the O&M Program's proposed avoidance and minimization measures (Section 1.3.5 of this opinion), actions conducted by PG&E in freshwater streams will avoid adverse effects to listed CCC steelhead. Culvert projects on streams will be designed to conform with NMFS guidelines for fish passage at stream crossings and these upgrades may improve existing passage conditions for steelhead, particularly at undersized culverts. NMFS does not expect any of the aforementioned effects of PG&E's O&M Program to combine with other effects in any significant way. Effects from proposed activities under the RGP are limited in time and area, and anticipated adverse effects are minimal and only affect a small number of listed fish during the five to 10-year period of this RGP. Ultimately, the effects of the proposed activities that would be conducted under this RGP, when added to the environmental baseline, cumulative effects, and species status, are not expected to appreciably reduce the likelihood of survival or recovery of listed salmonids and green sturgeon, nor does it appreciably degrade the value of their critical habitat.

2.8. Conclusion

After reviewing and analyzing the current status of the listed species and critical habitat, the environmental baseline within the action area, the effects of the proposed action, the effects of other activities caused by the proposed action, and the cumulative effects, it is NMFS' biological opinion that the proposed PG&E O&M Program is not likely to jeopardize the continued existence of threatened CCC steelhead, threatened CCV steelhead, threatened CV spring-run Chinook salmon, endangered Sacramento River winter-run Chinook salmon, and threatened Southern DPS green sturgeon or destroy or adversely modify designated critical habitat for CCC steelhead, Sacramento River winter-run Chinook salmon, and Southern DPS green sturgeon.

2.9. Incidental Take Statement

Section 9 of the ESA and Federal regulations pursuant to section 4(d) of the ESA prohibit the take of endangered and threatened species, respectively, without a special exemption. "Take" is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. "Harm" is further defined by regulation to include significant habitat modification or degradation that actually kills or injures fish or wildlife by significantly impairing essential behavioral patterns, including breeding, spawning, rearing, migrating, feeding, or sheltering (50 CFR 222.102). "Harass" is further defined by interim guidance as to "create the likelihood of injury to wildlife by annoying it to such an extent as to significantly disrupt normal behavioral patterns which include, but are not limited to, breeding, feeding, or sheltering." "Incidental take" is defined by regulation as takings that result from, but are not the purpose of, carrying out an otherwise lawful activity conducted by the Federal agency or applicant (50 CFR 402.02). Section 7(b)(4) and section 7(o)(2) provide that taking that is incidental to an otherwise lawful agency action is not considered to be prohibited taking under the ESA if that action is performed in compliance with the terms and conditions of this ITS.

2.9.1. Amount or Extent of Take

In this opinion, NMFS determined that incidental take of threatened CCC steelhead, threatened CCV steelhead, threatened CV spring-run Chinook salmon, endangered Sacramento River winter-run Chinook salmon, and threatened Southern DPS green sturgeon in the form of injury, harm, or mortality is reasonably certain to occur in association with impact hammer pile driving in San Francisco Bay. Additionally, the incidental take of Southern DPS green sturgeon will occur during fish collection and relocation associated with cofferdam construction.

For impact hammer pile driving, NMFS is not able to estimate the specific number of CCC steelhead, CCV steelhead, CV spring-run Chinook salmon, winter-run Chinook salmon, and green sturgeon that will be incidentally taken by elevated underwater sound levels due to the large geographic scope of the action area, varying environmental conditions between project sites, and the number of proposed sites for the Program. Additionally, monitoring or measuring the number of listed fish actually injured or killed by elevated sound levels during pile driving is also not feasible. Injured or killed fish are unlikely to be observed because they may not float to the surface or may be carried away by strong currents in portions of the action area. Due to the difficulty in quantifying the number of listed fish that could be injured or killed by pile driving, a surrogate measure of incidental take is necessary to establish a limit to take exempted by this incidental take statement. NMFS will therefore use the following incidental take surrogate pursuant to 50 CFR 402.14(i)(1)(i) for elevated underwater sound levels during impact hammer pile driving:

The extent of incidental take will be considered exceeded if elevated sound levels during pile driving are greater than 206 dB peak or 187 dB cSEL at the following specified distances for each steel pile size:

Steel Pile Size	Distance (ft) to 206 dB peak	Distance (ft) to 187 dB accumulated SEL/day
16-inch	0	30
20-inch	20	446
24-inch	10	552
36-inch	20	827
60-inch	30	1,778
72-inch	30	1,309

For cofferdam construction, NMFS is not able to estimate the specific number of Southern DPS green sturgeon that will be collected and relocated during construction of cofferdams; however, it is expected to be a low number of individual fish during implementation of O&M Program activities for the reasons presented above in this opinion.

Unintentional injury of green sturgeon during capture, handling, and relocation will occur; however, mortality is unlikely absent an unintentional accident. The amount of incidental take during dewatering and fish relocation will be considered exceeded if more than one green sturgeon is killed during dewatering and fish relocation activities.

2.9.2. Effect of the Take

In the biological opinion, NMFS determined that the amount or extent of anticipated take, coupled with other effects of the proposed action, is not likely to result in jeopardy to the species or destruction or adverse modification of critical habitat.

2.9.3. Reasonable and Prudent Measures

"Reasonable and prudent measures" are measures that are necessary or appropriate to minimize the impact of the amount or extent of incidental take (50 CFR 402.02).

NMFS believes the following reasonable and prudent measures are necessary and appropriate to minimize take of listed fish:

1. Undertake measures to ensure that harm and mortality to listed fish resulting from fish relocation and dewatering activities is low.
2. Ensure proposed culvert repair and replacement actions are designed to provided unimpeded fish passage.
3. Prepare and submit post-construction reports for each O&M program activity that includes cofferdam construction in San Francisco Bay and/or pile driving with an impact hammer on steel piles 20 inches or greater in diameter.
4. Prepare and submit annual reports for O&M program activities performed on streams with listed anadromous salmonids and/or designated critical habitat.

2.9.4. Terms and Conditions

In order to be exempt from the prohibitions of section 9 of the ESA, the Federal action agency must comply (or must ensure that any applicant complies) with the following terms and conditions. The Corps or any applicant has a continuing duty to monitor the impacts of incidental take and must report the progress of the action and its impact on the species as specified in this ITS (50 CFR 402.14). If the entity to whom a term and condition is directed does not comply with the following terms and conditions, protective coverage for the proposed action would likely lapse.

1. The following terms and conditions implement reasonable and prudent measure 1:

    a. PG&E shall retain qualified fisheries biologist(s) with expertise in the areas of identification, handling, collecting, and relocating anadromous fish species to oversee cofferdam construction and fish relocation at work sites in San Francisco Bay. The qualified biologist(s) must be on site during all dewatering events to capture, handle, and safely relocate ESA-listed fish.

    b. Biologists shall conduct fish collections in a manner which minimizes potential risks to ESA-listed fish. The biologist must monitor construction sites during placement and removal of cofferdams to ensure that any adverse effects to listed fish are minimized.

    c. ESA-listed fish shall be handled with extreme care and kept in water to the maximum extent possible during rescue activities. Captured fish will be relocated, as soon as possible, to a location with suitable habitat conditions.

    d. If any salmonids or sturgeon are found dead or injured, the biologist shall contact NMFS biologist Sara Azat by phone at 707-575-6067, by email at sara.azat@noaa.gov or the NMFS Santa Rosa Area Office at 707-387-0737. The purpose of the contact is to review the activities resulting in take and to determine if additional protective measures are required. All mortalities of listed fish must be retained. Tissue samples are to be acquired from each mortality per the methods identified in the NMFS Southwest Fisheries Science Center Genetic Repository protocols (contact the above NMFS office at the phone number provided) and sent to: NOAA Coastal California Genetic Repository, Southwest Fisheries Science Center, 110 McAllister Way, Santa Cruz, CA 95060.

2. The following terms and conditions implement reasonable and prudent measure 2:

    a. The Corps or PG&E shall submit draft design plans for projects that include culvert repair or replacement on streams with listed anadromous fish to NMFS for review and approval at least 120 days prior to construction. Design plans are to be submitted to NMFS North Central Coast Office, Attention: San Francisco Bay Branch Chief, 777 Sonoma Avenue, Room 325, Santa Rosa, California 95404-6528.

3. The following terms and conditions implement reasonable and prudent measure 3:

   a. PG&E shall provide a written post-construction report to NMFS within 60 days of completion of work for each project site in San Francisco Bay that includes cofferdam construction and/or driving of steel piles 20 inches or greater in diameter. The report must include the following information:

      - Summary of construction activities, including: dates construction began and ended; use of a cofferdam and other measures to protect aquatic habitat; a description of the minimization measures taken to address any unanticipated issues; photographs pre-, during, and post-construction; and any other relevant information.

      - Summary of fish relocation activities, including: the number of fish collected by species; the condition of fish at the time of release; the number and species of fish injured or killed; description of the equipment and methods used to collect, hold, and transport fish; and a description of any problems which may have arisen during the relocation activities and a statement as to whether or not the activities had any unforeseen effects.

      - Summary of pile driving activities and hydroacoustic monitoring, including: size and number of piles installed by impact hammer; results of hydroacoustic monitoring, if any was performed; functionality of air bubble curtain, if any was used; and a description of any problems which may have arisen during the pile driving and associated unforeseen effects.

   b. Post-construction reports are to be submitted to NMFS North Central Coast Office, Attention: San Francisco Bay Branch Chief, 777 Sonoma Avenue, Room 325, Santa Rosa, California 95404-6528.

4. The following terms and conditions implement reasonable and prudent measure 4:

   a. PG&E shall include the following additional information in the annual reports to NMFS (to be submitted on March 31 per BA-AMM-03):

      - Summary of construction activities at gas line crossings and access roads (*i.e.*, culvert repair/replacements), including: dates construction began and ended; measures to protect riparian habitat and riparian revegetation; a description of the minimization measures taken to address any unanticipated issues; photographs pre-, during, and post-construction; and any other relevant information.

   b. Annual reports are to be submitted to NMFS North Central Coast Office, Attention: San Francisco Bay Branch Chief, 777 Sonoma Avenue, Room 325, Santa Rosa, California 95404-6528.

2.10. Conservation Recommendations

Section 7(a)(1) of the ESA directs Federal agencies to use their authorities to further the purposes of the ESA by carrying out conservation programs for the benefit of the threatened and endangered species. Specifically, "conservation recommendations" are suggestions regarding discretionary measures to minimize or avoid adverse effects of a proposed action on listed species or critical habitat or regarding the development of information (50 CFR 402.02).

- NMFS recommends that hydroacoustic monitoring be performed at all sites that utilize an impact hammer on steel piles greater than 20-inches in diameter to improve the breadth of information related to elevated underwater sound levels during pile driving in the San Francisco Bay.

2.11. Reinitiation of Consultation

This concludes formal consultation for the PG&E's Bay Area Operation and Maintenance Program.

Under 50 CFR 402.16(a): "Reinitiation of consultation is required and shall be requested by the Federal agency or by the Service where discretionary Federal agency involvement or control over the action has been retained or is authorized by law and: (1) If the amount or extent of taking specified in the incidental take statement is exceeded; (2) If new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not previously considered; (3) If the identified action is subsequently modified in a manner that causes an effect to the listed species or critical habitat that was not considered in the biological opinion or written concurrence; or (4) If a new species is listed or critical habitat designated that may be affected by the identified action."

2.12. Not Likely to Adversely Affect" Determinations

Under the ESA, "effects of the action" are all consequences to listed species or critical habitat that are caused by the proposed action, including the consequences of other activities that are caused by the proposed action. A consequence is caused by the proposed action if it would not occur but for the proposed action and it is reasonably certain to occur. Effects of the action may occur later in time and may include consequences occurring outside the immediate area involved in the action (50 CFR 402.02). In our analysis, which describes the effects of the proposed action, we considered 50 CFR 402.17(a) and (b). When evaluating whether the proposed action is not likely to adversely affect listed species or critical habitat, NMFS considers whether the effects are expected to be completely beneficial, insignificant, or discountable. Completely beneficial effects are contemporaneous positive effects without any adverse effects to the species or critical habitat. Insignificant effects relate to the size of the impact and should never reach the scale where take occurs. Effects are considered discountable if they are extremely unlikely to occur.

2.12.1. Background and Action Agency's Effects Determination

The Corps has determined that the proposed action is not likely to adversely affect the following species and critical habitat (Evolutionarily Significant Units [ESU]) or (Distinct Population Segments [DPS]) under the jurisdiction of NMFS:

California Coastal (CC) Chinook salmon ESU (*Oncorhynchus tshawytscha*)
Threatened (70 FR 37160; June 28, 2005)
Critical habitat (70 FR 52488; September 2, 2005);

South-Central California Coast (S-CCC) steelhead DPS (*Oncorhynchus ykiss*)
Threatened (71 FR 834; January 5, 2006)
Critical habitat (70 FR 52488; September 2, 2005);

Central California Coast (CCC) coho salmon ESU (*Oncorhynchus kisutch*)
Endangered (70 FR 37160, June 28, 2005)
Critical habitat (64 FR 24049; May 5, 1999).

The life history of Chinook salmon is summarized in Myers *et al.* (1998) and the most recent NMFS status review (NMFS 2016e). The CC Chinook salmon ESU are typically fall spawners, entering their natal streams in the early fall. Adults tend to spawn in the mainstem or larger tributaries of rivers, and eggs are deposited in redds for incubation. When the 0+ age fish emerge from the gravel in the spring, they typically migrate to salt water shortly after emergence. Prey resources during early freshwater rearing and out-migration are critical to Chinook salmon survival as they grow and move out to the open ocean.

The life history of steelhead is summarized in Busby *et al.* (1996) and the most recent NMFS status review (Williams *et al*. 2016). S-CCC Steelhead are anadromous forms of *Oncorhynchus mykiss,* spending some time in both fresh- and saltwater. Juveniles – typically in spring as smolts – migrate to the ocean where they mature. Adult steelhead return to freshwater rivers and streams to reproduce, or spawn. Unlike Pacific salmon, steelhead are iteroparous, or capable of spawning in multiple years before death (Busby *et al.* 1996; Moyle 2002). Within the S-CCC steelhead DPS, adults typically enter freshwater between December and April, with peaks occurring in January through March (Fukushima and Lesh 1998). Eggs (laid in gravel nests called redds), alevins (gravel dwelling hatchlings), fry (juveniles newly emerged from stream gravels), and other juvenile life stages all rear in freshwater until they migrate to the ocean where they reach maturity.

The life history of coho salmon in California is summarized by NMFS (1995; 2016f). Coho are also anadromous salmonids, spending some time in both freshwater and saltwater. In California coastal streams, adult coho salmon upstream migration occurs between November and February, and smolt outmigration occurs between March and June, peaking March through May (Fukushima and Lesh 1998). CCC coho salmon were historically abundant in the Russian River and tributaries. Presently, however, coho are rare throughout the action area.

Critical habitat for CC Chinook, S-CCC steelhead, and CCC coho salmon is present in the action area. The PBFs of designated critical habitat for CC Chinook salmon and S-CCC steelhead in freshwater include:

1. Freshwater spawning sites with water quantity and quality conditions and substrate supporting spawning, incubation, and larval development;

2. Freshwater rearing sites with:
   a) Water quantity and floodplain connectivity to form and maintain physical habitat conditions and support juvenile growth and mobility;
   b) Water quality and forage supporting juvenile development; and
   c) Natural cover such as shade, submerged and overhanging large wood, log jams and beaver dams, aquatic vegetation, large rocks and boulders, side channels, and undercut banks;

3. Freshwater migration corridors free of obstruction and excessive predation with water quantity and quality conditions and natural cover such as submerged and overhanging large wood, aquatic vegetation, large rocks and boulders, side channels, and undercut banks supporting juvenile and adult mobility and survival.

For CCC coho salmon critical habitat, the following essential habitat types were identified: 1) juvenile summer and winter rearing areas; 2) juvenile migration corridors; 3) areas for growth and development to adulthood; 4) adult migration corridors; and 5) spawning areas. Within these areas, essential features of coho salmon critical habitat includes adequate: 1) substrate, 2) water quality, 3) water quantity, 4) water temperature, 5) water velocity, 6) cover/shelter, 7) food, 8) riparian vegetation, 9) space, and 10) safe passage conditions (64 FR 24029).

2.12.2. Effects of the Action

As described in Section 2.5.1 of this opinion, the O&M Program includes maintenance of electrical transmission lines that are supported by steel-lattice towers, steel poles, and wooden poles. The majority of PG&E's electrical infrastructure in the Bay Area is located in terrestrial areas. Electrical infrastructure facilities to be maintained by the proposed O&M Program in tidal waters are limited to San Francisco Bay. Threatened CC Chinook salmon, threatened S-CCC steelhead, endangered CCC coho salmon, and their designated critical habitat are not present in San Francisco Bay.

In the freshwater portion of the action area, no electrical infrastructure is located in freshwater streams and no electrical infrastructure maintenance would be conducted in streams. Measures proposed by PG&E in terrestrial areas during work on electrical towers and poles are expected to prevent the degradation of water quality in streams with listed anadromous fish. Thus, electrical tower and pole repairs/replacements in terrestrial areas are anticipated to have no effect on threatened CC Chinook salmon, threatened S-CCC steelhead, endangered CCC coho salmon and their designated critical habitat.

Within the action area, PGE&E O&M Program activities that will affect threatened CC Chinook salmon, threatened S-CCC steelhead, and endangered CCC coho salmon are associated with

natural gas line maintenance and culvert repair/replacements on freshwater streams. Natural gas system O&M activities are described in Section 1.3.3 of the opinion. At stream crossings with listed anadromous fish, these activities consist of site-specific erosion measures over pipelines, pipeline recoating, pipeline replacement, valve recoating, and valve replacement. Proposed maintenance activities at access roads are described in Section 1.3.4 of the opinion. For access road maintenance at stream crossings with listed anadromous fish, the Program proposes to repair and replace culverts.

Table 5 of the opinion presents the known streams with listed anadromous fish and/or designated critical habitat in the action area where PG&E gas line activities may occur. There may be additional gas line crossings on streams with listed anadromous fish in the action area that were not identified by PG&E during consultation and are not listed in Table 5. For road maintenance work on culverts, the location of these stream crossing activities could occur throughout the nine-county O&M Program area, including sites on streams with listed anadromous fish and/or critical habitat. During implementation of the RGP, PG&E's pre-construction notifications for individual O&M activities will identify specific locations and specify whether or not listed anadromous fish or designated critical habitat may be present at work sites.

The proposed O&M activities associated with gas line infrastructure generally involve the excavation of soils to expose the gas line or valve, performing the recoating or replacement work (valve or pipeline), and then replacing the excavated materials to re-bury the pipeline. For site-specific erosion protection, biodegradable jute netting and other non-hardscape materials will be placed on exposed sections of pipeline in the stream channel to prevent further erosion. PG&E proposes to limit O&M activities associated with gas line crossings at waterways with listed anadromous fish to periods when the work sites are naturally dry (see NOAABA-AMM-13). By restricting gas line maintenance to sites that are naturally dry, no dewatering with cofferdams will be required and the potential adverse effects associated with excavation and trenching in wetted areas will be avoided. Similarly, proposed repair and replacement of culverts on streams with listed anadromous fish, will only be conducted by PG&E when work sites are naturally dry.

Sections 2.5.3 and 2.5.4 of the opinion present the potential effects of gas line O&M activities and culvert maintenance on freshwater streams with threated CCC steelhead and their designated critical habitat. These effects also apply to threatened CC Chinook salmon, threatened S-CCC steelhead, and endangered CCC coho salmon. With no flowing water present during work at sites on freshwater streams during O&M Program activities, no listed salmon or steelhead will be present and no effects during construction are expected. Post-construction, minor turbidity will occur in waters at work sites when the site is re-watered during the following wet season with rainfall, but use of erosion control measures and plantings of native vegetation are expected to minimize the mobilization of sediments from areas disturbed by construction activities. For these reasons, the effects of O&M activities at gas line infrastructure and culvert repair/replacement sites on water quality and riparian vegetation are expected to be insignificant for CC Chinook salmon, S-CCC steelhead, and CCC coho salmon.

Proposed site-specific erosion solutions on exposed gas line crossing have the potential to prevent lateral channel migration, effectively forcing streams into a simplified linear configuration. Simplified stream reaches typically produce limited macroinvertebrate prey and

provide poor functional habitat for rearing juvenile salmonids (Florsheim *et al*. 2008). Meandering streams create and maintain both the hydraulic and physical components of healthy instream habitat used by fish and other aquatic species (Spence *et al.* 1996). For erosion protection actions authorized by this RGP in waterways with listed anadromous fish, PG&E will not utilize any hardscape materials. Erosion protection materials will include jute netting, straw waddles, native plants, and hydroseeding. Materials will be placed in the channel to avoid constricting flow and not increase water velocities in the channel. Additionally, erosion protection projects will not span more than 20 percent of the active channel width and not exceed 500 square feet per site (NOAABA-AMM-14). These measures will significant limit the extent of impacts on channel morphology and stream hydraulics. The 20 percent channel width limit, combined with placement of materials to not constrict flow nor increase water velocities, will ensure fish passage is unaffected and the channel maintains existing features that provide complex rearing, feeding, spawning, and shelter habitat. On average, only two site-specific erosion protection projects would be performed per year in anadromous salmonid streams throughout the nine-county action area. Based on the proposed measures and limits for erosion protection activities at gas line crossings, the effects of this O&M Program element are expected to be insignificant on CC Chinook salmon, S-CCC steelhead, and CCC coho salmon.

Culverts can impair fish passage, streamflow and bedload transport in streams. To ensure all culvert projects on streams with listed anadromous salmonids do not produce adverse effects, PG&E proposes to design culverts to conform with NMFS guidelines for fish passage at stream crossings (NOAABA-AMM-15). Culvert project designs will be presented to NMFS and the Corps in Pre-Construction Notification packages for NMFS review prior to construction. Via this implementation procedure, all culvert repairs and replacements by the Program will be designed and constructed to ensure fish passage is not impaired, and streamflow and bedload transport are unimpeded. In some cases, the Program's repair and replacement of culverts would improve fish passage conditions over the baseline condition at existing undersized culverts. For these reasons, the effects of O&M activities at culverts on fish passage and streams in the action area are expected to be insignificant on CC Chinook salmon, S-CCC steelhead, and CCC coho salmon.

The action area is located within designated critical habitat for CC Chinook salmon, S-CCC steelhead, and CCC coho salmon. Effects to designated critical habitat will include minor levels of turbidity post-construction, channel and habitat impairment from erosion solutions, and fish passage impairment at culverts. For reasons presented above, these construction and post-construction effects on designated critical habitat are expected to be insignificant.

2.12.3. Conclusion

Based on this analysis, NMFS concurs with the Corps that the proposed action is not likely to adversely affect the subject listed species and designated critical habitats.

2.12.4. Reinitiation of Consultation

Reinitiation of consultation is required and shall be requested by the Corps or by NMFS, where discretionary Federal involvement or control over the action has been retained or is authorized by law and (1) the proposed action causes take; (2) new information reveals effects of the action that may affect listed species or critical habitat in a manner or to an extent not previously considered;

(3) the identified action is subsequently modified in a manner that causes an effect to the listed species or critical habitat that was not considered in the written concurrence; or (4) a new species is listed or critical habitat designated that may be affected by the identified action (50 CFR 402.16).

3. MAGNUSON–STEVENS FISHERY CONSERVATION AND MANAGEMENT ACT ESSENTIAL FISH HABITAT RESPONSE

Section 305(b) of the MSA directs Federal agencies to consult with NMFS on all actions or proposed actions that may adversely affect EFH. Under the MSA, this consultation is intended to promote the conservation of EFH as necessary to support sustainable fisheries and the managed species' contribution to a healthy ecosystem. For the purposes of the MSA, EFH means "those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity", and includes the physical, biological, and chemical properties that are used by fish (50 CFR 600.10). Adverse effect means any impact that reduces quality or quantity of EFH, and may include direct or indirect physical, chemical, or biological alteration of the waters or substrate and loss of (or injury to) benthic organisms, prey species and their habitat, and other ecosystem components, if such modifications reduce the quality or quantity of EFH. Adverse effects on EFH may result from actions occurring within EFH or outside of it and may include site-specific or EFH-wide impacts, including individual, cumulative, or synergistic consequences of actions (50 CFR 600.810). Section 305(b) of the MSA also requires NMFS to recommend measures that can be taken by the action agency to conserve EFH. Such recommendations may include measures to avoid, minimize, mitigate, or otherwise offset the adverse effects of the action on EFH [CFR 600.905(b)].

This analysis is based, in part, on the EFH assessment provided by the Corps and descriptions of EFH for Pacific Coast Groundfish (Pacific Fishery Management Council (PFMC 2020), Coastal Pelagic Species (CPS) (PFMC 1998), and Pacific Coast Salmon (PFMC 2014) contained in the fishery management plans (FMPs) developed by the PFMC and approved by the Secretary of Commerce.

3.1. Essential Fish Habitat Affected by the Program

The Corps has determined that the proposed action would adversely affect EFH for various life stages of fish species managed under the Pacific Coast Groundfish, Coastal Pelagic, and Pacific Coast Salmon FMPs. This determination is based on the potential for O&M activities to result in disturbance of benthic habitat, increased turbidity, increased in-water sound and vibration, and other adverse effects to water quality. In addition, the Program action area includes areas designated as Habitat Areas of Particular Concern (HAPC) for various species of fish with the Pacific Coast Groundfish and Pacific Coast Salmon FMPs; estuaries and eelgrass are designated HAPC for both FMPs.

3.2. Adverse Effects on Essential Fish Habitat

NMFS has determined the proposed action would adversely affect EFH for various life stages of fish species managed under the Pacific Coast Groundfish, Coastal Pelagic, and Pacific Coast Salmon FMPs through (1) elevated levels of underwater sound, (2) disturbance to benthic

habitat, (3) impacts to water quality in the form of increased turbidity in the water column and suspension of sediments, (4) stream channel disturbance during repair and replacement gas lines at stream crossings, and (5) impacts to water quality associated with access road maintenance.

EFH may also be temporarily impacted by dewatering of construction areas in San Francisco Bay. Culvert repair and replacements in streams throughout the action area may have beneficial effects on EFH for Pacific Coast Salmon by upgrade passage conditions. The short-term and long-term effects of the Bay Area O&M Program's activities on EFH for the Pacific Coast Groundfish and Coastal Pelagic FMPs are generally the same as that presented in Section 2.5.1.8 of this opinion for designated critical habitat for the Southern DPS of green sturgeon. Effects to EFH for the Pacific Coast Salmon FMP are generally the same extent and type as described in Section 2.5.1.8 of this opinion for CCC steelhead designated critical habitat.

3.3. Essential Fish Habitat Conservation Recommendations

NMFS determined that the following conservation recommendations are necessary to avoid, minimize, mitigate, or otherwise offset the impact of the proposed action on EFH.

The Corps and PG&E should avoid and minimize adverse effects of EFH quantity and quality by:

1. follow Term and Condition #2(a) from the ITS in Section 2.9.2 above;
2. complete the monitoring and reporting described in Terms and Conditions #3(a), 3(b) 4(a) and 4(b) from the ITS in Section 2.9.2 above; and
3. follow the ESA conservation recommendation described in Section 2.10 above.

3.4. Statutory Response Requirement

As required by section 305(b)(4)(B) of the MSA, the Corps must provide a detailed response in writing to NMFS within 30 days after receiving an EFH Conservation Recommendation. Such a response must be provided at least 10 days prior to final approval of the action if the response is inconsistent with any of NMFS' EFH Conservation Recommendations unless NMFS and the Federal agency have agreed to use alternative time frames for the Federal agency response. The response must include a description of the measures proposed by the agency for avoiding, minimizing, mitigating, or otherwise offsetting the impact of the activity on EFH. In the case of a response that is inconsistent with the Conservation Recommendations, the Federal agency must explain its reasons for not following the recommendations, including the scientific justification for any disagreements with NMFS over the anticipated effects of the action and the measures needed to avoid, minimize, mitigate, or offset such effects [50 CFR 600.920(k)(1)].

In response to increased oversight of overall EFH program effectiveness by the Office of Management and Budget, NMFS established a quarterly reporting requirement to determine how many conservation recommendations are provided as part of each EFH consultation and how many are adopted by the action agency. Therefore, we ask that in your statutory reply to the EFH portion of this consultation, you clearly identify the number of conservation recommendations accepted.

3.5. Supplemental Consultation

The Corps must reinitiate EFH consultation with NMFS if the proposed action is substantially revised in a way that may adversely affect EFH, or if new information becomes available that affects the basis for NMFS' EFH Conservation Recommendations [50 CFR 600.920(l)].

4. DATA QUALITY ACT DOCUMENTATION AND PRE-DISSEMINATION REVIEW

The Data Quality Act (DQA) specifies three components contributing to the quality of a document. They are utility, integrity, and objectivity. This section of the opinion addresses these DQA components, documents compliance with the DQA, and certifies that this opinion has undergone pre-dissemination review.

4.1. Utility

Utility principally refers to ensuring that the information contained in this consultation is helpful, serviceable, and beneficial to the intended users. The intended users of this opinion are the Corps. Other interested users could include PG&E, California Department of Fish & Wildlife, San Francisco Bay Conservation and Development Commission, and San Francisco Bay Regional Water Quality Control Board. Individual copies of this opinion were provided to the Corps and PG&E. The document will be available within 2 weeks at the NOAA Library Institutional Repository [https://repository.library.noaa.gov/welcome]. The format and naming adhere to conventional standards for style.

4.2. Integrity

This consultation was completed on a computer system managed by NMFS in accordance with relevant information technology security policies and standards set out in Appendix III, 'Security of Automated Information Resources,' Office of Management and Budget Circular A-130; the Computer Security Act; and the Government Information Security Reform Act.

4.3. Objectivity

Information Product Category: Natural Resource Plan

Standards: This consultation and supporting documents are clear, concise, complete, and unbiased; and were developed using commonly accepted scientific research methods. They adhere to published standards including the NMFS ESA Consultation Handbook, ESA regulations, 50 CFR 402.01 et seq., and the MSA implementing regulations regarding EFH, 50 CFR part 600.

Best Available Information: This consultation and supporting documents use the best available information, as referenced in the References section. The analyses in this opinion and EFH consultation contain more background on information sources and quality.

Referencing: All supporting materials, information, data and analyses are properly referenced, consistent with standard scientific referencing style.

Review Process: This consultation was drafted by NMFS staff with training in ESA and MSA implementation, and reviewed in accordance with West Coast Region ESA quality control and assurance processes.

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71 FR 17757. 2006. Endangered and Threatened Wildlife and Plants: Threatened Status for Southern Distinct Population Segment of North American Green Sturgeon. Federal Register. 71:17757-17766.

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Reg. Meas. ID: 428347

PRE-CONSTRUCTION NOTIFICATION/NOTICE OF INTENT
PG&E Bay Area Operations and Maintenance Program

1. Activity Type(s) (select all that apply):

Natural Gas System Activities

- ☐ Fencing
- ☐ Site-Specific Erosion Solutions
- ☐ Internal Pipeline Inspection and Repair
- ☐ Pipeline Recoating
- ☐ Valve Recoating and Replacement
- ☐ Pipeline Cathodic Protection
- ☐ Pipeline Lowering and Replacement
- ☐ Water Diversion Techniques
- ☐ Pipeline Access

Electrical System Activities

- ☐ Substation Maintenance
- ☐ Tower Replacement or Repair
- ☐ Boardwalk Replacement or Repair
- ☐ Pole Reinforcement and Replacement
- ☐ Line Reconductoring
- ☐ Facility Access

2. Duly Authorized Representative (Project Contact):

Name: Phone Number:

Title: Email Address:

Address: City, State:

Zip Code:

3. Project Name:

4. Transmission Line/Tower/Pole/Pipeline Name(s)/Number(s):

5. Project Information

Street Address (if applicable): City:

County: Zip Code:

Latitude: Longitude:

Assessor's Parcel Number (APN):

6. Driving Directions:

7. Activity Purpose:

8. Description of Activity and Water Quality Impacts:

9. Site-Specific Avoidance and Minimization Measures (as applicable):

10. Description of Other Known Projects in the Vicinity Scheduled to Occur at the Same Time:

11. Anticipated Activity Timeframe:

Start Date: End Date:

12. USACE District: ☐ Sacramento ☐ San Francisco

13. RWQCB:

☐ Region 1 – North Coast
☐ Region 2 – San Francisco Bay
☐ Region 3 – Central Coast
☐ Region 5 – Central Valley

a. Endangered Species

Will the activity be located in an area with the potential for endangered species not covered by PG&E's Bay Area O&M Habitat Conservation Plan, Biological Opinions associated with the Regional General Permit, or the Programmatic Biological Opinion for delta smelt?

☐ Yes ☐ No

If yes, explain:

For activities in estuary/bay habitat, will the activity be conducted outside of the Limited Operating Period (June 1 to November 30)? ☐ Yes ☐ No

For activities that involve impact pile-driving or cofferdam installation in estuary/bay habitat, will the work occur beyond November 30? ☐ Yes ☐ No

For activities in estuary/bay habitat that do not involve impact pile-driving or cofferdam installation, will the work occur beyond January 15? ☐ Yes ☐ No

15. Riparian Tree Removal

Will the activity result in the removal of riparian trees? ☐ Yes ☐ No

If yes, fill out the table below for each tree to be removed.

Species Name	Common Name	Diameter at Breast Height	Indicate whether the tree is part of the overstory or understory
			☐ Overstory ☐ Understory
			☐ Overstory ☐ Understory
			☐ Overstory ☐ Understory
			☐ Overstory ☐ Understory

16. Temporary and Permanent Impacts

Temporary Impacts: Would your project result in temporary impacts? ☐ Yes ☐ No

If yes, attach the restoration plan.

Total Temporary Impacts: acres; linear feet

Permanent Impacts: Would your project result in permanent impacts? ☐ Yes ☐ No

Total Permanent Impacts: acres; linear feet

17. Other Agency Permits, Licenses, Agreements, Plans, and Email Correspondence

Fill out the table below for each related permit.

Related Permits	Have you applied? (yes/no)	If yes, have you received the permit? (yes/no)	Permit Type	ID Number (e.g., USACE file number)
USACE Nationwide Construction Permit Pre-Notification				
United States Fish and Wildlife Service Incidental Take Permit				
National Oceanic and Atmospheric Administration National Marine Fisheries Service Incidental Take Permit				
Other Federal Permits				
California Department of Fish and Wildlife Lake and Streambed Alteration Agreement				
Coastal Development Permit				
Other State Permits				
Local Permit(s)				
Construction Stormwater General Permit				

18. Receiving Waters Information[1]

Site ID	Waterbody Name	Impacted Aquatic Resource Type	Water Board Hydrologic Units (HUC 8)	Receiving Waters	Receiving Waters Beneficial Uses	303(d) Listing Pollutant (if any)
		☐ Lake ☐ Ocean/Bay/Estuary ☐ Riparian Zone ☐ Stream Channel ☐ Vernal Pool ☐ Wetland				
		☐ Lake ☐ Ocean/Bay/Estuary ☐ Riparian Zone ☐ Stream Channel ☐ Vernal Pool ☐ Wetland				
		☐ Lake ☐ Ocean/Bay/Estuary ☐ Riparian Zone ☐ Stream Channel ☐ Vernal Pool ☐ Wetland				
		☐ Lake ☐ Ocean/Bay/Estuary ☐ Riparian Zone ☐ Stream Channel ☐ Vernal Pool ☐ Wetland				

[1] For receiving waters information (e.g., beneficial uses, watershed identification, etc.), refer to the Regional Water Basin Plans on the applicable Regional Water Board website or the State Water Board's Plans and Policies website (www.waterboards.ca.gov/plans_policies/).

19. Individual Direct Impact Information

Please fill out the table below. Choose either “Permanent” or “Temporary” and either “Dredge” or “Fill/Excavation” once per row. Provide a restoration plan, as appropriate, demonstrating how any temporary impacts will be restored to pre-project conditions.

Latitude	Longitude	Impact Type	Site ID	Acres	Cubic Yards	Linear Feet	Dredge or Fill/Excavation
		☐ Permanent ☐ Temporary					☐ Dredge ☐ Fill/Excavation
		☐ Permanent ☐ Temporary					☐ Dredge ☐ Fill/Excavation
		☐ Permanent ☐ Temporary					☐ Dredge ☐ Fill/Excavation
		☐ Permanent ☐ Temporary					☐ Dredge ☐ Fill/Excavation

20. Proposed Compensatory Mitigation

Complete Attachment I: Permittee-Responsible Mitigation Proposal Form or Attachment II: Mitigation Banking Proposal Form depending on the type of compensatory mitigation proposed for the project.

Attachments (check all that apply):

- ☐ Site Map(s)*
- ☐ Additional Pages and/or Supplemental Information
- ☐ Drawings, or Design Plans *
- ☐ Pre-Project Site Photographs*
- ☐ Aquatic Resource Delineation Report
- ☐ Archaeological Information (under separate cover)
- ☐ Proposed Dewatering Plan
- ☐ Horizontal Directional Drill or Drilling Plan
- ☐Temporary Impact Restoration Plan
- ☐Water Quality Monitoring Plan
- ☐ Other Agency Correspondence, Permits, and Permit Applications
- ☐ Fee Check or Online Payment Receipt *
- ☐ Other(s) (list below):

ATTACHMENT I: PERMITTEE-RESPONSIBLE MITIGATION PROPOSAL FORM

I-1. Summary of Proposed Mitigation

I-2. Location

APN(s):	Ownership:
	Proponent(s):
County:	Sectional Coordinates (Mount Diablo Base Meridian):
Nearest City:	
Total Acres of APN(s):	

I-3. Summary of Proposed Mitigation by Water Type

Resource/Habitat Type Affected	Acres of Permanent Impact	Acres of Credit			
		Establishment	Restoration	Enhancement	Preservation
Lake					
Ocean/Bay/Estuary					
Riparian Zone					
Stream Channel					
Vernal Pool					
Wetland					

I-4. Summary of Proposed Mitigation by Species

Resource/Habitat Type Affected	Acres of Permanent Impact	Acres of Credit			
		Establishment	Rehabilitation	Enhancement	Preservation
Western snowy plover (*Charadrius alexandrinus nivosus*)					
California least tern (*Sternula antillarum browni*)					
Delta smelt (*Hypomesus transpacificus*)					
Palmate-bracted bird's-beak (*Chloropyron palmatum*)					
Soft bird's-beak (*Chloropyron molle* ssp. *molle*)					
Sonoma alopecurus (*Alopecurus aequalis* var. *sonomensis*)					

I-5. Supporting Attachments

ATTACHMENT II: MITIGATION BANKING PROPOSAL FORM

II-1. Bank Identification

Bank Name:
Bank Owner:

II-2. Location

APN(s):	Sectional Coordinates (Mount Diablo Base Meridian):
County:	

II-3. Summary of Proposed Mitigation by Water Type

Resource/Habitat Type Affected	Acres of Permanent Impact	Acres of Credit			
		Establishment	Rehabilitation	Enhancement	Preservation
Lake					
Ocean/Bay/Estuary					
Riparian Zone					
Stream Channel					
Vernal Pool					
Wetland					

II-4. Summary of Proposed Mitigation by Species

Resource/Habitat Type Affected	Acres of Permanent Impact	Acres of Credit			
		Establishment	Rehabilitation	Enhancement	Preservation
Western snowy plover (*Charadrius alexandrinus nivosus*)					
California least tern (*Sternula antillarum browni*)					
Delta smelt (*Hypomesus transpacificus*)					
Palmate-bracted bird's-beak (*Chloropyron palmatum*)					
Soft bird's-beak (*Chloropyron molle* ssp. *molle*)					
Sonoma alopecurus (*Alopecurus aequalis* var. *sonomensis*)					

Attachment B – Notice of Intent Instructions

How to Apply

Applicants seeking Pacific Gas and Electric Company Bay Area Operations and Maintenance Program authorization are required to submit a Notice of Intent (NOI) to the State Water Resources Control Board or the appropriate Regional Water Quality Control Board (collectively the Water Board). A map showing regional water board jurisdictional boundaries is available on the Water Board's website (http://www.waterboards.ca.gov/waterboardsmap.shtml). Addresses and contact information can be found in the online Staff Directory (https://www.waterboards.ca.gov/water_issues/programs/cwa401/docs/staffdirectory.pdf).

Regional Water Board NOI Submission
Submit the NOI and application fee to the Regional Water Board with jurisdiction where the proposed project impacts would occur. For projects that cross a regional board boundary, submit the NOI to the State Water Board as directed below.

State Water Board NOI Submission
For projects that cross a Regional Water Board boundary: submit the NOI and application fee to the State Water Board. The appropriate Regional Water Boards should also be provided a copy of any NOI submitted to the State Water Board. For State Water Board NOIs, mail to:

State Water Resources Control Board, Division of Water Quality
1001 I Street; 15th Floor
Sacramento, CA 95814
(SWBNWP@waterboards.ca.gov)

Fees

Fee amounts are determined according to the Cal. Code Regs., tit. 23, § 2200(a)(2) fee schedule (https://govt.westlaw.com/calregs/Document/IEEE14760D45A11DEA95CA4428EC25FA0?viewType=FullText&originationContext=documenttoc&transitionType=CategoryPageItem&contextData=(sc.DefaDef).

- A fee calculator is available online and may be used to **estimate** fees (https://www.waterboards.ca.gov/water_issues/programs/cwa401/#fees).
- Include only the application fee with your NOI. Water Board staff will determine whether any additional project fees are required during NOI review.
- Fees may be paid online or by check, money order, or cashier check. Information on how to make an online payment is available at the State Water Board's Fee Payment Website (https://www.waterboards.ca.gov/make_a_payment/). If fees are paid online prior to application submission, attach payment receipt to the NOI. Although fees should be included

with the NOI and submitted to the appropriate Water Board, **make all checks, money orders, and cashier checks payable to the "State Water Board**."

- Fees are subject to change.

Notice of Intent Review Process

To avoid project delays, submit an NOI as early as possible. Within 30 days of NOI receipt, Water Board staff will determine if the NOI is complete.

- Incomplete NOIs will be returned to the applicant with a request to provide information needed to determine the NOI complete. In cases where the NOI is incomplete and the applicant fails to provide the requested information, the Water Board may issue a Notice of Exclusion (NOE).
- If the NOI is determined complete, within 45 days of NOI receipt, the Water Board will either issue a Notice of Applicability (NOA) or an NOE.
    - If the Water Board does not issue an NOA or NOE within 45 days of receiving a complete NOI, the discharger may proceed with the project according to all applicable Certification conditions.
- An NOA authorizes the proposed activity for enrollment under the Certification. An NOE denies authorization and enrollment of the proposed activity under the Certification.

Definitions

Consider the following definitions while completing your NOI.

Permanent aquatic resource impacts will permanently change an aquatic resource to a non-aquatic habitat type or permanently changes the bottom elevation of an aquatic resource. Permanent impacts can result in physical loss of area and ecological degradation.

Temporary aquatic resource impacts are impacts that temporarily cause a physical loss or ecological degradation of an aquatic resource. The impact must be restored to pre-project conditions through natural ecological processes or active restoration in order to be classified as temporary. If the impact is not restored to pre-project condition, it is classified as permanent.

Consider the following instructions while completing the NOI form:

Activity Type

Identify the planned Activity Type(s).

Legally Responsible Party and Duly Authorized Representative Information

Duly Authorized Representative Name and Title: The Duly Authorized Representative (agent) is authorized to certify and submit applications or reports to the Water Boards on behalf of the Legally Responsible Party. Telephone number, email address, and the agent's mailing address (not the project address) including the street, city, state, and zip code must be provided.

Project Name: Provide the project name. The project name will be used in all correspondence referencing the project. Be sure the project name is consistent with other agency permits and applications for the same project, and is consistent on all maps, drawings, and reports. The project name should be clearly relevant to the project (e.g., Blue Creek Bridge Project; Jones Subdivision Road Widening Project).

Transmission Line/Tower/Pole/Pipeline Name(s)/Number(s): Provide the name and/or number of each transmission line, tower, pole and/or pipeline that will be affected by the project.

Project Information

Project Address: Provide the street address of the project location and the Assessor's Parcel Number (APN). If the proposed project does not have a physical street address, be as descriptive as possible in this section. For example, "Leisure Town Rd., 5.5 miles south of the intersection of I-80 and Leisure Town Rd."

Coordinates: Indicate the location for the center point of your project in decimal degrees (approximate location is acceptable). Assistance in determining a project's coordinates is widely available through various free online services or your local library.

Driving Directions: Provide directions to the project site from the nearest major intersection.

Activity Purpose: Provide a brief narrative description of the proposed project's end goal.

Description of Activity and Water Quality Impacts: Provide a detailed, technically accurate narrative description of the proposed project purpose, project design, all activities planned to complete the design. Include total impacts, area of ground disturbance and area of impact to all aquatic resources on the site (i.e., any and all streams, wetlands, lakes, ponds, beaches, shorelines, etc). If temporary diversions or impoundments of water, cofferdams, or similar structures are proposed, include a dewatering plan as required in Certification. If trimming of riparian vegetation is proposed, describe the species impacted and explain why trimming is necessary to complete the project.

Site-Specific Avoidance and Minimization Measures: Describe steps taken to avoid impacts to waters and measures incorporated into the project design to minimize loss of, or significant adverse impacts to, beneficial uses of waters of the state, including on-site restoration of the project area. A

description may include actions or methods proposed for erosion control, including winterization strategies to stabilize bare soils and revegetation proposals. A map may be included to indicate the approximate location and area of soil, land and vegetation disturbance, and proposed erosion and sediment control best management practices (BMPs) proposed to avoid and minimize project impacts to waters of the state, including BMPs for hazardous substances. Refer to the Procedures' state Supplemental Dredge or Fill Guidelines, subpart H, for actions to minimize adverse impacts to waters of the state. If the effects of impervious surfaces will be minimized through implementation of Low Impact Development treatments, describe those minimization treatments.

Description of Other Known Projects in the Vicinity Scheduled to Occur at the Same Time: Provide a brief description, including estimated adverse impacts of any projects implemented by the project applicant within the last year or planned for implementation by the applicant within the next year that are in any way related to the proposed activity or that may impact the same receiving water body(ies) as the proposed activity. For this item, the waterbody extends to a named source or stream segment identified in the relevant Regional Water Quality Control Plan (Basin Plan). Water Board Basin Plans are found on the applicable Regional Water Board Basin Plan webpage, and also located on the State Water Board's Plans and Policies website (https://www.waterboards.ca.gov/plans_policies/).

Anticipated Activity Timeframe: Provide the estimated start and end dates for the proposed project.

USACE District: Indicate whether the project impacts will occur within the boundaries of the Sacramento and/or San Francisco district.

RWQCB: Indicate which Water Boards Region(s) will be affected by the project.

Endangered Species: Indicate yes if your project will be located in an area with the potential for endangered species that is not covered by PG&E's Bay Area O&M Habitat Conservation Plan, Biological Opinions associated with the Regional General Permit, or the Programmatic Biological Opinion for delta smelt; indicate no if it will not. If yes, indicate which special status species will be affected and where special status impacts are expected to occur, if known, and indicate yes or no on the questions regarding whether or not the activity will be conducted outside of the estuary/bay Limited Operating Period; if impact pile-driving or cofferdam installation will occur in estuary/bay habitat beyond November 30; and if impact pile-driving or cofferdam installation will occur in estuary/bay habitat beyond January 15.

Tree Removal: Indicate yes if your project results in the removal of riparian trees; indicate no if it will not. If yes, populate the Riparian Tree Removal Table with the requested information, or attach a similar table if additional rows are needed.

- Species name
- Common name

- Diameter at breast height (DBH)
- Indicate if the tree(s) are part of the riparian overstory or understory

Temporary and Permanent Impacts

Temporary Impacts: Indicate yes if your project will result in temporary impacts to waters of the state. Provide the total temporarily impacted area in acres, to the nearest thousandth of an acre. Provide the total temporarily impacted length to the nearest whole foot. These quantities must match the sum of the temporary impact quantities provided in Table 3. If you are proposing temporary impacts attach a restoration plan, that contains all Certification requirements (a schedule; plans for grading of disturbed areas to pre-project contours; a planting palette with plan species native to the project area; seed collection location; invasive species management; performance standards; and maintenance requirements (e.g., watering, weeding, and replanting). A restoration plan must be provided before your NOI may be determined complete.

Permanent Impacts: Indicate yes if your project would result in permanent impacts; indicate no if it would not. Provide the total permanently impacted area in acres, to the nearest thousandth of an acre. Provide the total temporarily impacted length to the nearest whole foot.

Other Agency Permits, Licenses, Agreements, Plans, and Email Correspondence

Provide the following information for each permit from other agencies:

- **Have you applied?** Indicate yes if you have applied for the specified permit; indicate no if you have not.
- **Have you received the permit?** Indicate yes if you have received the permit; indicate no if you have not.
- **Permit Type:** Provide the name of the permit.
- **ID Number:** Provide the permit's identification number or unique identifier.

Receiving Waters Information: Populate Receiving Waters Information Table with the requested information as described below.

- **Impact Site ID:** Identify the impact site with a site ID. Site IDs should correspond to those used in project maps and other agency application materials.
- **Waterbody Name:** List the waterbody name found in the applicable Basin Plan. If the impact site ID occurs in an unnamed waterbody enter "unnamed" and provide the first named downstream receiving water. Contact Water Board staff for Basin Plan maps or general assistance completing this section, if needed. Regional Water Board Basin Plans are also located on the State Water Board's Plans and Policies website (https://www.waterboards.ca.gov/plans_policies/).

- **Impacted Aquatic Resource Type:** For each impact site ID, identify the impacted aquatic resource type from the following list: lake, ocean, bay, estuary, riparian zone, stream channel, vernal pool, or wetland. (More refined or precise resource classifications may be used in project plans and related documents.)
- **Water Board Hydrologic Units:** Identify the Water Board Basin Plan hydrologic unit code (HUC). Note that the Basin Plan HUC is not the same as a U.S. Geological Survey HUC. If unknown, indicate UNK and this information will be completed by Water Board staff.
- **Receiving Waters:** List the first downstream waterbody with beneficial use designation in the Water Board Basin Plan. If unknown, indicate UNK and this information will be completed by Water Board staff.
- **Receiving Waters Beneficial Uses:** List the beneficial use designation. If unknown, indicate UNK and this information will be completed by Water Board staff.
- **303d Listing Pollutant:** List pollutants for receiving waters that have a 303(d) impairment designation; if the water is not listed, indicate NA. If unknown, indicate UNK and this information will be completed by Water Board staff.

Individual Direct Impact Information: Populate the Individual Direct Impact Information Table with the requested information as described below. This table may be used for dredge or fill/excavation activities.

- **Latitude:** Provide the center coordinate of the impact site in decimal degrees.
- **Longitude:** Provide the center coordinate of the impact site in decimal degrees.
- **Impact Type:** Indicate if the impact at the impact site ID is permanent or temporary.
- **Site ID:** Identify the impact site with a site ID; site IDs should correspond with those used in the Receiving Waters Information Table.
- **Acres, Cubic Yards, and Linear Feet:** Provide the area in acres, volume in cubic yards dredged (if applicable), and length in linear feet for each impact site. For acres, round to the nearest thousandth of an acre.
- **Dredge or Fill/Excavation?** For each impact site, identify if the impact is from dredging or from fill/excavation activities.

Compensatory Mitigation Proposal(s)

- **Attachment I/II:** Complete the corresponding form (I or II) depending on whether the permittee responsible or mitigation bank mitigation is proposed. List the size, type, functions and values of the proposed mitigation. Describe the success criteria, monitoring, long-term funding, management, and protection details.

Attachments Checklist

Use the checklist to confirm the necessary documentation is attached to your NOI. If you determine one of the listed items does not pertain to your project, leave the checkbox empty:

- **Site Map(s):** Submit maps of sufficient detail to clearly illustrate all project elements, site characteristics, and impacts, with a scale of at least 1:24000 (1" = 200'). Acceptable map formats, listed in order of preference, are:
    - **GIS shapefiles:** Shapefiles must depict the boundaries of all project areas, site characteristics, and extent of aquatic resources impacted or avoided. Each shapefile should be attributed with the extent/type of aquatic resources impacted. Features and boundaries should be accurate to within 33 feet (10 meters). Identify datum/projection used and, if possible, provide map with north American datum of 1983 (NAD 83) in the California Teale Albers projection in feet.
    - **KLM files:** Saved from online mapping services. Maps must show the boundaries of all project areas and extent/type of aquatic resources impacted. Include URL(s) of maps. If this format is used, include a spreadsheet with the object ID and attributed with the extent/type of aquatic resources impacted.
    - **Other electronic format**: (CAD or illustration format) that provides a context for location (inclusion of landmarks, known structures, geographic coordinates, or USGS DRG or DOQQ). Maps must show the boundaries of all project areas and extent/type of aquatic resources impacts. If this format is used, include a table with the object ID and attributed with the extent/type of aquatic resources impacted.
    - Aquatic resource maps marked on paper **USGS 7.5 minute topographic maps or Digital Orthophoto Quarter Quads (DOQQ):** Original or legible copies are acceptable. Maps must show boundaries of all project areas and extent/type of aquatic resources impacted. If this format is used, include a spreadsheet with the object ID and attributed with the extent/type of aquatic resources impacted.
- **Additional Pages and/or Supplemental Information:** For example, if the requested information does not fit in the space provided on the form, or if you would like to provide supplemental information not requested in the NOI.
- **Drawings, or Design Plans:** As applicable, attach drawings, including plan and cross-section views, clearly depicting the location, size, and dimensions of the proposed activity, as well as the location of delineated waters on the site. The drawings should contain a title block, legend and scale, amount (in cubic yards, if applicable) and area (in acres) of fill, including both permanent and temporary impacts. The ordinary high-water mark or, if tidal waters, the mean high-water mark and high tide line, should be shown (in feet), based on National Geodetic Vertical Datum (NGVD) or other appropriate referenced elevation and design plans. Maps prepared according to the description below may satisfy some or all of this information.
- **Pre-Project Site Photographs:** Include a unique identifier, date stamp, written description of photo details, and latitude/longitude (in decimal degrees) or map indicating location of photo. Successive photos should be taken from the same vantage point to compare pre/post construction conditions.
- **Aquatic Resource Delineation Report:** Include if available.
- **Archaeological Information (under separate cover)**
- **USACE Upload Spreadsheet**

- **Proposed Dewatering Plan:** If not included in project description.
- **Horizontal Directional Drill or Drilling Plan:** Include if project involves Horizontal Directional Drilling or similar drilling operations.
- **Temporary Impact Restoration Plan:** Should include plans for restoring any proposed temporary impacts to pre-project conditions.
- **Water Quality Monitoring Plan:** Include if project involves planned work in water or stream diversions.
- **Other Agency Correspondence, Permits, and Permit Applications**: Attach other agency permits, applications, or correspondence as required.
- **Fee Check or Online Payment Receipt**

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
West Coast Region
777 Sonoma Avenue, Room 325
Santa Rosa, California 95404-4731

April 6, 2023 **Refer to NMFS No:** WCRO-2021-02887

James Mazza
Regulatory Division Chief
Department of the Army
San Francisco District, Corps of Engineers
450 Golden Gate Avenue
San Francisco, California 94102-3406

Re: Endangered Species Act Section 7(a)(2) Biological Opinion and Magnuson–Stevens Fishery Conservation and Management Act Essential Fish Habitat Response for the Pacific Gas and Electric Company's Bay Area Operation and Maintenance Program (Corps File No. 2018-00490S)

Dear Mr. Mazza:

Thank you for your letters of November 10, 2021, and April 4, 2023, requesting consultation with NOAA's National Marine Fisheries Service (NMFS) pursuant to section 7 of the Endangered Species Act of 1973 (ESA) (16 U.S.C. 1531 et seq.) for the Pacific Gas and Electric Company's (PG&E) Bay Area Operation and Maintenance Program (O&M Program). PG&E has applied for a regional general permit (RGP) from the U.S. Army Corps of Engineers (Corps) pursuant to Section 404 of the Clean Water Act of 1972, as amended, 33 U.S.C. § 1344 *et seq*., and Section 10 of the Rivers and Harbors Act of 1899, as amended, 33 U.S.C. § 403 *et seq*. PG&E proposes to conduct routine maintenance activities on electrical and natural gas infrastructure in the nine-county San Francisco Bay Area.[1]

The enclosed biological opinion is based on our review of the information provided by PG&E and the Corps for O&M Program activities and describes our analysis of potential effects on threatened Central California Coast steelhead (*Oncorhynchus mykiss*), threatened California Central Valley steelhead (*O. mykiss*), endangered Sacramento River Winter-run Chinook salmon *(O. tshawystsha)*, threatened Central Valley Spring-run Chinook salmon (*O. tshawystsha*), threatened Southern Distinct Population Segment of North American green sturgeon (*Acipenser medirostris*), and their designated critical habitats in accordance with section 7 of the ESA. In this biological opinion, NMFS concludes the proposed O&M Program activities are not likely to jeopardize the continued existence of these ESA-listed steelhead, salmon and green sturgeon, nor is it likely to adversely modify their critical habitat. However, NMFS anticipates take of these species will occur during Program activities and an incidental take statement is included with the enclosed biological opinion.

[1] The nine Bay Area counties consist of Alameda, Contra Costa, Marin, Napa, San Francisco, San Mateo, Santa Clara, Solano, and Sonoma counties.

NMFS has also found that the proposed O&M Program may affect, but is not likely to adversely affect threatened South-Central California Coast steelhead (*O. mykiss*), threatened California Coastal Chinook salmon (*O. tshawystsha*), endangered Central California Coast coho salmon (*O. kisutch*), and their designated critical habitat in accordance with section 7 of the ESA.

Thank you, also, for your request for consultation pursuant to the essential fish habitat (EFH) provisions in Section 305(b) of the Magnuson–Stevens Fishery Conservation and Management Act [16 U.S.C. 1855(b)] for this action. Based on NMFS' review, we concluded that the action would adversely affect EFH for species managed under the Pacific Coast Salmon, Pacific Coast Groundfish, and Coastal Pelagic Species Fishery Management Plans (FMP). Therefore, we have included the results of that review in Section 3 of the enclosed document.

Please contact Sara Azat at the California Coastal Office in Santa Rosa at sara.azat@noaa.gov or 707-575-6067 if you have any questions concerning this consultation, or if you require additional information.

Sincerely,



Alecia Van Atta
Assistant Regional Administrator
California Coastal Office

Enclosure

cc: Greg Brown, Corps of Engineers, San Francisco, CA (gregory.g.brown@usace.army.mil)
Matt Brown, PG&E, Fresno, CA (mvb5@pge.com)
Copy to E-file FRN 151422WCR2021SR00227

Endangered Species Act (ESA) Section 7(a)(2) Biological Opinion and Magnuson–Stevens Fishery Conservation and Management Act Essential Fish Habitat Response

Pacific Gas and Electric Company Bay Area Operation and Maintenance Program
NMFS Consultation Number: WCRO-2021-02887

Affected Species and NMFS' Determinations:

ESA-Listed Species	Status	Is Action Likely to Adversely Affect Species?	Is Action Likely to Jeopardize the Species?	Is Action Likely to Adversely Affect Critical Habitat?	Is Action Likely to Destroy or Adversely Modify Critical Habitat?
Central California Coast Steelhead (*Oncorhynchus mykiss)*	Threatened	Yes	No	Yes	No
California Central Valley Steelhead (*O. mykiss*)	Threatened	Yes	No	Yes	No
Sacramento River Winter-run Chinook (*O. tshawytscha*)	Endangered	Yes	No	Yes	No
Central Valley Spring-run Chinook (*O. tshawytscha*)	Threatened	Yes	No	Yes	No
North American Green Sturgeon (*Acipenser medirostris*)	Threatened	Yes	No	Yes	No
South-Central California Coast steelhead DPS (*O. mykiss*)	Threatened	No	NA	No	NA
California Coastal Chinook (*O. tshawytscha*)	Threatened	No	NA	No	NA
Central California Coast Coho Salmon (*O. kisutch*)	Endangered	No	NA	No	NA

Fishery Management Plan That Identifies EFH in the Project Area	Does Action Have an Adverse Effect on EFH?	Are EFH Conservation Recommendations Provided?
Pacific Coast Salmon	Yes	Yes
Pacific Coast Groundfish	Yes	Yes
Coastal Pelagic Species	Yes	Yes

Consultation Conducted By: National Marine Fisheries Service, West Coast Region

Issued By: 

Alecia Van Atta
Assistant Regional Administrator
California Coastal Office

Date: April 4, 2023

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1. INTRODUCTION

This Introduction section provides information relevant to the other sections of this document and is incorporated by reference into Sections 2 and 3, below.

1.1. Background

NOAA's National Marine Fisheries Service (NMFS) prepared the biological opinion (opinion) and incidental take statement (ITS) portions of this document in accordance with section 7(b) of the Endangered Species Act (ESA) of 1973 (16 U.S.C. 1531 et seq.), as amended, and implementing regulations at 50 CFR part 402.

We also completed an essential fish habitat (EFH) consultation on the proposed action, in accordance with section 305(b)(2) of the Magnuson–Stevens Fishery Conservation and Management Act (MSA) (16 U.S.C. 1801 et seq.) and implementing regulations at 50 CFR part 600.

We completed pre-dissemination review of this document using standards for utility, integrity, and objectivity in compliance with applicable guidelines issued under the Data Quality Act (DQA) (section 515 of the Treasury and General Government Appropriations Act for Fiscal Year 2001, Public Law 106-554). The document will be available within two weeks at the NOAA Library Institutional Repository [https://repository.library.noaa.gov/welcome]. A complete record of this consultation is on file at California Coastal NMFS office.

1.2. Consultation History

In 2017, the Pacific Gas and Electric Company (PG&E) finalized a Habitat Conservation Plan and obtained an ESA Section 10(a)(1)(B) incidental take permit from the U.S. Fish and Wildlife Service (FWS) for the Bay Area Operation and Maintenance Program (O&M Program). The FWS Section 10(a)(1)(B) permit authorized the incidental take of several terrestrial species and fairy shrimp. In 2019, PG&E began preparing an application for a regional general permit (RGP) from the U.S. Army Corps of Engineers (Corps) pursuant to Section 404 of the Clean Water Act of 1972, as amended, 33 U.S.C. § 1344 *et seq*., and Section 10 of the Rivers and Harbors Act of 1899, as amended, 33 U.S.C. § 403 *et seq*., for O&M Program activities in waters of the U.S in the nine Bay Area counties, consisting of Alameda, Contra Costa, Marin, Napa, San Francisco, San Mateo, Santa Clara, Solano, and Sonoma counties.

PG&E with the assistance of a consultant team, prepared a draft biological assessment which evaluated the effects of O&M Program activities on listed species under the jurisdiction of the NMFS. The January 2020 administrative draft of this biological assessment was submitted by PG&E to NMFS for review and comment.

On June 4, 2020, PG&E, their consultants, and NMFS met via teleconference to discuss the scope of activities proposed for inclusion in the RGP.

NMFS and PG&E had several conference calls between August and December 2020 to discuss Program activities, scope of the programmatic consultation, and conservation recommendations.

On February 1, 2021, NMFS leadership met with PG&E representatives to discuss O&M Program activities and information needs for the NMFS-Corps section 7 consultation.

On March 9, 2021, PG&E provided a revised draft of the biological assessment for NMFS review, and discussions between NMFS, the Corps, and PG&E representatives continued through March, April and May 2021 regarding the scope of the consultation. Based on the information provided in the draft biological assessment it was determined that proposed O&M Program work in freshwater streams occurs primarily, but not exclusively, in ephemeral waterways that are not occupied by listed anadromous fish. In addition, the generalized descriptions of O&M activities in freshwater streams presented in the March 2021 biological assessment did not provide sufficient information for NMFS to assess potential effects on listed fish in freshwater areas. Therefore, the Corps, NMFS, and PG&E agreed to focus the consultation on O&M activities associated with electrical infrastructure in tidal waters because these activities are routinely permitted by the Corps and potential effects on listed fish are well understood and predicable.

A revised draft biological assessment was provided to NMFS on June 18, 2021, and discussions continued between NMFS and PG&E to clarify the project description, scope of activities, and development of avoidance/minimization measures.

By letter dated November 10, 2021, the Corps requested formal consultation with NMFS for PG&E's O&M activities within tidal waters and tidal wetlands of San Francisco Bay. With the consultation request, the Corps provided a biological assessment and EFH Assessment, prepared by Insignia Environmental and titled *National Oceanic and Atmospheric Administration - National Marine Fisheries Service Biological Assessment for the Regional General Permit for Pacific Gas and Electric Company's Bay Area Operation and Maintenance Program, October 2021* (BA).

During February, March and April 2022, NMFS, the Corps, and PG&E representatives exchanged information regarding the project description. Specifically, NMFS requested additional details on tower replacement and eelgrass avoidance measures from PG&E.

During August and September 2022, NMFS, the Corps and PG&E representatives exchanged information regarding pile driving and the proposed mitigation program. A revised biological assessment was submitted on September 9, 2022, to NMFS and the Corps for review.

On September 29, 2022, the Corps transmitted to NMFS the final biological assessment for PG&E's O&M Program activities in tidal waters. Due to a minor error in Table 12 of the biological assessment, a revision was made by PG&E's consultant team on September 30, 2022. The final biological assessment was transmitted to NMFS on September 30, 2022 (September 2022 Biological Assessment).

A revised version of the September 2022 Biological Assessment's Technical Appendix A was provided by PG&E to NMFS on November 22, 2022.

During December 2022, NMFS determined that additional information and conservation measures were required to assess gas line crossing activities within freshwater streams. On December 12, 2022, PG&E representatives provided the geographic coordinates for 482 gas pipeline crossings in the nine Bay Area counties project area. Review by NMFS staff determined that approximately 110 of these crossings overlap with listed fish and critical habitat. The NMFS review of gas line crossing locations also revealed that three additional listed fish species (*i.e.*, threatened California Coastal Chinook salmon, endangered Central California Coast coho salmon, and threatened South-Central California Coast steelhead) may be affected by the O&M Program.

Between January and March 2023, NMFS and PG&E continued work together to identify gas line crossing sites that may affect listed anadromous fish and develop conservation measures for these freshwater work locations. On April 4, 2023, a supplemental biological assessment was transmitted to NMFS by the Corps for PG&E Bay Area O&M Program (March 2023 Supplemental Biological Assessment), and the Corps clarified that their request for formal consultation included all of the RGP's proposed activities in tidal waters and freshwater streams in the Bay Area. The Corps also requested on April 4, 2023, NMFS concurrence with the Corps' finding that the O&M Program would not adversely affect threatened California Coastal Chinook salmon, endangered Central California Coast coho salmon, threatened South-Central California Coast steelhead, and their designated critical habitat.

On July 5, 2022, the U.S. District Court for the Northern District of California issued an order vacating the 2019 regulations that were revised or added to 50 CFR part 402 in 2019 ("2019 Regulations," see 84 FR 44976, August 27, 2019) without making a finding on the merits. On September 21, 2022, the U.S. Court of Appeals for the Ninth Circuit granted a temporary stay of the district court's July 5 order. On November 14, 2022, the Northern District of California issued an order granting the government's request for voluntary remand without vacating the 2019 regulations. The District Court issued a slightly amended order two days later on November 16, 2022. As a result, the 2019 regulations remain in effect, and we are applying the 2019 regulations here. For purposes of this consultation and in an abundance of caution, we considered whether the substantive analysis and conclusions articulated in the biological opinion and incidental take statement would be any different under the pre-2019 regulations. We have determined that our analysis and conclusions would not be any different.

1.3. Proposed Federal Action

Under the ESA, "action" means all activities or programs of any kind authorized, funded, or carried out, in whole or in part, by Federal agencies (see 50 CFR 402.02). Under the MSA, "Federal action" means any action authorized, funded, or undertaken, or proposed to be authorized, funded, or undertaken by a Federal agency (see 50 CFR 600.910).

The Corps proposes to authorize PG&E to conduct routine O&M activities on natural gas and electric transmission distribution infrastructure within wetlands and non-wetland waters of the U.S. within the nine-county San Francisco Bay Area.[2] The Corps would issue the RGP pursuant

[2] The nine Bay Area counties consist of Alameda, Contra Costa, Marin, Napa, San Francisco, San Mateo, Santa Clara, Solano, and Sonoma counties.

to Section 404 of the Clean Water Act of 1972, as amended, 33 U.S.C. § 1344 *et seq*. and Section 10 of the Rivers and Harbors Act of 1899, as amended, 33 U.S.C. § 403 *et seq*. The RGP would provide authorization for five (5) years and may be renewed for a total duration of up to 10 years.

PG&E's O&M Program includes activities in terrestrial areas, tidal waters, and freshwater streams. Electrical infrastructure O&M activities will be performed in terrestrial areas and tidal waters (see Section 1.3.2). Natural gas line system O&M activities will be performed in terrestrial areas, tidal waters, and freshwater streams (see Section 1.3.3). Access road maintenance will be performed in terrestrial areas and freshwater streams (see Section 1.3.4). As described in Section 2 of this opinion, eight listed species of anadromous fish may be affected by PG&E's O&M Program. Table 1 provides a summary of listed fish species affected by PG&E O&M activities. Figure 1 presents a map of the Bay Area and overview of PG&E's O&M Program facilities associated with electrical towers and natural gas lines.

Table 1. Categories of O&M Activities and Affected ESA-Listed Fish

PG&E O&M Activity	Area Work Conducted	ESA-Listed Fish Species Present
Electrical Transmission Tower Repair and Replacements	Estuarine	Central California Coast Steelhead
		California Central Valley Steelhead
		Sacramento River Winter-run Chinook
		Central Valley Spring-Run Chinook
		Southern DPS Green Sturgeon
	Terrestrial	n/a
Natural Gas System Infrastructure Repair and Replacement	Estuarine	Central California Coast Steelhead
		California Central Valley Steelhead
		Sacramento River Winter-run Chinook
		Central Valley Spring-Run Chinook
		Southern DPS Green Sturgeon
	Stream Crossings	Central California Coast Steelhead
		South-Central California Coast Steelhead
		California Coastal Chinook
		Central California Coast Coho
	Terrestrial	n/a
Access Road Maintenance	Stream Crossings	Central California Coast Steelhead
		South-Central California Coast Steelhead
		California Coastal Chinook
		Central California Coast Coho
	Terrestrial	n/a

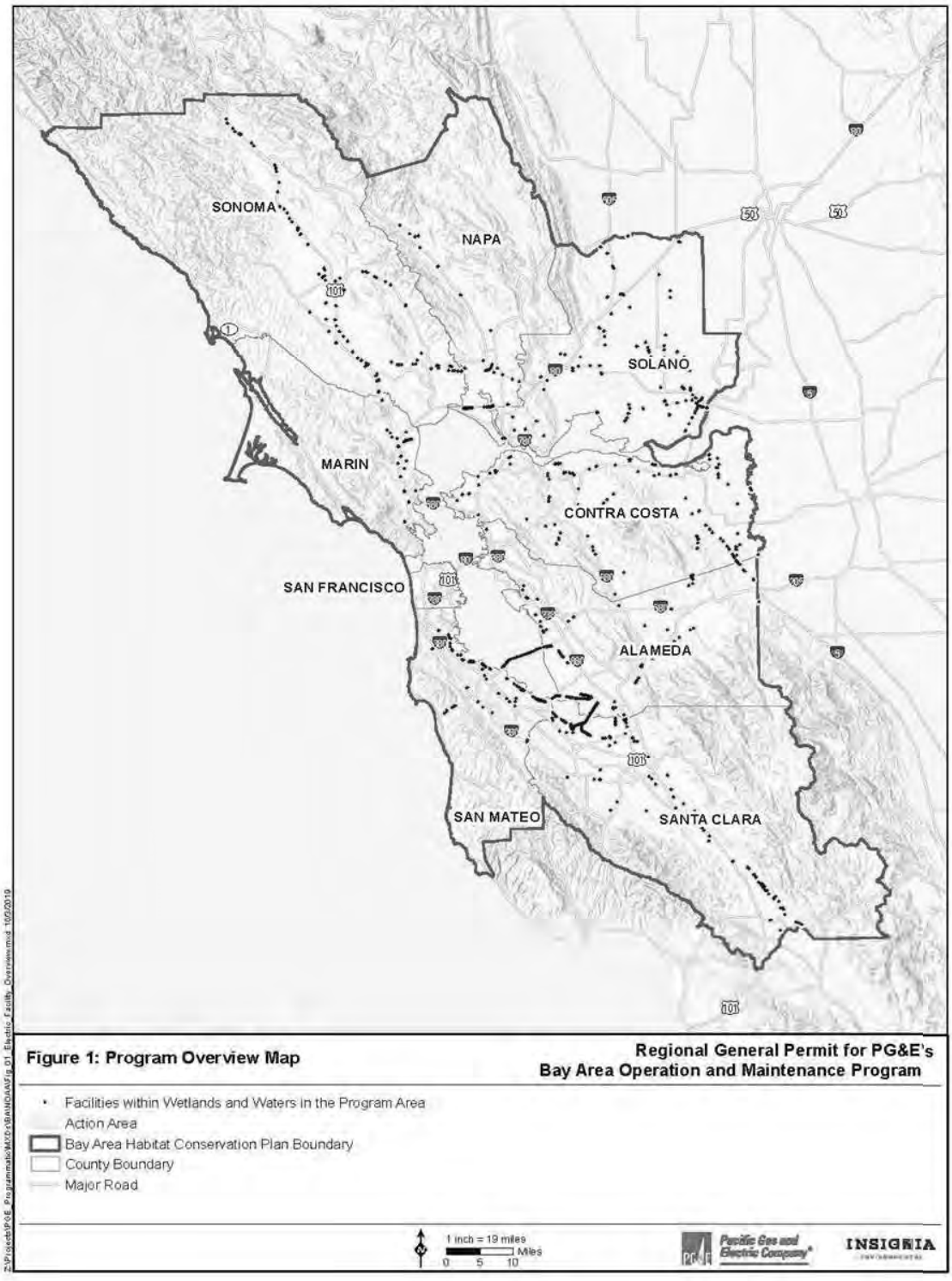


Figure 1. Action Area and Overview of PG&E Bay Area O&M Program Facilities (Source: PG&E Bay Operations September 2022 Biological Assessment)

1.3.1. RGP Implementation Procedures

The RGP implementation process is described in Section 4 of the March 2023 Supplemental Biological Assessment. PG&E will prepare and submit to the Corps project-specific Pre-Construction Notification packages for each proposed O&M Program activity conducted under the RGP. The Pre-Construction Notification must include, among other things, a complete project description, location, construction timing, avoidance/minimization measures, and mitigation actions. The Corps will review each Pre-Construction Notification to confirm eligibility under the RGP and PG&E may not proceed until the Corps provides written approval.

For those activities that may affect NMFS listed fish and/or critical habitat, the Corps or PG&E will provide copies of Pre-Construction Notification packages to NMFS for review. The Corps with input from NMFS will confirm that all Program limits, avoidance/minimization measures, and mitigation requirements developed for this programmatic consultation and required by the RGP are included. For proposed O&M Program actions that do not meet all the requirements of the RGP or this programmatic consultation, the Corps would initiate and complete individual ESA/EFH consultations with NMFS prior to authorizing these activities.

1.3.2. Electrical Infrastructure O&M Activities

PG&E proposes routine maintenance on electrical infrastructure in the Bay Area to maintain safety and operability. The electrical transmission system in the Bay 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. The distribution system includes primary and secondary distribution lines that deliver electricity and distribution transformers that reduce voltage from distribution to utilization (i.e., residential or commercial) levels. Primary distribution lines carry three-phase AC power in the 2–50 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 electrical power for lighting and most appliances.

PG&E conducts patrols of its lines and associated facilities annually or on more frequent basis. Inspections of electrical tower footings and poles are performed 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. 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. 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.

The majority of electrical infrastructure O&M activities will be conducted in terrestrial areas. No electrical infrastructure is located in freshwater streams; thus, no electrical tower or pole repair/replacement activities will be conducted in freshwater streams. Some electrical

infrastructure work will be performed by the O&M Program in tidal wetland and estuarine waters in Suisun Bay, Grizzly Bay, San Pablo Bay, and San Francisco Bay, collectively referred to as the San Francisco Bay in this opinion. Table 2 provides a summary of the proposed electrical tower repair and boardwalk activities in tidal areas that may affect listed fish and/or designated critical habitat, and includes the typical equipment used, activity duration, anticipated annual frequency, and average project footprint in fish habitat.

For the purposes of this consultation PG&E has categorized the proposed electrical infrastructure O&M activities in tidal areas as "high" or "low" impact (Table 3). Activities that are defined as high include pile driving or cofferdam installation, and may result in adverse impacts to listed fish species, critical habitat, or EFH. These activities require additional avoidance, minimization or mitigation measures (see Section 1.3.5 of this opinion). All high impact activities would be conducted during a limited operating period (LOP) between June 1 and November 30. Low impact activities would also be conducted between June 1 and November 30, but low impact activities may extend work until January 15, provided that these activities are initiated prior to November 30 of the previous year.

Table 2. Summary of Activities in Tidal Waters

Activity	Equipment	Duration of Each Project	Number in Tidal Habitat	Frequency	Average Footprint in Habitat
Tower Repair and Replacement	Barge, helicopter, rubber mats, metal sheet piles, plywood, concrete, vibratory hammer, impact hammer, and piles	7 to 35 days	121 facilities	17 towers per year	500 square feet
Boardwalk Repair and Replacement	Boat, barge, helicopter, generator and handheld equipment (including drills, chain saws, and circular saws)	60 days	50 miles	15 sections of various lengths per year	variable

Table 3. Activity Type and Impact Level in Tidal Waters

Activity	Impact Level
Tower Repair and Replacement without Pile Driving or Cofferdam Installation	Low
Tower Repair and Replacement with Pile Driving or Cofferdam Installation	High
Boardwalk Repair or Replacement	Low

1.3.2.1 Tower Replacement and Repair

Tower replacement and repair work includes work at the tower site and access to the construction tower site. Replacement refers to the removal of an existing tower and replacement

with a new tower. Tower repair includes the cleaning and repair of concrete tower caps, installation of fiberglass casings, and tower painting. PG&E may temporarily place a rubber mat at the base of each footing as a work area during O&M activities.

Access to towers may occur from existing boardwalks, a temporary section of boardwalk, or crews may utilize a barge as a work area. A helicopter or barge may be used to place construction materials on the boardwalk or barge, and then materials would be moved to the work site by hand. Most minor tower repairs would be conducted from existing boardwalks. A barge with a crane or helicopter would be used to repair or replace the upper portion of the tower, in areas where there are no existing boardwalks, and/or where construction of a temporary boardwalk is not feasible. Depending on the local conditions, the work barges may rest on the bottom of the bay at low tide.

Old tower footings may be abandoned in place or removed in association with tower foundation repairs and replacements (see Section 1.3.2.2). Footing removal would be assessed on a case-by-case basis depending on the impact of removing the footing, or whether the remaining footing would be a hazard to navigation. Cofferdams would be installed to conduct footing removals in tidal waters (see Section 1.3.2.6 of this opinion for additional information regarding cofferdams). Degraded wooden pilings would be removed by being cut at mudline level at low tide.

1.3.2.2 Tower Foundation Repair or Replacement

Tower foundation repair or replacement work in subtidal and intertidal habitats would generally be performed with cofferdams. Cofferdams would be installed during low tide around a tower footing or around the entire tower to isolate the work area from the waters of San Francisco Bay (see Section 1.3.2.6 of this opinion for additional information regarding cofferdams). The cofferdam would keep the enclosed work area dry and minimizes the mobilization of sediment during construction activities.

To strengthen tower foundations, some concrete from the existing footings is removed to expose the steel (rebar) reinforcements. New pins are inserted, a new rebar cage is installed, and concrete forms are constructed. Concrete will be mixed off site and delivered to work sites via helicopter or barge. A form is constructed around the footing to hold the concrete during curing. The concrete is then poured, allowed to cure, and the form is removed. In some instances, grade beams, which hold pile caps together and strengthen tower foundations, are installed between adjacent foundations. This involves installing forms, pouring concrete, and removing the forms. Once the repair is complete, the cofferdam is removed by excavating around the outside and hoisting it from the workspace.

In instances where a complete replacement or new foundations are required, piles are first installed adjacent to the existing foundation (see Section 1.3.2.7 of this opinion for additional information regarding pile driving). Once piles are installed, a new tower foundation is created on the piles. When all replacement work is complete, the cofferdams are removed as described above.

A crew of six to 10 personnel is typically required for tower foundation repair or replacement, and work would occur over a period of 7 to 35 days to complete each tower. Access may occur

on existing roads where available. In-water access occurs through the use of boats and barges for towers within San Francisco Bay and tributaries/tidal sloughs that are large enough for barges to access.

1.3.2.3 Boardwalk Replacement or Repair

PG&E has more than 50 miles of boardwalks that service their electrical transmission facilities in the vegetated marshes, mudflats, and open waters around the San Francisco Bay. The boardwalks typically extend from levees and provide access across marshes and salt ponds to electrical tower footings. Support equipment for replacement and repair of boardwalks include, but is not limited to, boats, barges, and helicopters. A 100-foot by 200-foot staging yard located on land is often also used to store materials. All boardwalk replacement and repair activities are completed manually and require the use of generators and handheld equipment, including, but not limited to drills, chain saws, and circular saws. A crew of three to five personnel conducts the repair or replacement activities and this work typically takes up to 60 days to complete. Crews typically work from existing installed sections of boardwalks, which minimizes the need for access below and around the boardwalk. However, in some instances, work is conducted from barges and/or from the mudflat (*i.e.,* unvegetated sediment) during low tide.

Based on the muddy, soft substrate that is commonly encountered during boardwalk replacement and repair activities, replacement pilings are typically pushed into the mud by using a steel bar for leverage. This method does not require hammering or striking that will result in vibratory or noise disturbance to aquatic species. Occasionally, small pilings may be hammered into place by hand using sledgehammers or similar tools when substrates and sediments require it. Piling installation via hammer or sledgehammer generally requires five to 10 strikes to install a single piling. Each 4-inch by 4-inch piling is made of plastic lumber. Degraded pilings that have been replaced will be removed as close to the mudline as possible by being cut at mudline level during low tide.

Replacement planking is transported along the boardwalk on special hand-dollies. Planking is then slid into place, drilled, and bolted. If the existing section of boardwalk is substantially degraded, crews perform the work within an approximately 10-foot radius around the boardwalk section being replaced. Handrails are then installed (or replaced), which are wood planks that are connected to the boardwalk with support beams.

1.3.2.4 Pole Reinforcement and Replacement

Proposed pole reinforcement methods include attaching trusses to existing poles to provide additional support or the use of a polyvinyl chloride product to reinforce deteriorating wood poles. The most common method to restore ground-level strength to utility poles involves the installation of a single (or in some cases, a double) steel truss. The reinforced pole remains in place next to the installed truss. Composite fabric sheets may also be used for reinforcement of poles. Sheets are wrapped around the pole in layers and a resin material is applied to each layer. PG&E determines the type of reinforcement method after reviewing the results of an inspected line segment. This may require the installation of guy wires and anchors, by line truck auger, which could consist of a screw or a concrete structure. The work is generally performed by a crew of two to five personnel and takes 1 to 2 days to complete.

Pole replacement involves framing the new pole (i.e., crossarms, pins, insulators, grounds, bonding, markers, and any equipment are installed) on the ground adjacent to the existing pole prior to setting the replacement pole in the ground. To replace a pole, the line is typically de-energized. A line truck auger is used to drill a hole, the new pole is placed into the new hole, the void is backfilled and compacted, and 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. Pole and equipment replacement and repair would require an approximately 10-foot-long by 7-foot-wide work area. The work is generally performed by a crew of four to five personnel and is completed in one day for a distribution pole and up to three days for a transmission pole. Pole replacements conducted by the O&M Program will not be performed in tidal waters or freshwater streams.

1.3.2.5 Line Reconductoring

Line reconductoring involves the replacement of conductors (i.e., wires) once the wires begin to show wear or cannot handle the transmission load or if increased capacity is required. Work crews install replacement conductors by temporarily splicing them to the ends of the existing conductors and pulling them through travelers (i.e., pulleys) attached to the arms of the towers or pole cross-arms. Conductor replacement is performed with boom trucks, winches, and in some cases, a helicopter may be used.

Reconductoring typically is done in 2 to 3-mile sections with the use of temporary pull and tension sites (*i.e.*, pull sites). Several pieces of equipment are used at the pull sites, including tensioners (*i.e.*, 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. This work is generally conducted by a crew of three to eight personnel and potentially one helicopter crew over a period of 1 to 2 months. Although PG&E avoids locating pull sites above water, the geometry of the alignment, pole/tower placement, or topography may require that some pull sites are located on the water. On-water pull sites will be located on a work barge. Aside from utilizing a work barge, no in-water work is associated with line reconductoring activities.

1.3.2.6 Cofferdam Construction in Tidal Waters

As discussed above, cofferdams may be installed to perform tower repairs/replacements in tidal areas. Cofferdams would be constructed of 1.125-inch (approximately) plywood and support beams, or constructed using metal sheet piles. Plywood cofferdams would be installed by first clearing the mud, by hand, from the base of the footing and the plywood is pushed down to 3-foot depth (approximately). Metal sheet pile cofferdams would installed using a vibratory hammer operated from a barge. Mud and sediments removed during construction would be reused on site, or bagged and taken to a landfill. Cofferdams would be installed and closed during low tide. Any water in the cofferdam would be pumped directly onto the adjacent land or into the adjacent water. Avoidance and minimization measures and best management practices for cofferdam installation and dewatering are provided in Section 1.3.5 below.

1.3.2.7 Pile Installation

As discussed above, installation of piles may be required for tower repairs and replacements. Pile types include wood, steel, and concrete piles. Concrete piles would be cast in place using a hollow steel pile as the casing or form. Installations would occur by helical pile driving, vibratory hammer pile driving, and impact hammer pile driving. Helical pile driving is a relatively new method of pile installation where large piles are screwed into the soil instead of being driven with a hammer. The type of pile installation utilized at each site will be determined by the site characteristics (e.g., soil or substrate type) and/or the availability of pile type. Avoidance and minimization measures for pile driving include work windows, hammer cushions, and bubble curtains (see Section 1.3.5 below).

The majority of the pile-driving activities required for tower repair/replacements and foundation repairs/replacements will occur within muddy, fine materials, and soft habitat that range from clay (very fine) to silt to sand (relatively course). Additionally, approximately 92% of the tower foundations where pile driving will occur are located in water depths at or above mean lower low water (MLLW); approximately 7% are located in water depths between 0 and -15 feet MLLW; and less than 1% is located in water depths below -15 feet MLLW. A barge mounted vibratory or impact hammer, or a combination of the two, would be used to drive the piles. A helical pile driver or impact hammer may be utilized to install piles to their final depth. Piles would range from 16 to 72 inches in diameter. When an impact hammer is used, up to 2,000 strikes may occur per day.

When 24-inch diameter piles or smaller are used to repair foundations at a single tower, approximately 16 piles are installed and pile driving would last between 16 and 24 days. When 60-inch diameter piles are used to repair foundations at a single tower, four piles are installed and pile driving would typically take between 6 and 15 days. Installation of 72-inch piles would be similar to 60-inch diameter piles.

1.3.3. Natural Gas System O&M Activities

PG&E acquires natural gas in open markets and moves it (by means of compression) through a series of compressor stations prior to use or storage. Gas is distributed to individual residential and business customers via smaller, lower-pressure distribution pipelines, transitioning from high-pressure lines to smaller, low-pressure lines via pressure regulators or gas pressure-limiting stations. In the Bay Area, PG&E owns and operates a compressor station and 1,820 miles of transmission pipelines, which convey natural gas to 19,350 miles of distribution lines.

Proposed PG&E natural gas line O&M activities will primarily occur in terrestrial areas; although gas line crossings at streams is common and a small number of gas lines are located in tidal wetlands or estuarine waters. Natural gas line O&M activities consist of site-specific erosion measures over pipelines, pipeline recoating, pipeline replacement, valve recoating, and valve replacement. These proposed activity types would occur in terrestrial areas and at waterway crossings throughout the nine counites of San Francisco Bay Area. Table 4 provides a summary of these activities. Table 5 presents the known streams with listed anadromous fish and/or designated critical habitat in the action area with PG&E gas line crossings. Although unlikely, there may be additional gas line locations on streams with listed anadromous fish or

critical habitat that were not identified by PG&E during consultation and are not listed in Table 5. During implementation of the RGP, PG&E's pre-construction notifications for individual O&M activities will identify specific locations and specify whether or not listed anadromous fish or designated critical habitat may be present at work sites.

Table 4. Summary of Natural Gas System O&M Activities in Streams with Listed Anadromous Fish

Activity	Description	Equipment	Duration	Expected Frequency	Footprint in Habitat
Site-Specific Erosion Measures	Protection of gas lines at sites of scour and erosion though placement of biodegradable jute, riprap, and rock	Trucks, backhoe, and excavator	1 to 14 days	2 per year	Up to 500 square feet of permanent impact per project
Pipeline Recoating	Gas lines are recoated with epoxy.	Backhoe, sandblaster, plastic sheeting and tarps, and shot-blasting machine	3 to 5 days	2 per year	No new permanent impacts
Valve Recoating and Replacement	Gas valves are recoated with epoxy or replaced.	Trucks, backhoe, excavator, sandblasting, coating machine, and crane	4 to 6 days for recoating; 28 to 35 days for replacement	1 per year	Up to 200 square feet of permanent impact per project
Pipeline Replacement	Excavation of trench and pipe segments are replaced.	Truck, bulldozer, excavator, frac tank, sideboom, and welding rig	28 to 168 days	2 per year	Up to 2,500 square feet of permanent impact per project

Table 5. Gas Crossing Streams with Listed Anadromous Fish and Critical Habitat[3]

Gas Crossing Number[4]	Stream Name	Likely to Support Year-Round Flow[5]
14	Norton Slough	
15	West Slough	
16, 17	Russian River	YES
24	Tributary to Windsor Creek	
25, 27	Windsor Creek	
26	Mill Creek	
28	Cañon Creek	
29	Napa River	YES
79	Napa River	
30	Putah Creek	
33, 34, 35	South Fork Putah Creek	
38	Tributary to Santa Rosa Creek	
43, 44, 52, 53, 54	Santa Rosa Creek	
45, 46, 48	Tributary to Santa Rosa Creek	
73, 75, 78	Laguna de Santa Rosa	
99	Lindsey Slough	
112	Schell Creek	
113	Huichica Creek	
114	Unnamed Stream	
115	Unnamed Stream	
116, 117, 118, 119	Suscol Creek	
131	Adobe Creek	
132	Green Valley Creek	
135	Cordelia Slough	YES

[3] Additional gas line crossing locations with listed anadromous salmonids and/or designated critical habitat in the Bay Area O&M Program action area (see Figure 1) may be identified during implementation of the RGP.

[4] Reference number from March 2023 Supplemental Biological Assessment. Each reference number refers to a separate gas line crossing.

[5] NOAABA-AMM-13 limits gas line O&M activities in streams with listed anadromous fish and/or designated critical habitat to periods when channels are naturally dry; O&M activities will not be performed in stream channels at these locations if streamflow is present.

Gas Crossing Number[4]	Stream Name	Likely to Support Year-Round Flow[5]
146	Schultz Slough	
149, 150	San Antonio Creek	
183	Sacramento River	YES
185, 186	Grizzly Island Tidal Slough	YES
197	Montezuma Slough	YES
203, 206	Novato Creek	
218, 223	Miller Creek	
226, 227	Taylor Slough - Jersey Island	YES
228	Gallinas Creek	
229, 230	Dutch Slough - Jersey Island	YES
238	Pinole Creek	
239	Pacheco Creek	YES
240	Arroyo del Hambre	
247	Alhambra Creek	
251	Rock Slough	YES
256, 257	Old River	YES
258, 259	Wildcat Creek	
261, 262	Alhambra Creek	
265, 266	Corte Madera Creek	
269, 270	Werner Dredger Cut	YES
338	Arroyo Las Positas	
350	Arroyo Valle	
352	Colma Creek	
360, 363, 364	Vallecitos Creek	
365	Alameda Creek	YES
371, 372, 376, 377	San Mateo Creek	YES
384, 385, 386	Tidal Slough Tributary to Lower Coyote Creek	YES
394, 395, 396,	Apanolio Creek	
387, 397, 399	Pilarcitos Creek	
402, 403	San Francisquito Creek	
404, 405, 415, 416	Coyote Creek	YES

Gas Crossing Number[4]	Stream Name	Likely to Support Year-Round Flow[5]
427, 428, 432, 437, 438, 443, 451	Coyote Creek	
413	Mountain View Slough	YES
414	Stevens Creek	YES
417, 419, 424	Guadalupe River	YES
445	Guadalupe River	
422, 423	Los Trancos Creek	
426	Upper Penitencia Creek	
441	Los Gatos Creek	

1.3.3.1 Site-Specific Erosion Measures at Gas Lines

In locations where scour and erosion within a waterway has exposed a gas pipeline, PG&E proposes to construct site-specific solutions to the erosion problem. Site-specific solutions would consist of placement of biodegradable jute netting, riprap, and rock fill over the exposed portions of the pipeline. These erosion solutions are designed to protect the exposed pipeline and prevent further erosion from occurring. The extent of the erosion solution will typically not be longer than 100 feet or wider than 50 feet on any stream in the program area. Installation will typically begin with preparing the site for installation of the erosion solution. This may involve clearing vegetation and minor recontouring in the area of existing erosion. Once prepared, the erosion solution will be delivered to the site on a truck and placed in the prepared area. The erosion solution will then be installed according to the manufacturer's specifications. Erosion solutions may require geotechnical investigations to design and install.

For scour and erosion solution activities in waterways with listed anadromous fish and/or designated critical habitat (see Table 5), PG&E proposes measures to ensure activities do not degrade fish habitat, impair natural channel functions, or impede fish passage. Specifically, no hardscape will be installed within the streambed or banks at any project sites with listed anadromous fish and/or designated critical habitat. In streams with listed anadromous fish, PG&E will use non-hardscape solutions such as biodegradable jute netting, straw, hydroseeding, waddles, and native plants. In addition, site-specific erosion protection structures will not span more than 20 percent of the active channel width and will not exceed 500 square feet per site. Site-specific erosion measures will be designed to not constrict flow in the channel and not increase water velocities in the channel. Installation of scour and erosion protection will only be conducted when work sites are naturally dry; no dewatering or cofferdams will be utilized for this activity. If work activities impact riparian vegetation, sites will be revegetated with native plant species in a manner consistent with maintaining safety at PG&E's infrastructure. A crew of two to eight personnel is usually required over a period of up to 14 days. PG&E expects to conduct two erosion protection projects per year in waterways with listed anadromous fish and/or designated critical habitat.

1.3.3.2 Pipeline Recoating

When a natural gas line's costing has deteriorated, PG&E proposes to recoat pipelines with epoxy to protect them from degradation and external corrosion. Once recoating is determined to be required, the pipeline segment is excavated using a backhoe. The surface of the pipe is then prepared for the new coating by running a self-contained grit- or shot-blasting machine over the exposed area. The pipeline continues to operate while a coating machine applies the coating. Upon completion of the recoating, sediment excavated to exposed the pipe will be replaced to cover the pipeline and the surface contoured to return the site to pre-construction conditions.

Recoating of pipelines may be conducted at stream crossings. As with site-specific erosion activities, pipeline recoating at stream crossings with listed anadromous fish/critical habitat (see Table 5) will only be performed when the site is naturally dry. No stream dewatering or cofferdams will be used to dewater work sites for recoating of pipelines. When recoating is completed, the trench will be backfilled with the previously excavated materials and the streambed/banks re-countered to pre-construction conditions. On average, an approximately 20-foot-wide work area is needed for this activity. No new permanent impacts are anticipated with this activity, as all work will be performed within the existing pipeline alignment. If work activities impact riparian vegetation, sites will be revegetated with native plant species in a manner consistent with maintaining safety at PG&E's infrastructure. A crew of approximately four to six personnel conducts this activity. Pipeline recoating typically takes 3 to 5 days to complete at stream crossings. PG&E expects to conduct two pipeline recoating projects per year in waterways with listed anadromous fish and/or designated critical habitat.

1.3.3.3 Valve Recoating and Replacement

Proposed O&M Program activities include the recoating and replacement of valves on gas pipelines. Depending on the condition of the valve, PG&E either recoats or replaces the values. Prior to replacing or installing valves, PG&E will isolate portions of the pipeline where work will be performed and excavation may be required to expose the valve. Once the valve has been exposed through excavation, recoating is conducted by sandblasting the valve over tarps, collecting the debris, and recoating the valve with a specialized epoxy that protects against corrosion. The recoating process generally takes 4 to 6 days to complete, and would be conducted by a crew of six to 13 personnel.

Valve replacement involves excavation of soils to access the existing valve and adjacent segment of pipeline, removal of the existing valve (and potentially a segment of the adjacent pipeline), installation of the new valve, and backfill of the excavated area. Valve recoating or replacement typically involves excavating an area 40 feet by 60 feet to access the valves. Each valve replacement typically takes 28 to 35 days to complete, and would be performed with the same equipment as recoating.

PG&E identified only two valves in the O&M Program area that are located within 100 feet of waterways supporting listed anadromous fish and/or critical habitat. If work is required at either of these valves, only one would be worked on per year. Valve recoating or replacement activities would not be performed in wetted areas of waterways with anadromous fish. Excavation of materials to expose valves located near waterways with listed anadromous fish would be

performed without disturbing the stream channel. If work activities impact riparian vegetation, sites will be revegetated with native plant species in a manner consistent with maintaining safety at PG&E's infrastructure.

1.3.3.4 Gas Pressure Limiting Station Construction

PG&E may install new pressure limiting stations on natural gas lines. Human population densities determine the class location of pipeline designations. A change in the class location designation may trigger the installation of a pressure limiting station. Pressure limiting stations lower the pressure of the gas in a line. A typical station encompasses a footprint of approximately 250 feet by 100 feet, including above ground pipe and valve structures, and a small control building surrounded by security fencing. Pressure limiting stations will not be located in tidal waters or freshwater streams.

1.3.3.5 Pipeline Replacement

Proposed O&M Program activities include the replacement of sections of natural gas lines. Some replacements may also include lowering the pipeline. The equipment typically required for pipeline segment replacement includes a truck, bulldozer, excavator, frac tank, forklift, lowboy and trailer, sideboom, water truck, and a welding rig. Pipeline segment replacement begins with clearing and grading the right-of-way, and trenching and excavating the existing pipeline. A new trench is excavated for the new pipeline segment parallel and adjacent to the existing pipeline. PG&E typically places the new section of pipe as close to the abandoned pipeline as possible and modifies any existing easements by expanding the easement width to accommodate the new section of pipeline.

The length of affected pipe varies, depending on the reason for replacement. The minimum length of pipe replaced is typically 40 feet. For longer pipeline segment replacements, a welded and coated pipe is lifted and lowered into the trench by sideboom tractors and excavators. Padded slings are used so the tractors can lower the pipe without damaging the pipe's protective coating. For shorter pipeline replacements, especially sections damaged by third parties or corrosion, replacements are typically within the same alignment. Old pipeline segments may be removed or abandoned in place.

Following the placement of the new pipeline segment and removal of any existing segments, all trenches are then backfilled. Backfilling the trench involves replacing and compacting the excavated subsoil into the trench and re-spreading the stockpiled topsoil, if appropriate, to return the surface to its original grade. Native material excavated from the pipeline trench is used to backfill the trench.

In most cases, pipeline replacements are not located in waters. However, there may be some segments within waters, including waters containing listed anadromous fish and their critical habitat. As described above for erosion measures and pipeline recoating, PG&E proposes to only perform pipeline replacements at stream crossings with listed anadromous fish/critical habitat (see Table 5) when the site is naturally dry. No stream dewatering or cofferdams will be used to dewater work sites for pipeline replacements. When the new pipe segment is installed, the trench will be backfilled with the previously excavated native materials and the streambed/banks re-

countered to pre-construction conditions. If work activities impact riparian vegetation, sites will be revegetated with native plant species in a manner consistent with maintaining safety at PG&E's infrastructure.

The O&M Program also proposes to ensure gas line crossing activities do not create any fish passage impediments for anadromous species. NOAABA-AMM-15 requires PG&E to evaluate all pipeline replacement and abandonment activities at sites with listed anadromous fish and/or critical habitat and confirm that the project design conforms with the most current NMFS guidelines for fish passage at stream crossings.

On average, trenching for pipeline replacement typically requires a 10-foot wide excavation area. A crew of approximately 15 to 20 personnel is required to conduct this activity. Approximately 14 to 28 days are required to complete small pipeline replacements. Although most pipeline replacement actions will occur within the existing pipeline footprint, there may be sites where minor adjustments to the alignment are required.

1.3.4. Road Maintenance for Facility Access

Access to PG&E's electrical infrastructure and gas line facilities requires routine maintenance of roads. Routine road maintenance activities for the O&M Program will include blading to smooth over washouts, eroded areas, and washboard surfaces as needed. Access road maintenance could also include cleaning ditches, moving and establishing berms, clearing and making functional drain inlets, clearing and establishing water bars, and cleaning and repairing over-side drains. Road maintenance activities will primarily be conducted in upland areas and outside of waterways with listed anadromous fish. However, the O&M Program may also repair/replace culverts on streams to ensure safe access to and from PG&E electrical infrastructure and natural gas line facilities. The location of these stream crossing activities could occur throughout the nine-county O&M Program area, including sites on streams with listed anadromous fish and/or critical habitat (See Table 5).

At some O&M project sites a temporary bridge may be installed on an existing roadway to cross a channel. Portable, prefabricated bridges will be used and remain in place for the duration of the O&M project, which can range from a few days to 24 weeks. Temporary bridges will be installed over a stream crossing as a clear-span structure (NOAABA-AMM-15). No bridge structural elements will extend into the channel and a crane would be used to place the bridge without disturbing the channel or waters of the stream. No new roads with be constructed in associated with temporary bridges or culvert repairs/replacements.

Construction activities associated with culvert repair/replacement would not occur in flowing waters on streams with listed anadromous salmonids/critical habitat. PG&E proposes to only conduct culvert work at stream crossings when the work sites are naturally dry (NOAABA-AMM-13). No stream dewatering or cofferdams will be used to dewater work sites for road maintenance activities in streams with anadromous fish and/or critical habitat. In addition, PG&E will ensure that all culvert activities at sites with listed anadromous fish and/or critical habitat will be designed to meet the most current NMFS guidelines for fish passage at stream crossings (NOAABA-AMM-15). If work activities impact riparian vegetation, sites will be revegetated with native plant species in a manner consistent with maintaining safety at PG&E's

infrastructure (NOAABA-AMM-16). No more than two culvert repair/replacement or bridge crossing projects will occur per year on streams with listed anadromous fish and/or critical habitat. Each culvert replacement project may permanently affect up to 5,000 square feet of area.

1.3.5. Avoidance and Minimization Measures

PG&E's proposed avoidance and minimization measures for the O&M Program are presented in the September 2022 Biological Assessment, Section 2.1 and Attachment A. Additional and revised avoidance and minimization measures are presented in the March 2023 Supplemental Biological Assessment, Section 4.

Measures presented below are a sub-set of the proposed measures and designed to address water quality, listed fish species, elevated underwater sound levels, and fish habitat. All proposed avoidance and minimization measures are presented in the September 2022 Biological Assessment and the March 2023 Supplemental Biological Assessment.

BA-AMM-03: Annual Reporting. PG&E will prepare and submit an annual report to the U.S. Fish and Wildlife Service (USFWS) and NOAA Fisheries by March 31 for O&M activities conducted during the previous calendar year. The annual report will include a brief description of each project (e.g., project type and location), as well as any listed species observed and designated critical habitat or sensitive habitat in which worked was conducted. In addition, specific detail regarding the status of the project construction (i.e., not constructed, under construction, or completed); date of project implementation and duration of construction; a listing of pile size, type, and installation methods; estimated length of boardwalks repaired or replaced, and materials used; mitigation information; and any underwater noise monitoring will be included in the annual report.

WQ-AMM-01: **Discharge from Construction.** Discharge of the following to surface waters, ground waters, or land will be prohibited:

- unset cement, concrete, grout or damaged concrete spoils;
- water that has contact uncured concrete or cement; or
- concrete related washout.

If concrete washout is necessary at a site, washout containment will be used to prevent any discharge. Wastewater will be delivered to and disposed of at a sanitary wastewater collection system/facility (with authorization from the facility's owner or operator) or a properly licensed disposal or reuse facility.

WQ-AMM-02: Refueling Procedure. Vehicular and equipment refueling within 250 feet from the edge of vernal pools, and 100 feet from the edge of other wetlands, streams, or waterways is prohibited. If refueling must be conducted closer to wetlands, a secondary containment area subject to review by an environmental field specialist and/or biologist will be constructed. Spill prevention and cleanup equipment will be maintained in refueling areas.

BA Attachment A: Activity Specific Erosion and Sediment Control Plan. PG&E will develop and implement an Activity-Specific Erosion and Sediment Control Plan (A-ESCP) for

all construction projects, and good-housekeeping best management practices (BMPs) are implemented throughout the year. PG&E's Good Housekeeping A-ESCP with standard BMPs is presented as Attachment A to the BA.

WQ-AMM-03: In-Water Activities. The duration of in-water activity will be limited to the minimum amount of time necessary to conduct O&M activities

WQ-AMM-04: Staging and Storage Area. Staging and storage areas for equipment, materials, fuels, lubricants, and solvents will be located away from wetlands and waters, as feasible, in areas where spoil or accidental spills cannot be washed into the water feature.

NOAABA-AMM-01: Boat Access and Docking. Every effort will be made to minimize disturbance to subtidal and wetland vegetation. During boat access, boats will be docked to existing facilities or landed in areas that minimize the potential impact to subtidal and wetland vegetation. Barges will be placed on mudflats in such a manner that subtidal and wetland vegetation is not disturbed. Work crews will be trained to avoid vegetated areas, and foot traffic will be confined to existing facilities, mudflats, and established work areas to minimize disturbance to vegetation.

NOAABA-AMM-02: Dewatering in Tidal Waters. All water pumps used during initial dewatering and fish relocation will follow the intake screen criteria identified in NOAA Fisheries' *Juvenile Fish Screen Criteria for Pump Intakes (1996) See https://media.fisheries.noaa.gov/dam-migration/fish_screen_criteria_for_pumped_water_intakes.pdf.* Water remaining in the cofferdam will be pumped directly onto the adjacent land at low tide when feasible, and a qualified biological monitor will be present. If pumping water onto adjacent land is not feasible, water will be pumped into open water or mudflats directly adjacent to the cofferdam. Fish encountered during dewatering will be carefully relocated by a NOAA Fisheries and U.S. Fish and Wildlife Service-approved fisheries biologist to suitable habitat adjacent to work areas, per NOAABA-AMM-03. Dewatering activities will not be conducted within streams that support federally listed fish.

NOAABA-AMM-03: Fish Salvage and Relocation in Isolated Tideland Pools and Cofferdam Dewatering in Tidal Waters. An experienced fisheries biologist will be present to observe cofferdam dewatering activities whenever pumps are operating and monitor work in tidal waters that may hold salmonids in isolated pools. The agency-approved biologist will ensure that fish species do not become trapped against the cofferdam filter and any fish that were not swept out of the work area will be rescued. Efforts will be made to reduce collecting and handling stress, minimize the time that fish are held in buckets, and minimize handling stress during processing and release. Fish collection efforts will be conducted using sweep and block nets and will occur within the cofferdam area until multiple passes have been conducted and substantial depletion or absence of fish has been documented. Rescued fish will be released 100 feet away from the cofferdam, or at another location approved by NOAA Fisheries as soon as possible. Additional fish salvage and relocation procedures include the following:

- No employee or contractor will remove any fish, dead or alive, from the site for personal use. All efforts to reduce the time that live fish are out of the water will be made to

reduce the chances of fish injury or death during the fish rescue. All fish will be promptly returned to the water.

- Listed fish species will be processed first and released as soon as possible. All fish species will be recorded on data sheets, as well as the time and date that each individual was caught; location where the individual was caught; gear type used; water temperature; total number of individuals caught; and any other pertinent observations of the fish.

- After the fish rescue effort is completed, dewatering of the area will continue. The agency-approved biologist and/or fish rescue biologist will provide a worker education program in the event that additional fish may remain within the dewatering area. The biologist will return to the site to rescue additional fish if the workers observe them within the dewatering area.

- If any turtles or snakes are captured during fish rescue, they will be relocated to the fish release site(s).

Following dewatering and relocation of fish, further monitoring by an experienced fisheries biologist will no longer be required for the dewatered area, unless the integrity of the cofferdam seal is compromised and the work area becomes re-watered.

NOAABA-AMM-04: Seasonal Avoidance in Estuary/Bay Waters for Low-Impact Activities. In-water O&M activities that do not include impact hammer use and do not include cofferdam construction are considered "low-impact activities". Low-impact activities within the San Francisco, San Pablo, Suisun, and Grizzly bays will occur during the limited operating period (LOP) (i.e., between June 1 and November 30) to the maximum extent possible in order to avoid Chinook salmon and steelhead migration.

If necessary, in-water O&M activities that do not involve impact pile driving or cofferdam installation will be allowed to occur between June 1 and January 15, provided the activities are initiated prior to November 30. No new O&M activities will be initiated outside of the LOP, and PG&E will finish the activity as soon as logistically possible based on site-specific construction conditions. PG&E will provide compensatory mitigation at an increased ratio for permanent impacts from O&M activities conducted after November 30. (see Section 6 -Compensatory Mitigation in the Project's September 2022 Biological Assessment).

Pole reinforcement and repair above mean high water, as well as tower and/or boardwalk repair and replacement above mean high water, are not subject to this LOP, as PG&E expects potential effects to federally listed fish species will be minimal or will not occur.

NOAABA-AMM-05: Seasonal Avoidance in Estuary/Bay Waters for High-Impact Activities. In-water O&M activities that include impact hammer use and/or cofferdam construction are considered "high-impact activities". High-impact activities within the San Francisco, San Pablo, Suisun, and Grizzly bays will be planned and scheduled to occur between June 1 and November 30. No impact pile driving will be initiated if it cannot reasonably be completed by November 30. If unforeseen circumstances prevent the completion of pile driving

by November 30, PG&E will request an extension from the Corps on a case-by-case basis to complete the pile driving that has already been initiated.

Pole reinforcement and repair above mean high water, as well as boardwalk repair and replacement, are not subject to this LOP, as PG&E expects potential effects to federally listed fish species will be minimal or will not occur.

NOAABA-AMM-06: Soft Start. Prolonged, soft-start procedures will be implemented when impact pile driving is required for piles greater than 20 inches in diameter in waters that provide habitat for federally listed anadromous fish species. Soft-starts will include pile driving at 40- to 60-percent reduced energy for at least 15 seconds, followed by a 1-minute waiting period. This procedure will be repeated at least two times before commencing full-energy impact pile driving.

NOAABA-AMM-07: Eelgrass Bed Avoidance. PG&E will avoid all eelgrass (*Zostera spp*.) beds. If any O&M activities must occur within eelgrass beds. PG&E will comply with NOAA Fisheries' California Eelgrass Mitigation Policy and Implementing Guidelines (NOAA Fisheries 2014a), including pre- and post-construction surveys to assess impacts to eelgrass.

NOAABA-AMM-08: Installation of Piles. PG&E will prioritize using a vibratory hammer to install piles, but when an impact hammer is necessary, only one hammer will be used at a time with no more than 2,000 strikes per day on piles within an individual work area. PG&E will also utilize sound attenuation devices during pile-driving (e.g., hammer cushions, bubble curtains, dewatered cofferdams, dewatered isolation casings, etc.). Air bubble curtains would be utilized for impact driving of piles larger than 12 inches in diameter unless the work site is dewatered by a cofferdam. In instances when impact driving is limited to periods of low tide and water depths are less than 4 inches for the entire duration of the pile driving, air bubble curtains are not required. In addition, pile-driving activities that require multiple days at the same location will occur at least 12 hours apart to avoid impacts to federally listed fish species.

NOAABA-AMM-09: Installation of Cofferdams. PG&E will prioritize using a vibratory hammer to install sheet pile cofferdams, but when an impact hammer is necessary, only one hammer will be used at a time with no more than 2,000 strikes per day on piles within an individual work area. PG&E will also utilize sound attenuation devices during pile-driving (e.g., hammer cushions, bubble curtains, dewatered cofferdams, dewatered isolation casings, etc.). In addition, pile-driving activities that require multiple days at the same location will occur at least 12 hours apart to avoid impacts to federally listed fish species. Cofferdams will be installed and closed during low tide.

NOAABA-AMM-10: Hydroacoustic Monitoring. PG&E will conduct hydroacoustic monitoring during the installation of all 72-inch piles when cofferdams are not utilized. PG&E will also conduct hydroacoustic monitoring during the installation of the first 60-inch pile at each discrete tower location when cofferdams are not used. If the sound pressure levels (SPLs) do not exceed 206 decibels (dB) peak and/or the daily accumulated sound exposure level (cSEL) does not exceed 187 dB during the monitoring (see Table 7 in the Project's September 2022 Biological Assessment) of the installation of the first 60-inch pile, PG&E may stop monitoring activities at that tower location. If SPLs or cSEL dB levels exceed limits established in Table 7 of the Project's September 2022 Biological Assessment for 60-inch piles, PG&E will take

additional measures to reduce the sound impacts below established sound impact limits. Monitoring will continue at these locations and will only stop when noise is recorded on a continuing basis (one full day or approximately 2,000 strikes) below the thresholds established in Table 7 of the September 2022 Biological Assessment. PG&E will continue to implement these measures for all remaining 60-inch piles at the locations where they were implemented. Hydroacoustic monitoring will only occur when water depth is 3 feet or greater at mean lower low water to allow for adequate depth for hydrophone placement. PG&E will report the results of the monitoring in their annual report using the NMFS Underwater Noise Monitoring Plan Template.

NOAABA-AMM-11: Removal of Piles. Pile removal will occur using either a vibratory hammer or direct pull method of extraction. A vibratory hammer/extraction must be attempted first unless it presents a greater risk of disturbance to sediments (*i.e.,* contaminants are present). The direct pull method will be utilized if it is more appropriate for the substrate type, pile length, and structural integrity of the piling.

NOAABA-AMM-12: Removal of Cofferdams. Cofferdam removal will occur using either a vibratory hammer or direct pull method of extraction. A vibratory hammer/extraction must be attempted first unless it presents a greater risk of disturbance to sediments. The direct pull method will be utilized if it is more appropriate for the substrate type, pile length, and structural integrity of the piling.

NOAABA-AMM-13: In-Stream Work During Dry Conditions Only. Activities performed in streams known to support or with the potential to support listed fisheries (having suitable habitat and connectivity to known fisheries streams) and streams designated as critical habitat will be conducted during naturally dry conditions. In addition, trenching and pipeline excavation activities will not be conducted within flowing streams that provide federally listed fish habitat.

NOAABA-AMM-14: Hardscape Limitation. No hardscape (i.e., rock, concrete, or other hard structural material) will be installed within the bed or banks of any stream that is known to support listed fish or that has suitable habitat, including designated critical habitat, for listed fish as well as connectivity to known listed fisheries streams. Site-specific erosion protection structures will not span more than 20 percent of the active channel width and will not exceed 500 square feet per site. In no cases will site-specific erosion protection structures compromise or impede fish passage. Site-specific erosion measures will not constrict flow in the channel and not increase water velocities in the channel.

NOAABA-AMM-15: Culvert Repair and/or Replacement, Temporary Bridges, and Pipeline Replacement and/or Abandonment to Accommodate Fish Passage. Existing culverts that are repaired or replaced in streams supporting listed fish or that have suitable habitat to support listed fish and connectivity to known listed fisheries streams, and streams designated as critical habitat must meet standards for fish passage as identified in the current version of NOAA Fisheries' Guidelines for Salmonid Passage at Stream Crossings (See https://www.fisheries.noaa.gov/west-coast/habitat-conservation/west-coast-fish-passage-guidelines). PG&E will also ensure that prefabricated bridges are designed in a manner that avoids impacts to streams that support listed fish. If deemed necessary, PG&E will conduct a channel morphology assessment to ensure these standards can be met prior to execution of the

O&M activity. In addition, the use of rock will be minimized, and no more than 2 culvert repairs or replacement will occur in fish habitat per year.

In the event that a pipeline requires replacement or abandonment in place, the pipeline depth and specifications will be designed to meet the standards for fish passage identified in NOAA Fisheries' Guidelines for Salmonid Passage at Stream Crossings. In addition, culvert repair and replacement, pipeline replacement, and pipeline abandonment activities will not be conducted within flowing streams that provide federally listed fish habitat and designated critical habitat. Work will only be conducted when project site conditions are naturally dry.

1.3.6. Mitigation

PG&E intends to provide compensatory mitigation for future impacts from O&M activities in advance by using an estimate of the projected impact (Table 6) and the following proposed mitigation ratios:

- For activities that are conducted within the LOP and result in permanent impacts, PG&E proposes to mitigate for those impacts at a 3-to-1 ratio.
- For activities that are conducted outside of the LOP, PG&E proposes to mitigate for permanent impacts at a ratio of 4-to-1.

Based on the estimated area of new or expanded tower footings placed in San Francisco Bay, PG&E has calculated compensatory mitigation for impacts to estuarine waters (Table 6). The 4-to-1 ratio was used to calculate the highest projected impact totals to provide a conservative estimate for the purpose of calculating initial compensatory mitigation requirements.

Table 6. Projected Permanent Impacts and Compensatory Mitigation in Tidal Waters

Listed Anadromous Fish Species	Approx. Permanent Impact (acres annually)	Projected Compensatory Mitigation with 4-to-1 Ratio (acres)	
		Annually	5 Years
Central Valley Spring-Run Chinook Salmon	<0.01	0.04	0.2
Sacramento River Winter-Run Chinook Salmon	<0.01	0.04	0.2
Central California Coast Steelhead	0.03	0.12	0.6
California Central Valley Steelhead	<0.01	0.04	0.2
Southern DPS of Green Sturgeon	0.02	0.08	0.4
Total	0.08	0.32	1.6

Based on the projected impacts and mitigation proposed, PG&E proposes to contribute $600,000 in initial funding to one or more fish passage and/or fish habitat improvement projects within the San Francisco Bay, and/or freshwater salmonid migratory corridors within the greater San Francisco Bay Area. Should PG&E exceed its initial projected impact, it will contribute additional funding to habitat improvement projects at $10 per square foot of additional compensatory mitigation required, and no less than 0.1 acre.

If the Corps renews the RGP for an additional 5-year period and PG&E has not fully allocated the projected compensatory mitigation credit[6], the remaining credit will apply to the renewed RGP as an advanced credit. If additional compensatory mitigation associated with a 5-year renewal is needed, PG&E will provide additional funding at $10.00 per square foot.

During the course of the program, PG&E will report actual annual impacts to fish and fish habitat over the life of the RGP. PG&E will provide annual updates to NOAA Fisheries showing actual impact acreages converted to compensatory mitigation required using appropriate ratios as outlined above, including a ledger showing debiting and allocation of credit achieved against projected mitigation.

NMFS considered, under the ESA, whether or not the proposed action would cause any other activities and determined that it would not.

2. ENDANGERED SPECIES ACT: BIOLOGICAL OPINION AND INCIDENTAL TAKE STATEMENT

The ESA establishes a national program for conserving threatened and endangered species of fish, wildlife, plants, and the habitat upon which they depend. As required by section 7(a)(2) of the ESA, each Federal agency must ensure that its actions are not likely to jeopardize the continued existence of endangered or threatened species or to adversely modify or destroy their designated critical habitat. Per the requirements of the ESA, Federal action agencies consult with NMFS, and section 7(b)(3) requires that, at the conclusion of consultation, NMFS provide an opinion stating how the agency's actions would affect listed species and their critical habitats. If incidental take is reasonably certain to occur, section 7(b)(4) requires NMFS to provide an ITS that specifies the impact of any incidental taking and includes reasonable and prudent measures (RPMs) and terms and conditions to minimize such impacts.

The Corps determined the proposed action is not likely to adversely affect threatened South-Central California Coast steelhead (*O. mykiss*), threatened California Coastal Chinook salmon (*O. tshawystsha*), endangered Central California Coast coho salmon (*O. kisutch*), and their designated critical habitat. Our concurrence is documented in the "Not Likely to Adversely Affect" Determinations section (Section 2.12 below).

2.1. Analytical Approach

This biological opinion includes both a jeopardy analysis and an adverse modification analysis. The jeopardy analysis relies upon the regulatory definition of "jeopardize the continued existence of" a listed species, which is "to engage in an action that reasonably would be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of that species" (50 CFR 402.02). Therefore, the jeopardy analysis considers both survival and recovery of the species.

[6] PG&E has likely overestimated the amount of mitigation to ensure funding is available to accomplish it. If their actual impacts are less than estimated, PG&E will apply the remaining funds to their impacts in the following five years.

This biological opinion also relies on the regulatory definition of "destruction or adverse modification," which "means a direct or indirect alteration that appreciably diminishes the value of critical habitat as a whole for the conservation of a listed species" (50 CFR 402.02).

The designations of critical habitat for ESA listed steelhead, Chinook salmon, and green sturgeon use the term primary constituent element (PCE) or essential features. The 2016 final rule (81 FR 7414; February 11, 2016) that revised the critical habitat regulations (50 CFR 424.12) replaced this term with physical or biological features (PBFs). The shift in terminology does not change the approach used in conducting a "destruction or adverse modification" analysis, which is the same regardless of whether the original designation identified PCEs, PBFs, or essential features. In this biological opinion, we use the term PBF to mean PCE or essential feature, as appropriate for the specific critical habitat.

We use the following approach to determine whether a proposed action is likely to jeopardize listed species or destroy or adversely modify critical habitat:

- Evaluate the rangewide status of the species and critical habitat expected to be adversely affected by the proposed action.
- Evaluate the environmental baseline of the species and critical habitat.
- Evaluate the effects of the proposed action on species and their critical habitat using an exposure–response approach.
- Evaluate cumulative effects.
- In the integration and synthesis, add the effects of the action and cumulative effects to the environmental baseline, and, in light of the status of the species and critical habitat, analyze whether the proposed action is likely to: (1) directly or indirectly reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of that species; or (2) directly or indirectly result in an alteration that appreciably diminishes the value of critical habitat as a whole for the conservation of a listed species.
- If necessary, suggest a reasonable and prudent alternative to the proposed action.

To conduct this assessment, NMFS examined an extensive amount of information from a variety of sources. Detailed background information on the biology and status of the listed species and critical habitat has been published in a number of documents including peer reviewed scientific journals, primary reference materials, and governmental and non-governmental reports. Additional information regarding the effects of the Program's actions on the listed species, their anticipated response to these actions, and the environmental consequences of the actions as a whole was formulated from the aforementioned resources, and the following biological assessments:

> PG&E. 2022. National Oceanic and Atmospheric Administration – National Marine Fisheries Service Biological Assessment for the Regional General Permit for Pacific Gas and Electric Company's Bay Area Operation and Maintenance Program. September 2022.

PG&E. 2023. National Oceanic and Atmospheric Administration – National Marine Fisheries Service March 2023 Biological Assessment Supplement. March 2023.

Information taken directly form published, citable documents are referenced in the text and listed at the end of this document. A complete record of this consultation is on file at NMFS North-Central Coast Office in Santa Rosa, California (ARN #151422WCR2021SR00227).

2.2. Rangewide Status of the Species and Critical Habitat

This opinion examines the status of each species that is likely to be adversely affected by the proposed action. The status is determined by the level of extinction risk that the listed species face, based on parameters considered in documents such as recovery plans, status reviews, and listing decisions. This informs the description of the species' likelihood of both survival and recovery. The species status section also helps to inform the description of the species' "reproduction, numbers, or distribution" for the jeopardy analysis. The opinion also examines the condition of critical habitat throughout the designated area, evaluates the conservation value of the various watersheds and coastal and marine environments that make up the designated area, and discusses the function of the PBFs that are essential for the conservation of the species.

This biological opinion analyzes the effect of the proposed PG&E O&M Program activities in the San Francisco Bay on the following Federally-listed species (Distinct Population Segment [DPS] or Evolutionary Significant Unit [ESU]) and designated critical habitats:

Central California Coast (CCC) steelhead (*Oncorhynchus mykiss*) DPS
Threatened (71 FR 834; January 5, 2006)
Critical habitat (70 FR 52488; September 2, 2005);

California Central Valley (CCV) steelhead (*O. mykiss*) DPS
Threatened (71 FR 834; January 5, 2006)
Critical habitat (70 FR 52488; September 2, 2005);

Central Valley (CV) spring-run Chinook salmon (*O. tshawytscha*) ESU
Threatened (70 FR 37160; June 28, 2005)
Critical habitat (70 FR 52488; September 2, 2005);

Sacramento River winter-run Chinook salmon (*O. tshawytscha*) ESU
Endangered (70 FR 37160; June 28, 2005)
Critical habitat (58 FR 33212; June 16, 1993);

North American green sturgeon (*Acipenser medirostris*) Southern DPS
Threatened (71 FR 17757; April 7, 2006)
Critical habitat (74 FR 52300; September 8, 2008).

2.2.1. CCC Steelhead and CCV Steelhead

Steelhead are anadromous forms of *Oncorhynchus mykiss*, spending some time in both freshwater and saltwater. Steelhead are iteroparous, or capable of spawning more than once

before death (Busby *et al.* 1996). Although one-time spawners are the great majority, Shapovalov and Taft (1954) reported that repeat spawners are relatively numerous (17.2 percent) in California streams. Steelhead young usually rear in freshwater for 1 to 3 years before migrating to the ocean as smolts, but rearing periods of up to 7 years have been reported. Migration to the ocean usually occurs in the spring. Steelhead may remain in the ocean for 1 to 5 years (2 to 3 years is most common) before returning to their natal streams to spawn (Busby *et al.* 1996).

Adult steelhead typically migrate from the ocean to freshwater between December and April, peaking in January and February (Fukushima and Lesh 1998). Adults returning to spawn may migrate several miles, hundreds of miles in some watersheds, to reach their natal streams. Although spawning typically occurs between January and May, the specific timing of spawning may vary a month or more among streams within a region, and within streams interannually. Spawning and smolt emigration may continue through June (Busby *et al.* 1996). Female steelhead dig a nest in the stream and then deposit their eggs. After fertilization by the male, the female covers the nest with a layer of gravel. Steelhead do not necessarily die after spawning and may return to the ocean, sometimes repeating their spawning migration one or more years. The embryos incubate within the nest. Hatching time varies from about three weeks to two months depending on water temperature. The young fish emerge from the nest about two to six weeks after hatching.

Steelhead fry rear in edgewater habitats and move gradually into pools and riffles as they grow larger. Cover is an important habitat component for juvenile steelhead, both as a velocity refuge and as a means of avoiding predation (Shirvell 1990, Meehan and Bjornn 1991). Steelhead, however, tend to use riffles and other habitats not strongly associated with cover during summer rearing more than other salmonids. Young steelhead feed on a wide variety of aquatic and terrestrial insects, and emerging fry are sometimes preyed upon by older juveniles. Rearing steelhead juveniles prefer water temperatures of 7.2 to 14.4 degrees Celsius (°C) and have an upper lethal limit of 23.9°C (Barnhart 1986, Bjornn and Reiser 1991). However, they can survive in water up to 27°C with saturated dissolved oxygen conditions and a plentiful food supply. Fluctuating diurnal water temperatures also aid in survivability of salmonids (Busby *et al.* 1996). Juvenile steelhead emigrate episodically from natal streams during fall, winter, and spring high flows, to the ocean to continue rearing to maturity.

The distribution of steelhead in the ocean is not well known. Interannual variations in climate, abundance of key prey items (e.g. squid), and density dependent interactions with other salmonid species are key drivers of steelhead distribution and productivity in the marine environment (Atcheson *et al.* 2012; Atcheson *et al.* 2013). Available information indicates that steelhead originating from central California use a cool, stable, thermal habitat window (ranging between 8-14 degrees Celsius [°C]) in the marine environment characteristic of conditions in northern waters above the 40th parallel to the southern boundary of the Bering Sea (Hayes *et al.* 2012).

2.2.1.1 Status of CCC Steelhead

CCC steelhead was listed as federally threatened in 1997 (62 FR 43937) and the listing was updated in 2006 (71 FR 834). This DPS includes all naturally spawned steelhead from the Russian River in Sonoma County to Aptos Creek in Santa Cruz County as well as the drainages

of San Francisco, Suisun, and San Pablo Bays eastward to Chipps Island at the confluence of the Sacramento and San Joaquin rivers. The DPS also includes two artificial propagation programs, the Don Clausen Fish Hatchery and the Kingfisher Flat Hatchery/Scott Creek (Monterey Bay Salmon and Trout Project) steelhead hatchery programs.

Historically, approximately 70 populations of steelhead existed in the CCC steelhead DPS (Spence *et al.* 2008, Spence *et al.* 2012). Many of these populations (about 37) were independent, or potentially independent, meaning they had a high likelihood of surviving for 100 years absent anthropogenic impacts (Bjorkstedt *et al.* 2005). The remaining populations were dependent upon immigration from nearby CCC steelhead DPS populations to ensure their viability (McElhaney *et al.* 2000, Bjorkstedt *et al.* 2005).

While historical and present data on abundance are limited, CCC steelhead numbers are substantially reduced from historical levels. A total of 94,000 adult steelhead were estimated to spawn in the rivers of this DPS in the mid-1960s, including 50,000 fish in the Russian River, which is considered the largest population within the DPS (Busby *et al.* 1996). Recent estimates for the Russian River are on the order of 7,000 adult fish returning to spawn (NMFS 2016a), however abundance estimates for smaller coastal streams in the DPS indicate low but stable levels with recent estimates for several streams (Lagunitas, Waddell, Scott, San Vicente, Pudding, and Caspar creeks) of individual run sizes of 500 fish or less (62 FR 43937). Some loss of genetic diversity has been documented and attributed to previous among-basin transfers of stock and local hatchery production in interior populations in the Russian River (Bjorkstedt *et al.* 2005). In San Francisco Bay streams, reduced population sizes and fragmented habitat condition has likely also depressed genetic diversity in these populations. Similar losses in genetic diversity in the Napa River may have resulted from out-of-basin and out-of-DPS releases of steelhead in the Napa basin in the 1970s and 1980s. These transfers included fish from the South Fork Eel River, San Lorenzo River, Mad River, Russian River, and the Sacramento River.

The scarcity of information on CCC steelhead abundance continues to make it difficult to assess whether conditions have changed appreciably since the previous status review assessment (Williams *et al*. 2016). The most recent status update concludes that steelhead in the CCC DPS remain "likely to become endangered in the foreseeable future", as new and additional information does not appear to suggest a change in extinction risk (NMFS 2016). NMFS concluded that the CCC steelhead DPS shall remain listed as threatened (81 FR 33468; May 26, 2016).

Recent monitoring efforts indicate steelhead still occur in all diversity strata of the DPS. However, hatchery-origin fish remain more prevalent than natural-origin fish in the Russian River, and an overall downward abundance trend was observed in one of the more robust populations, Scott Creek. Small-scale fish passage improvement and habitat restoration projects have improved habitat conditions locally; however, the DPS still faces threats throughout the region from both legacy habitat degradation and modification, as well as new urban growth, continued water diversions, and dams.

A final recovery plan for CCC steelhead was completed by NMFS in October 2016 (NMFS 2016b). The plan describes key threats, actions needed to achieve recovery, and measurable

criteria by which NMFS will determine when recovery has been reached. Recovery plan actions are primarily designed to restore ecological processes that support healthy steelhead populations, and address the various activities that harm these processes and threaten the species' survival. The recovery plan calls for a range of actions including the restoration of floodplains and channel structure, restoring riparian conditions, improving streamflows, restoring fish passage, protecting and restoring estuarine habitat, among other actions.

2.2.1.2 Status of CCV Steelhead

CCV steelhead was listed as federally threatened in 1998 (63 FR 13347) and the listing was updated in 2006 (71 FR 834). This DPS includes all naturally spawned anadromous *O. mykiss* (steelhead) populations below natural and manmade impassable barriers in the Sacramento and San Joaquin rivers and their tributaries, excluding steelhead from San Francisco and San Pablo Bays and their tributaries. The DPS also includes two artificial propagation programs, the Coleman National Fish Hatchery and Feather River Hatchery steelhead hatchery programs.

CCV steelhead historically were well-distributed throughout the Sacramento and San Joaquin rivers (Busby *et al.* 1996). Although it appears CCV steelhead remain widely distributed in Sacramento River tributaries, the vast majority of historical spawning areas are currently above impassable dams. At present, all CCV steelhead are considered winter-run steelhead (McEwan and Jackson 1996), although there are indications that summer steelhead were present in the Sacramento River system prior to the commencement of large-scale dam construction in the 1940s (IEP 1999). McEwan and Jackson (1996) reported that wild steelhead stocks appear to be mostly confined to upper Sacramento River tributaries such as Antelope, Deer, and Mill creeks and the Yuba River. However, naturally spawning populations are also known to occur in Butte Creek, and the upper Sacramento mainstem, Feather, American, Mokelumne, and Stanislaus rivers (CALFED 2000). It is possible that other small populations of naturally spawning steelhead exist in Central Valley streams, but are undetected due to lack of sufficient monitoring and research programs; increases in fisheries monitoring efforts led to the discovery of steelhead populations in streams such as Auburn Ravine and Dry Creek (IEP 1999).

Small self-sustaining populations of CCV steelhead exist in the Stanislaus, Mokelumne, Calaveras, and other tributaries of the San Joaquin River (McEwan 2001). On the Stanislaus River, steelhead smolts have been captured in rotary screw traps at Caswell State Park and Oakdale each year since 1995 (Demko *et al*. 2000). Incidental catches and observations of steelhead juveniles also have occurred on the Tuolumne and Merced rivers during fall-run Chinook salmon monitoring activities, indicating that steelhead are widespread, if not abundant, throughout accessible streams and rivers in the Central Valley (Good *et al*. 2005).

Steelhead counts at the Red Bluff Diversion Dam (RBDD) declined from an average annual count of 11,187 adults for the ten-year period beginning in 1967, to an average annual count 2,202 adults in the 1990's (McEwan and Jackson 1996). Estimates of the adult steelhead population composition in the Sacramento River (natural origin versus hatchery origin) have also changed over this time period; through most of the 1950's, Hallock *et al*. (1961) estimated that 88 percent of returning adults were of natural origin, and this estimate declined to 10-30 percent in the 1990's (McEwan and Jackson 1996). Furthermore, the California Fish and Wildlife Plan estimated a total run size of about 40,000 adults for the entire Central Valley, including San

Francisco Bay, in the early 1960s (CDFW 1965). In 1991-92, this run was probably less than 10,000 fish based on dam counts, hatchery returns and past spawning surveys (McEwan and Jackson 1996).

The 2016 status review (Williams *et al*. 2016) summarized that little had changed in the status of CCV steelhead since 2011 (Williams *et al.* 2011). While there are some increased returns to hatcheries in the Central Valley, the returns of wild fish and data on the wild population are still lacking. Most natural-origin CCV populations are very small, are not monitored, and may lack the resiliency to persist for protracted periods if subjected to additional stressors, particularly widespread stressors such as climate change. The genetic diversity of CCV steelhead has likely been impacted by low population sizes and high numbers of hatchery fish relative to natural-origin fish. The life-history diversity of the DPS is mostly unknown, as very few studies have been published on traits such as age structure, size at age, or growth rates in CCV steelhead.

In July 2014, NMFS released a final Recovery Plan for CCV steelhead (NMFS 2014). The Recovery Plan outlines actions to restore habitat, access, and improve water quality and quantity conditions in the Sacramento River to promote the recovery of listed salmonids. Key actions for the Recovery Plan include conducting landscape-scale restoration throughout the Delta, incorporating ecosystem restoration into Central Valley flood control plans that includes breaching and setting back levees, and restoring flows throughout the Sacramento and San Joaquin River basins and the Delta.

2.2.2. CV Spring-run and Sacramento River Winter-run Chinook Salmon

Chinook salmon return to freshwater to spawn when they are 3 to 8 years old (Healey 1991). Runs are designated on the basis of adult migration timing; however, distinct runs also differ in the degree of maturation at the time of river entry, thermal regime and flow characteristics of their spawning site, and actual time of spawning (Myers *et al.* 1998). Both winter-run and spring-run Chinook salmon tend to enter freshwater as immature fish, migrate far upriver, and delay spawning for weeks or months. For comparison, fall-run Chinook salmon enter freshwater at an advanced stage of maturity, move rapidly to their spawning areas on the mainstem or lower tributaries of rivers, and spawn within a few days or weeks of freshwater entry (Healey 1991). Adult endangered Sacramento River winter-run Chinook salmon enter San Francisco Bay from November through June (Hallock and Fisher 1985), and delay spawning until spring or early summer. Adult threatened Central Valley spring-run Chinook salmon enter the Sacramento-San Joaquin Delta (Delta) beginning in January and enter natal streams from March to July (Myers *et al.* 1998). Central Valley spring-run Chinook salmon adults hold in freshwater over summer and spawn in the fall. Central Valley spring-run Chinook salmon juveniles typically spend a year or more in freshwater before migrating toward the ocean. Adequate instream flows and cool water temperatures are more critical for the survival of Central Valley spring-run Chinook salmon due to over summering by adults and/or juveniles.

Sacramento River winter-run Chinook salmon spawn primarily from mid-April to mid-August, peaking in May and June, in the Sacramento River reach between Keswick Dam and the RBDD. Central Valley spring-run Chinook salmon typically spawn between September and October depending on water temperatures. Chinook salmon generally spawn in waters with moderate gradient and gravel and cobble substrates. Eggs are deposited within the gravel where

incubation, hatching, and subsequent emergence take place. The upper preferred water temperature for spawning adult Chinook salmon is 13°C (Chambers 1956) to 14 °C (Reiser and Bjornn 1979). The length of time required for eggs to develop and hatch is dependent on water temperature, and quite variable.

Sacramento River winter-run Chinook salmon fry begin to emerge from the gravel in late June to early July and continue through October (Fisher 1994). Juvenile winter-run Chinook salmon spend 4 to 7 months in freshwater prior to migrating to the ocean as smolts. Central Valley spring-run Chinook salmon fry emerge from November to March and spend about 3 to 15 months in freshwater prior to migrating towards the ocean (Kjelson *et al*. 1982). Post-emergent fry seek out shallow, nearshore areas with slow current and good cover, and begin feeding on small terrestrial and aquatic insects and crustaceans. Chinook fry and parr may spend time rearing within riverine and/or estuarine habitats including natal tributaries, the Sacramento River, non-natal tributaries to the Sacramento River, and the Delta.

Within estuarine habitat, juvenile rearing Chinook salmon movements are generally dictated by tidal cycles, following the rising tide into shallow water habitats from the deeper main channels, and returning to the main channels when the tide recedes (Healey 1991; Levings 1982; Levy and Northcote 1982). Juvenile Chinook salmon forage in shallow areas with protective cover, such as intertidal and subtidal mudflats, marshes, channels and sloughs (Dunford 1975; McDonald 1960). As juvenile Chinook salmon increase in length, they tend to school in the surface waters of the main and secondary channels and sloughs, following the tides into shallow water habitats to feed (Allen and Hassler 1986). Kjelson *et al*. (1982) reported that juvenile Chinook salmon demonstrated a diel migration pattern, orienting themselves to nearshore cover and structure during the day, but moving into more open, offshore waters at night. The fish also distributed themselves vertically in relation to ambient light. Juvenile Sacramento River winter-run Chinook salmon migrate to the sea as smolts after only rearing in freshwater for 4 to 7 months, and occur in the Delta from October through early May (CDFW 2000). Most Central Valley spring-run Chinook salmon smolts are present in the Delta from mid-March through mid-May depending on flow conditions (CDFW 1998).

2.2.2.1 Status of Sacramento River Winter-run Chinook Salmon

Sacramento River winter-run Chinook salmon was first listed as a threatened species in 1990 (55 FR 46515). In 1994, NMFS reclassified the ESU as an endangered species due to several factors, including: (1) the continued decline and increased variability of run sizes since its listing as a threatened species in 1989; (2) the expectation of weak returns in coming years as the result of two small year classes (1991 and 1993); and (3) continuing threats to the species (59 FR 440). NMFS issued a final listing determination on June 28, 2005 (70 FR 37160). The Sacramento River winter-run Chinook salmon ESU includes winter-run Chinook salmon spawning naturally in the Sacramento River and its tributaries, as well as two artificial propagation programs: winter-run Chinook salmon from the Livingston Stone National Fish Hatchery and winter-run Chinook in a captive broodstock program maintained at Livingston Stone National Fish Hatchery and the University of California Bodega Marine Laboratory.

The Sacramento River winter-run Chinook salmon ESU has been completely displaced from its historical spawning habitat by the construction of Shasta and Keswick dams. Approximately, 300

miles of tributary spawning habitat in the upper Sacramento River is now inaccessible to the ESU. Most components of the Sacramento River winter-run Chinook salmon life history (e.g., spawning, incubation, freshwater rearing) have been compromised by the habitat blockage in the upper Sacramento River. The only remaining spawning habitat in the upper Sacramento River is between Keswick Dam and RBDD. This habitat is artificially maintained by cool water releases from Shasta and Keswick Dams, and the spatial distribution of spawners in the upper Sacramento River is largely governed by the water year type and the ability of the Central Valley Project to manage water temperatures in this area.

Between the time Shasta Dam was built and the Sacramento River winter-run Chinook salmon were listed in 1990, major impacts to the population occurred from warm water releases from Shasta Dam, juvenile and adult passage constraints at the RBDD, water exports in the southern Delta, and entrainment at a large number of unscreened or poorly-screened water diversions. However, the naturally spawning component of this ESU has exhibited marked improvements in abundance and productivity in the 2000s (CDFW 2008). These increases in abundance are encouraging, relative to the years of critically low abundance of the 1980s and early 1990s; however, returns of several West Coast Chinook salmon and coho salmon stocks were lower than expected in 2007, and stocks remained low through 2009.

A captive broodstock artificial propagation program for Sacramento River winter-run Chinook salmon has operated since the early 1990s as part of recovery actions for this ESU. As many as 150,000 juvenile salmon have been released by this program, but in most cases the number of fish released was in the tens of thousands (Good *et al.* 2005).

According to the 2016 NMFS 5-year status review, the extinction risk of the winter-run Chinook salmon ESU has increased from moderate risk to high risk of extinction since the 2007 and 2010 assessments (NMFS 2016c). Based on the Lindley *et al*. (2007) criteria, the population is currently at high extinction risk. High extinction risk for the population was triggered by the hatchery influence criterion, with a mean of 66 percent hatchery origin spawners from 2016 through 2018. Several listing factors have contributed to the recent decline, including drought, poor ocean conditions, and hatchery influence.

In July 2014, NMFS released a final Recovery Plan for Sacramento River winter-run Chinook salmon (NMFS 2014). The Recovery Plan outlines actions to restore habitat, access, and improve water quality and quantity conditions in the Sacramento River to promote the recovery of listed salmonids.

2.2.2.2 Status of CV Spring-run Chinook Salmon

CV spring-run Chinook salmon was listed as a threatened species in 1999 (64 FR 50394) and the listing was updated in 2005 (70 FR 37160). The Central Valley spring-run Chinook ESU includes all naturally spawned populations of spring-run Chinook salmon in the Sacramento River and its tributaries in California, including the Feather River. The artificial propagation program at the Feather River Hatchery is also considered part of the ESU.

Historically, the predominant salmon run in the Central Valley was the spring-run Chinook salmon. Extensive construction of dams throughout the Sacramento-San Joaquin Basin has

reduced the Central Valley spring-run Chinook salmon run to only a small portion of its historical distribution. The Central Valley drainage as a whole is estimated to have supported Central Valley spring-run Chinook salmon runs as large as 600,000 fish between the late 1880s and 1940s (CDFW 1998). The ESU has been reduced to only three naturally-spawning populations that are free of hatchery influence from an estimated 17 historic populations. These three populations (spawning in three tributaries to the Sacramento River - Deer, Mill, and Butte creeks), are in close geographic proximity, increasing the ESU's vulnerability to disease or catastrophic events.

Central Valley spring-run Chinook salmon from the Feather River Hatchery (FRH) were included in the ESU because they are believed by NMFS to be the only population in the ESU that displays early run timing. This early run timing is considered by NMFS to represent an important evolutionary legacy of the spring-run populations that once spawned above Oroville Dam (70 FR 37160). The FRH population is closely related genetically to the natural Feather River population. The FRH's goal is to release five million spring-run Chinook salmon per year. Recent releases have ranged from about one-and-a-half to five million fish, with most releases below five million fish (Good *et al.* 2005).

According to the NMFS 5-year species status review (NMFS 2016d), the status of the CV spring- run Chinook salmon ESU, until 2015, has improved since the 2010 status review. The improved status is due to extensive restoration, and increases in spatial structure with historically extirpated populations (Battle and Clear creeks) trending in the positive direction. However, more recent declines of many of the dependent and independent populations, high pre-spawn and egg mortality during the 2012 to 2016 drought, uncertain juvenile survival during the drought are likely increasing the ESU's extinction risk. Escapement data show a continued overall decline in adult returns from 2014 through 2020 (CDFW 2021).

In July 2014, NMFS released a final Recovery Plan for CV spring-run Chinook salmon (NMFS 2014). The Recovery Plan outlines actions to restore habitat, access, and improve water quality and quantity conditions in the Sacramento River to promote the recovery of listed salmonids. Key actions for the Recovery Plan include conducting landscape-scale restoration throughout the Delta, incorporating ecosystem restoration into Central Valley flood control plans that includes breaching and setting back levees, and restoring flows throughout the Sacramento and San Joaquin River basins and the Delta.

2.2.3. North American Green Sturgeon

The green sturgeon is an anadromous, long-lived, and bottom-oriented fish species in the family Acipenseridae. Sturgeon have skeletons composed mostly of cartilage and lack scales, instead possessing five rows of characteristic bony plates on their body called "scutes." On the underside of their flattened snouts are sensory barbels and a siphon-shaped, protrusible, toothless mouth. Large adults may exceed 2 meters in length and 100 kilograms in weight (Moyle 1976). Based on genetic analyses and spawning site fidelity, NMFS determined that North American green sturgeon are comprised of at least two DPSs: Northern DPS consisting of populations originating from coastal watersheds northward of and including the Eel River ("Northern DPS green sturgeon"), with spawning confirmed in the Klamath and Rogue river systems; and Southern DPS consisting of populations originating from coastal watersheds south of the Eel River

("Southern DPS green sturgeon"), with spawning confirmed in the Sacramento River system (Adams *et al.* 2002).

Green sturgeon is the most marine-oriented species of sturgeon (Moyle 2002). Along the West Coast of North America, they range in nearshore waters from Mexico to the Bering Sea (Adams *et al.* 2002), with a general tendency to head north after their out-migration from freshwater (Lindley *et al.* 2011). While in the ocean, archival tagging indicates that green sturgeon occur in waters between 0- and 200-meters depth, but spend most of their time in waters between 20–80 meters and temperatures of 9.5–16.0°C (Nelson *et al.* 2010, Huff *et al.* 2011). Subadult and adult green sturgeon move between coastal waters and estuaries (Lindley *et al*. 2008, Lindley *et al.* 2011), but relatively little is known about how green sturgeon use these habitats. Lindley *et al.* (2011) report multiple rivers and estuaries are visited by aggregations of green sturgeon in summer months, and larger estuaries (e.g., San Francisco Bay) appear to be particularly important habitat. During the winter months, green sturgeon generally reside in the coastal ocean. Areas north of Vancouver Island are favored overwintering areas, with Queen Charlotte Sound and Hecate Strait likely destinations based on detections of acoustically-tagged green sturgeon (Lindley *et al.* 2008, Nelson *et al*. 2010).

Based on genetic analysis, Israel *et al.* (2009) reported that almost all green sturgeon collected in the San Francisco Bay system were Southern DPS. This is corroborated by tagging and tracking studies which found that no green sturgeon tagged in the Klamath or Rogue rivers (i.e., Northern DPS) have yet been detected in San Francisco Bay (Lindley *et al.* 2011). However, green sturgeon inhabiting coastal waters adjacent to San Francisco Bay include Northern DPS green sturgeon.

Adult Southern DPS green sturgeon enter the San Francisco Bay in later winter thought early spring, and migrate upstream to spawn in the Sacramento River watershed from April through early July, with peaks in activity influenced by variations in water low and temperature (Heublein *et al*. 2009, Poytress *et al*. 2015, Miller *et al*. 2020). After hatching larvae migrate downstream and metamorphose into juveniles. Juveniles spend their first few years in the Sacramento-San Joaquin Delta (Delta) and San Francisco estuary before entering the marine environment as subadults. Juvenile green sturgeon collected at the State and Federal water export facilities in the southern Delta are generally between 200 mm and 400 mm total length (TL) (Adams *et al*. 2002) which suggests Southern DPS green sturgeon spend several months to a year rearing in freshwater before entering the Delta and San Francisco estuary. Subadult green sturgeon spend several years at sea before reaching reproductive maturity and returning to freshwater to spawn for the first time (Nakamoto *et al.* 1995). Post-spawn outmigration the San Francisco Bay is variable, with some individuals migrating to the ocean within 2-10 days and others remaining within the estuary for several months after leaving upstream spawning habitat (Heublein *et al*. 2009, Miller *et al*. 2020)

During the summer and fall, an unknown proportion of the population of non-spawning adults and subadults enter the San Francisco estuary from the ocean for periods ranging from a few days to 6 months (Lindley *et al*. 2011). Some fish are detected only near the Golden Gate, while others move as far inland as Rio Vista on the lower Sacramento River in the Delta. The

remainder of the population appear to enter bays and estuaries farther north from Humboldt Bay, California to Grays Harbor, Washington (Lindley *et al.* 2011).

Green sturgeon feed on benthic invertebrates and fish (Adams *et al.* 2002). Radtke (1966) analyzed stomach contents of juvenile green sturgeon captured in the Sacramento-San Joaquin Delta and found the majority of their diet was benthic invertebrates, such as mysid shrimp and amphipods (*Corophium spp*). Manual tracking of acoustically-tagged green sturgeon in the San Francisco Bay estuary indicates they are generally bottom-oriented, but make occasional forays to surface waters, perhaps to assist their movement (Kelly *et al.* 2007). Dumbauld *et al.* (2008) report green sturgeon utilize soft substrate in estuaries, presumably feeding on benthic invertebrates. Data from mapping surveys conducted in Willapa Bay, Washington, showed densities of "feeding pits" (depressions in the substrate believed to be formed when green sturgeon feed) were highest over shallow intertidal mud flats, while harder substrates (e.g., sand) had no pits (Moser *et al.* 2017). Within the San Francisco estuary, green sturgeon are encountered by recreational anglers and during sampling by the California Department of Fish and Wildlife (CDFW) in the shallow waters of San Pablo Bay.

2.2.3.1 Status of North American Green Sturgeon

The Southern DPS of North American green sturgeon was listed as a federally threatened species in 2006 (71 FR 17757). The Southern DPS includes all spawning populations of green sturgeon south of the Eel River (exclusive), principally including the Sacramento River green sturgeon spawning population.

To date, little population-level data have been collected for green sturgeon. In particular, there are no published abundance estimates for either Northern DPS or Southern DPS green sturgeon in any of the natal rivers based on survey data. As a result, efforts to estimate green sturgeon population size have had to rely on sub-optimal data with known potential biases. Available abundance information comes mainly from four sources: 1) incidental captures in the CDFW white sturgeon monitoring program; 2) fish monitoring efforts associated with two diversion facilities on the upper Sacramento River; 3) fish salvage operations at the water export facilities on the Sacramento-San Joaquin Delta; and 4) dual frequency sonar identification in spawning areas of the upper Sacramento River. These data are insufficient in a variety of ways (short time series, non-target species, etc.) and do not support more than a qualitative evaluation of changes in green sturgeon abundance.

CDFW's white sturgeon monitoring program incidentally captures Southern DPS green sturgeon. Trammel nets are used to capture white sturgeon and CDFW utilizes a multiple-census or Peterson mark-recapture method to estimate the size of subadult and adult sturgeon population (CDFW 2002). By comparing ratios of white sturgeon to green sturgeon captures, estimates of Southern DPS green sturgeon abundance can be calculated. Estimated abundance of green sturgeon between 1954 and 2001 ranged from 175 fish to more than 8,000 per year and averaged 1,509 fish per year. Unfortunately, there are many biases and errors associated with these data, and CDFW does not consider these estimates reliable. For larval and juvenile green sturgeon in the upper Sacramento River, information is available from salmon monitoring efforts at the RBDD and the Glenn-Colusa Irrigation District (GCID). Incidental capture of larval and juvenile green sturgeon at the RBDD and GCID have ranged between 0 and 2,068 green sturgeon per

year (Adams *et al.* 2002). Genetic data collected from these larval green sturgeon suggest that the number of adult green sturgeon spawning in the upper Sacramento River remained roughly constant between 2002 and 2006 in river reaches above Red Bluff (Israel and May 2010). In 2011, rotary screw traps operating in the Upper Sacramento River at RBDD captured 3,700 larval green sturgeon which represents the highest catch on record in 16 years of sampling (Poytress *et al.* 2011).

Juvenile green sturgeon are collected at water export facilities operated by the California Department of Water Resources (DWR) and the Federal Bureau of Reclamation (BOR) in the Sacramento-San Joaquin Delta. Fish collection records have been maintained by DWR from 1968 to present and by BOR from 1980 to present. The average number of Southern DPS green sturgeon taken per year at the DWR facility prior to 1986 was 732; from 1986 to 2001, the average per year was 47 (70 FR 17386). For the BOR facility, the average number prior to 1986 was 889; from 1986 to 2001 the average was 32 (70 FR 17386). Direct capture in the salvage operations at these facilities is a small component of the overall effect of water export facilities on Southern DPS green sturgeon; entrained juvenile green sturgeon are exposed to potential high levels of predation by non-native predators, disruption in migratory behavior, and poor habitat quality. Delta water exports have increased substantially since the 1970s and it is likely that this has contributed to negative trends in the abundance of migratory fish that utilize the Delta, including the Southern DPS green sturgeon.

A Southern DPS population estimate of 17,723 total individuals (95% confidence interval =12,614-22,482) was developed by Mora *et al*. (2018) through Dual Frequency Identification Sonar (DIDSON) surveys of aggregation sites conducted from 2010-2015 in the upper Sacramento River. The NMFS Southwest Fisheries Science Center has updated the total population estimate to 17,723 (Dudley 2021). The DIDSON surveys and modeling will eventually provide population trend data.

According to the NMFS (2021) 5-year status review and the 2018 final recovery plan (NMFS 2018), some threats to the species have recently been eliminated, such as take from commercial fisheries and removal of some passage barriers. However, the species viability continues to be constrained by factors such as a small population size, lack of multiple populations, and concentration of spawning sites into just a few locations. The species continues to face a moderate risk of extinction. A recent method has been developed to estimate the annual spawning run and population size in the upper Sacramento River so species can be evaluated relative to recovery criteria (Mora *et al*. 2018).

In August 2018, NMFS released a final Recovery Plan for the Southern DPS green sturgeon (NMFS 2018), which focuses on fish screening and passage projects, floodplain and river restoration, and riparian habitat protection in the Sacramento River Basin, the Delta, San Francisco Estuary, and nearshore coastal marine environment as strategies for recovery.

2.2.4. Status of Critical Habitat

In designating critical habitat, NMFS considers, among other things, the following requirements of the species: 1) space for individual and population growth, and for normal behavior; 2) food, water, air, light, minerals, or other nutritional or physiological requirements; 3) cover or shelter;

4) sites for breeding, reproduction, or rearing offspring; and, generally; and 5) habitats that are protected from disturbance or are representative of the historic geographical and ecological distributions of this species (50 CFR 424.12(b)). In addition to these factors, NMFS also focuses on PBFs within the designated area that are essential to the conservation of the species and that may require special management considerations or protection (81 FR 7214).

2.2.4.1 Status of CCC Steelhead Critical Habitat

Critical habitat was designated for CCC steelhead on September 2, 2005 (70 FR 52488) and includes the following CALWATER Hydrologic Units: Russian River, Bodega, Marin Coastal, San Mateo Coastal, Bay Bridge, Santa Clara, San Pablo, and Big Basin. The PBFs for CCC steelhead critical habitat include freshwater spawning sites, freshwater rearing sites, freshwater migration corridors, and estuarine areas.

The condition of CCC steelhead critical habitat, specifically its ability to provide for their conservation, has been degraded from conditions known to support viable salmonid populations. NMFS has determined that present depressed population conditions are, in part, the result of the following human-induced factors affecting critical habitat: logging; agricultural and mining activities; urbanization; stream channelization; dams; wetland loss; and water withdrawals, including unscreened diversions for irrigation. Impacts of concern include alteration of streambank and channel morphology, alteration of water temperatures, loss of spawning and rearing habitat, fragmentation of habitat, loss of downstream recruitment of spawning gravels and large woody debris, degradation of water quality, removal of riparian vegetation resulting in increased streambank erosion, loss of shade (higher water temperatures) and loss of nutrient inputs (Busby *et al*. 1996, NMFS 2016b). Water development has drastically altered natural hydrologic conditions in many of the streams in the DPS. Alteration of flows results in migration delays, loss of suitable habitat due to dewatering and blockage; stranding of fish from rapid flow fluctuations; entrainment of juveniles into poorly screened or unscreened diversions, and increased water temperatures harmful to salmonids.

2.2.4.2 Status of CCV Steelhead Critical Habitat

Critical habitat was designated for CCV steelhead on September 2, 2005 (70 FR 52488) and includes stream reaches of the Feather, Yuba and American rivers, Big Chico, Butte, Deer, Mill, Battle, Antelope, and Clear creeks, the Sacramento River, as well as portions of the northern Delta. The PBFs for CCV steelhead critical habitat include freshwater spawning sites, freshwater rearing sites, freshwater migration corridors, and estuarine areas.

Many of the PBFs of CCV steelhead critical habitat are degraded and provide limited high-quality habitat. Passage to historical spawning and juvenile rearing habitat has been largely reduced due to dam construction throughout the Central Valley. Levee construction has also degraded the freshwater rearing and migration habitat and estuarine areas as riparian vegetation has been removed, reducing habitat complexity and food resources and resulting in many other ecological effects. Additionally, due to reduced access to historical habitat, genetic introgression is occurring because natural-origin fish are interacting with hatchery-origin fish, providing the potential to reduce the long-term fitness and survival of this species.

Although the current conditions of CCV steelhead critical habitat are significantly degraded, the spawning habitat, migratory corridors, and rearing habitat that remain in the Sacramento-San Joaquin River watershed and the Delta are considered to have high intrinsic value for the conservation of the species as they are critical to ongoing recovery efforts.

2.2.4.3 Status of Sacramento River Winter-run Chinook Salmon Critical Habitat

Critical habitat was designated for the Sacramento River winter-run Chinook salmon on June 16, 1993 (58 FR 33212). Designated critical habitat for Sacramento River winter-run Chinook salmon includes the Sacramento River from Keswick Dam, Shasta County (River Mile 302) to Chipps Island (River Mile 0), all waters from Chipps Island westward to Carquinez Bridge, all waters of San Pablo Bay, and all water of San Francisco Bay (north of the San Francisco/Oakland Bay Bridge).

PBFs for Sacramento River Winter-run Chinook and their associated essential features include:

1. Access from the Pacific Ocean to appropriate spawning areas in the upper Sacramento River.
2. The availability of clean gravel for spawning substrate.
3. Adequate river flows for successful spawning, incubation of eggs, fry development and emergence, and downstream transport of juveniles.
4. Water temperatures between 6 and 14˚C for successful spawning, egg incubation, and fry development.
5. Habitat areas and adequate prey that are not contaminated.
6. Riparian areas that provide for successful juvenile development and survival.
7. Access downstream so that juveniles can migrate from the spawning grounds to San Francisco Bay and the Pacific Ocean (58 FR 33212).

Winter-run Chinook salmon critical habitat has been degraded from conditions known to support viable salmonid populations. It does not provide the full extent of conservation values necessary for the recovery of the species. In particular, adequate river flows and water temperatures have been impacted by human actions, substantially altering the historical river characteristics in which the Sacramento River winter-run Chinook salmon evolved. Depletion and storage of streamflow behind large dams on the Sacramento River and other tributary streams have drastically altered the natural hydrologic cycles of the Sacramento River and Delta. Alteration of flows results in migration delays, loss of suitable habitat due to dewatering and blockage, stranding of fish from rapid flow fluctuations, entrainment of juveniles into poorly screened or unscreened diversions, and increased water temperatures harmful to salmonids. Other impacts of concern include alteration of stream bank and channel morphology, loss of riparian vegetation, loss of spawning and rearing habitat, fragmentation of habitat, loss of downstream recruitment of spawning gravels, degradation of water quality, and loss of nutrient input.

2.2.4.4 CV Spring-run Chinook Salmon Critical Habitat

Critical habitat was designated for CV spring-run Chinook salmon on September 2, 2005 (70 FR 52488). The geographical range of designated critical habitat includes stream reaches of the Feather, Yuba, and American rivers; Big Chico, Butte, Deer, Mill, Battle, Antelope, and Clear

creeks; and the Sacramento River downstream to the Delta, as well as portions of the northern Delta (70 FR 52488; September 2, 2005). The PBFs for CV spring-run Chinook salmon critical habitat include freshwater spawning sites, freshwater migratory habitat, freshwater rearing sites, and estuarine habitat.

Currently, many of the PBFs of CV spring-run Chinook salmon critical habitat are degraded and provide limited high-quality habitat. Factors that lessen the quality of migratory corridors for juveniles include unscreened or inadequately screened diversions, altered flows in the Delta and mainstem Sacramento River, scarcity of complex in-river cover, in-river predation, degraded water quality, suboptimal water temperatures, and the lack of floodplain habitat. Although the current conditions of CV spring-run Chinook salmon critical habitat are significantly degraded, the spawning habitat, migratory corridors, and rearing habitat that remain are considered to have high intrinsic value for the conservation of the species.

2.2.4.5 Status of North American Green Sturgeon Critical Habitat

Critical habitat was designated for the Southern DPS of green sturgeon on October 9, 2009 (74 FR 52300) and includes coastal marine waters within 60 fathoms depth from Monterey Bay, California to Cape Flattery, Washington, including the Strait of Juan de Fuca to its United States boundary. Designated critical habitat also includes the Sacramento River, lower Feather River, lower Yuba River, Sacramento-San Joaquin Delta, Suisun Bay, San Pablo Bay, and San Francisco Bay in California.

PBFs of designated critical habitat in estuarine areas are food resources, water flow, water quality, mitigation corridor, depth, and sediment quality. In freshwater riverine systems, PBFs of green sturgeon critical habitat are food resources, substrate type or size, water flow, water quality, migratory corridor, depth, and sediment quality. In nearshore coastal marine areas, PBFs are migratory corridor, water quality, and food resources.

The current condition of critical habitat for the Southern DPS of green sturgeon is degraded over its historical conditions. It does not provide the full extent of conservation values necessary for the recovery of the species, particularly in the upstream riverine habitat of the Sacramento River. In the Sacramento River, migration corridor and water flow PBFs have been impacted by human actions, substantially altering the historical river characteristics in which the Southern DPS of green sturgeon evolved. In addition, the alterations to the Sacramento-San Joaquin River Delta may have a particularly strong impact on the survival and recruitment of juvenile green sturgeon due to their protracted rearing time in brackish and estuarine waters.

2.2.5. Additional Threats to Listed Species and Critical Habitat

2.2.5.1 Global Climate Change

Another factor affecting the range wide status of CCC steelhead, CCV steelhead, winter-run Chinook salmon, CV spring-run Chinook salmon, Southern DPS green sturgeon, and aquatic habitat at large is climate change. Recent work by the NMFS Science Centers ranked the relative vulnerability of west-coast salmon and steelhead to climate change. In California, listed coho and

Chinook salmon are generally at greater risk (high to very high risk) than listed steelhead (moderate to high risk) (Crozier *et al.* 2019).

Impacts from global climate change are already occurring in California. For example, average annual air temperatures, heat extremes, and sea level increased in California over the last century (Kadir *et al*. 2013). Snowmelt from the Sierra Nevada has declined (Kadir *et al*. 2013). Listed salmon, steelhead and green sturgeon have likely already experienced some detrimental impacts from climate change through lower and more variable stream flows, warmer stream temperatures, and changes in ocean conditions. California experienced well below average precipitation during the 2012-2016 drought, as well as record high surface air temperatures in 2014 and 2015, and record low snowpack in 2015 (Williams *et al*. 2016). Paleoclimate reconstructions suggest the 2012-2016 drought was the most extreme in the past 500 to 1000 years (Williams *et al*. 2016 Williams *et al*. 2020, Williams *et al*. 2022). Anomalously high surface temperatures substantially amplified annual water deficits during 2012-2016. California entered another period of drought in 2020. These drought periods are now likely part of a larger drought event (Williams *et al.* 2022). This recent long-term drought, as well as the increased incidence and magnitude of wildfires in California, have likely been exacerbated by climate change (Williams *et al.* 2022, Diffenbaugh *et al.* 2015, Williams *et al*. 2019).

The threat to CCC steelhead, CCV steelhead, winter-run Chinook salmon, CV spring-run Chinook salmon and green sturgeon from global climate change is expected to increase in the future. Modeling of climate change impacts in California suggests that average summer air temperatures are expected to continue to increase (Lindley *et al.* 2007; Moser *et al*. 2012). Heat waves are expected to occur more often, and heat wave temperatures are likely to be higher (Hayhoe *et al*. 2004; Moser *et al*. 2012; Kadir *et al*. 2013). Total precipitation in California may decline and the magnitude and frequency of dry years may increase (Lindley et al. 2007; Schneider 2007; Moser *et al.* 2012). Similarly, wildfires are expected to increase in frequency and magnitude (Westerling *et al.* 2011; Moser *et al.* 2012). Increases in wide year-to- year variation in precipitation amounts (droughts and floods) are projected to occur (Swain et al. 2018). Estuarine productivity is likely to change based on changes in freshwater flows, nutrient cycling, and sediment amounts (Scavia *et al*. 2002; Ruggiero *et al.* 2010).

In marine environments, ecosystems and habitats important to juvenile and adult salmonids are likely to experience changes in temperatures, circulation, water chemistry, and food supplies (Brewer and Barry 2008; Feely 2004; Osgood 2008; Turley 2008; Abdul-Aziz *et al*. 2011; Doney *et al.* 2012). Some of these changes, including an increased incidence of marine heat waves, are likely already occurring, and are expected to increase (Frolicher, *et al.* 2018). In fall 2014, and again in 2019, a marine heatwave, known as “The Blob”, formed throughout the northeast Pacific Ocean, which greatly affected water temperature and upwelling from the Bering Sea off Alaska, south to the coastline of Mexico. The marine waters in this region of the ocean are utilized by salmonids for foraging as they mature (Beamish 2018). Although the implications of these events on salmonid populations are not fully understood, they are having considerable adverse consequences to the productivity of these ecosystems and presumably contributing to poor marine survival of salmonids.

2.2.5.2 Water Quality

Recently published work has identified stormwater from roadways as causing mortality of adult coho salmon in the wild (Scholz *et al.* 2011) and laboratory settings (McIntyre *et al.* 2018). Subsequent laboratory studies showed this morality also occurred in juvenile coho salmon (Chow *et al.* 2019) as well as to juvenile steelhead and Chinook salmon (Brinkmann *et al*. 2022). These recent publications have identified a degradation product of tires (6PPD-quinone) as the causal factor in this mortality (Tian *et al.* 2022, Brinkmann *et al*. 2022, Tian *et al*. 2020; Peter *et al*. 2018). The parent compound (6PPD) is widely used by multiple tire manufacturers and the tire shreds/dust that produce the degradation product have been found to be ubiquitous where both rural and urban roadways drain into waterways (Feist *et al*. 2018, Sutton *et al.* 2019).

2.3. Action Area

"Action area" means all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action (50 CFR 402.02). The action area for this consultation includes all areas that will be directly and indirectly affected by PG&E's routine maintenance activities at electrical facilities, gas line facilities, and access roads within the nine-county San Francisco Bay Area.[7] Figure 1 displays the locations of PG&E facilities in the O&M Program action area. Although O&M Program activities can occur at any of the locations in Figure 1, most PG&E facilities associated with freshwater streams are located in urban or "developed" areas where instream habitat and natural channel function are impaired. In tidal waters and wetlands, PG&E's electrical towers are primarily located adjacent to bridges and in wetland areas along the margin of the Bay.

2.4. Environmental Baseline

The "environmental baseline" refers to the condition of the listed species or its designated critical habitat in the action area, without the consequences to the listed species or designated critical habitat caused by the proposed action. The environmental baseline includes the past and present impacts of all Federal, State, or private actions and other human activities in the action area, the anticipated impacts of all proposed Federal projects in the action area that have already undergone formal or early section 7 consultations, and the impact of State or private actions which are contemporaneous with the consultation in process. The consequences to listed species or designated critical habitat from ongoing agency activities or existing agency facilities that are not within the agency's discretion to modify are part of the environmental baseline (50 CFR 402.02).

San Francisco Bay is the largest estuary on the west coast of North American in terms of surface area and it is also one of the most urbanized. The human population within the San Francisco Bay Area is approximately eight million (2020 census). In the past 150 years, the diking and filling of tidal marshes has decreased the surface area of the San Francisco Bay by 37 percent, which has diminished tidal marsh habitat, increased pollutant loadings to the estuary, and degraded shoreline habitat. Most shoreline areas are dominated by docks, shipping wharves,

[7] The nine Bay Area counties consist of Alameda, Contra Costa, Marin, Napa, San Francisco, San Mateo, Santa Clara, Solano, and Sonoma counties.

marinas, and miles of rock riprap for erosion protection. Most tributary streams have lost habitat through channelization, riparian vegetation removal, and water development. Dams blocking anadromy are present on most streams and the associated reservoirs are used for water supply, aquifer recharge, and/or recreational activities.

2.4.1. San Francisco Bay Estuary Description

The Bay receives inputs from the Sacramento and San Joaquin rivers, Bay Area tributary streams, stormwater runoff, and wastewater from municipal and industrial sources that vary in volume depending on the location and seasonal weather patterns. The freshwater outflow pattern is seasonal with the highest outflow occurring in the winter and spring. Local watersheds adjacent to the Bay contribute approximately 56 percent of the sediment delivered to the Bay, with the Delta and coastal sources contributing the remaining sediment supply (Barnard *et al.* 2013). Current and wave patterns in the estuarine portion of the action area are largely generated by the tides interacting with the bottom and shoreline configurations.

Central Bay, Suisun Bay, San Pablo Bay, and the South Bay all have shallow areas with mud to sand bottom, and deeper channels with mainly sand bottom. The mean water depth of the Central Bay is approximately 40 feet while the South Bay, San Pablo Bay and Suisun Bay have mean depths of 16 feet or less. Most of the Bay floor is comprised of sand and mud, overlying metamorphic and sedimentary bedrock. Bottom sediments are mud-dominated in shallower, low tidal energy areas. Sand is prevalent in deeper high tidal energy areas, such as the deeper portions of Central Bay and Suisun Bay, particularly within the main tidal channels where large waveforms are present along the Bay floor (Barnard *et al*. 2013). Both wind and tidal currents are strong in many parts of the estuary. The Carquinez Strait and Golden Gate are relatively narrow sections where tidal currents are particularly strong. Wind-driven waves throughout the estuary are particularly common during the summer and these waves re-suspend sediments and increase local turbidity. Salinity varies from freshwater values in Suisun Bay to oceanic values at the Golden Gate.

2.4.2. Bay Area Watersheds Description

Freshwater streams in action area (Table 5) drain to either San Francisco Bay or drain directly to the Pacific Ocean. The watersheds that drain to San Francisco Bay contain highly developed urban areas. Dams in upper watershed areas have been constructed for water development. Lower bayside reaches are typically characterized by hardened channels that have been re-aligned for flood control as they pass through heavily urbanized areas. However, some upper watershed areas remain relatively undeveloped and are protected in regional and State parks.

Over 90% of the annual freshwater that discharges into the San Francisco Bay comes from the Sacramento and San Joaquin rivers that combined, drain the Central Valley. The approximately 66 smaller watersheds that drain into the San Francisco Estuary contribute the remaining 10% of freshwater runoff (Leidy *et al.* 2017). Parallel-trending coastal and interior coastal mountains and hills surrounding the Bay are oriented along a general northwest to southeast axis. The largest watersheds draining to San Francisco Bay are Napa River (426 square miles) and Alameda Creek (700 square miles) (Leidy *et al.* 2017).

The action area also includes portions of the Russian River and the Pajaro River watersheds. The Russian River watershed encompasses approximately 1,500 square miles of forests, agricultural lands, and urban areas within Sonoma and Mendocino counties. About 95% of the watershed is in private ownership. The Russian River is about 110 miles long and flows from its headwaters near Redwood and Potter Valleys to the Pacific Ocean at the town of Jenner on the Sonoma Coast.

The Pajaro River watershed is approximately 1,300 square miles and it includes agricultural lands, natural areas, and urban development in Santa Clara, Santa Cruz, San Benito, and Monterey counties. The Pajaro River watershed's rivers, tributaries, and creeks ultimately drain into Monterey Bay.

The topography of the action area is extremely varied, with elevations ranging from sea level to 4,265 feet atop of Mount Hamilton in the Diablo Range. Overall, the climate of the action area is characterized by dry, mild summers and moist, cool winters. Temperatures are strongly influenced by the San Francisco Bay, the Pacific Ocean, and the various Bay Area mountain ranges, which results in a variety of microclimates. Coastside is generally mountainous and experiences a marine climate, characterized by cool, foggy summers and relatively wet winters. The Bayside features a flatter topography, and is generally warmer and sunnier than coastal areas.

2.4.3. Status of Listed Species and Critical Habitat in the Action Area

2.4.3.1 Status of Listed Anadromous Salmonids in the Estuarine Portion of the Action Area

The San Francisco Bay portion of the action area is used primarily as a migration corridor by listed CCC steelhead, CCV steelhead, CV spring-run Chinook salmon, and Sacramento River winter-run Chinook salmon. Adult salmonids migrate from the Pacific Ocean through the San Francisco Bay as they seek the upstream spawning grounds of their natal streams. Adult CCV steelhead migration through the Bay typically begins in fall and winter (McEwan and Jackson 1996). Adult CCC steelhead typically migrate through San Francisco Bay to their natal streams from December through April. Adult Sacramento River winter-run Chinook migrate through San Francisco Bay between December and May. Adult Central Valley spring-run Chinook salmon enter the Bay from the ocean for their upstream migration between February and April.

Juvenile (smolt) salmonids migrate from their natal streams through San Francisco Bay to the ocean. Emigration timing is highly variable among Sacramento River winter-run Chinook, CV spring-run Chinook, CCC steelhead and CCV steelhead smolts, but peak migrations downstream typically occur through the estuary during the late winter and spring months. To assess juvenile salmonid outmigration behavior and timing, a series of studies were performed from 2006 through 2010 with Central Valley late fall-run Chinook salmon and CCV steelhead smolts. Smolt-sized juveniles originating from Coleman National Fish Hatchery were tagged with acoustic transmitters and released in the Sacramento River to monitor their downstream movement to ocean-entry at the Golden Gate. Results showed that smolts generally transited the Bay rapidly in 2 to 4 days, yet also made repeated upstream movements, coinciding with incoming tidal flows (Hearn *et al*. 2013). Most Chinook and steelhead smolts were detected by

acoustic receivers located over deep, channelized portions of the Bay (Hearn *et al* 2013). Smolts detected at nearshore, shallow sites such as marinas, or up tributaries generally returned to the main channel to finish their migration (Hearn *et al*. 2013).

During the course of their downstream migration, juvenile listed salmon and steelhead may utilize estuarine waters for seasonal rearing, but available information suggests that fish are actively migrating and currently they do not reside for extended periods in San Francisco Bay (Hearn *et al*. 2010). Historically, the tidal marshes of the Bay provided a highly productive estuarine environment for juvenile anadromous salmonids. However, loss of habitat, changes in prey communities, and water-flow alterations and reductions have degraded habitat and likely limit the ability of the Bay to support juvenile rearing. MacFarlane and Norton (2002) found that fall-run Chinook experienced little growth, depleted condition, and no accumulation of lipid energy reserves during the relatively limited time the fish spent transiting the 40-mile length of the estuary. Sandstrom *et al*. (2013) found that CCC steelhead smolts emigrated more rapidly through the Bay than the Napa River and the ocean.

In contrast to demersal fish that are associated with the channel bottom, salmonids are pelagic fish and, as such, primarily occupy the water column and near surface when over deeper waters (Mari-Gold Environmental and Novo Aquatic Sciences 2009). Within the action area, listed salmon and steelhead are thought to typically display a preferential use of the middle and upper water column. Studies by Kjelson *et al*. (1982) in the Sacramento-San Joaquin Delta concluded juvenile Chinook salmon appear to prefer shallow water habitats near the shore and the upper portion of the water column (less than 10 feet deep).

2.4.3.2 Status of Listed Anadromous Salmonids in the Freshwater Portion of the Action Area

Adult listed Central Valley anadromous salmonids (CCV steelhead, CV Spring-run Chinook salmon, and Sacramento River winter-run Chinook salmon) migrate through the estuary and into the Sacramento River to spawn in the upper Sacramento River and its tributaries. Following emergence from redds, fry and juvenile rearing occurs in freshwater reaches in the upper Sacramento River watershed. These spawning and rearing sites in the upper Sacramento River watershed are outside of this project's action area and the O&M Program is not expected affect the spawning and freshwater rearing habitats of listed Central Valley anadromous salmonids.

For CCC steelhead, freshwater streams in the action area support migration, spawning, and rearing. Small populations of CCC steelhead occur in several Bay tributary streams including Arroyo Corte Madera del Presido, Corte Madera Creek, Napa River, Sonoma Creek, Petaluma River, Novato Creek, Pinole Creek, Coyote Creek, Guadalupe River, San Mateo Creek, San Francisquito Creek, and Stevens Creek (NMFS 2016b). North of San Francisco Bay, CCC steelhead are present in the Russian River Watershed. However, Coyote Valley Dam and Warm Springs Dam block access to upstream anadromous fish habitat, alter sediment transport dynamics, and degrade water flow and temperature within the Russian River portion of the action area. CCC steelhead are also present in the coastal streams that flow directly to the Pacific Ocean in Sonoma, Marin, and San Mateo counties. Although CCC steelhead are widely distributed throughout streams in the action area, abundance levels are far below recovery targets.

2.4.3.3 Status of Green Sturgeon in the Action Area

Green sturgeon are iteroparous, and adults pass through the San Francisco Bay during spawning, and post-spawning migrations. Pre-spawn green sturgeon enter the Bay between late February and early May, as they migrate to spawning grounds in the Sacramento River (Heublein *et al*. 2009, Miller *et al.* 2020). Post-spawning adults may be present in the Bay after spawning in the Sacramento River in the spring and early summer for months prior to emigrating into the ocean. Juvenile green sturgeon move into the Delta and San Francisco Bay early in their juvenile life history, where they may remain for 2-3 years before migrating to the ocean (Allen and Cech 2007; Kelly *et al*. 2007). Sub-adult and non-spawning adult green sturgeon utilize both ocean and estuarine environments for rearing and foraging. Due to these life-history characteristics, juvenile, sub-adult and adult green sturgeon may be present in San Francisco Bay year-round (Miller *et al*. 2020).

Although relatively little is known about green sturgeon distribution and abundance in the Bay, telemetry studies have been useful to understand habitat use during by juvenile, sub-adult and adult individuals. Chapman *et al.* (2019) conducted telemetry studies from 2009 to 2012 with 106 acoustic receivers deployed from the Benicia Bridge (Carquinez Strait) to the Port of Oakland to evaluate areas affected by dredging within the estuary. These results indicated that green sturgeon were present at designated dredge material placement sites and detected throughout the year (Chapman *et al*. 2019). Kelly *et al.* (2007) tracked green sturgeon movements in the Bay and found that sub-adults typically remain in shallower depths (less than 30 feet) and show no preference for temperature, salinity, dissolved oxygen, or light levels. Observations also suggest that there are two main types of movements of sub-adult green sturgeon in the estuary: directional and non-directional (Kelly *et al*. 2007). Kelly *et al*. (2020) recently described how two tagged green sturgeon utilized selective tidal transport to move throughout San Pablo Bay – swimming with the current near the surface in deeper high-current areas, and swam along the bottom in shallow areas with little current. This behavior is thought to maximize swimming efficiency and conserve energy.

Green sturgeon are encountered by recreational anglers and during sampling by CDFW in the shallow waters of San Pablo Bay. These fish are likely foraging on benthic prey and fish commonly found in soft-bottom habitats (ghost shrimp, crab, crangonid shrimp, and thalassinid shrimp) (Dumbauld *et al*. 2008). The CDFW surveys are used to estimate sturgeon (white and green) abundance, relative abundance, harvest rate, and survival rate in San Francisco Bay and the delta. Data from 2012 and 2013 show that green sturgeon abundance is low in Suisun and San Pablo bays relative to white sturgeon abundance. Green sturgeon make up approximately two to five percent of the total reported sturgeon caught in the greater Bay and lower delta. Green sturgeon catches were highest in Suisun Bay and San Pablo Bay, with very few green sturgeon reported in Central San Francisco Bay. However, this may be due to variances in fishing efforts in different locations in the Bay. Nonetheless, based on the available data, NMFS believes the overall abundance of green sturgeon in the action area is low. Freshwater habitats utilized by green sturgeon for spawning are located in the upper Sacramento River basin and are outside the action area of this project.

2.4.3.4 Status and Factors Affecting CCC Steelhead Critical Habitat in the Action Area

San Francisco Bay from the Golden Gate Bridge to the eastern end of Carquinez Strait (excludes Suisun Bay) is designated as critical habitat for CCC steelhead. Several freshwater streams within the action area are also designated as critical habitat for CCC steelhead. The PBFs of critical habitat for CCC steelhead in the estuarine portion of the action area have been degraded due to altered and diminished freshwater inflow, shoreline development, shoreline stabilization, non-native invasive species, discharge and accumulation of contaminants, loss of tidal wetlands, and periodic dredging for navigation. In the freshwater portion of the action area, PBFs of critical habitat for CCC steelhead are degraded by barriers that block migration, altered stream hydrology, loss of gravel and large wood in channels, bank stabilization, and modifications for flood control through urbanized areas. Urban and rural development in and adjacent to streams has substantially diminished habitat complexity, natural productivity, and ecological integrity in streams throughout the action area.

2.4.3.5 Status and Factors Affecting Winter-run Chinook Salmon Critical Habitat in the Action Area

Critical habitat for Sacramento River winter-run Chinook salmon includes the portion of the action area located in Suisun Bay, San Pablo and Central San Francisco Bay north of the San Francisco-Oakland Bay Bridge. Features of designated critical habitat for winter-run Chinook salmon in the action area essential for their conservation are habitat areas and adequate prey that are uncontaminated. These PBFs of designated critical habitat within the action area are degraded and limited. Habitat degradation in the action area is primarily due to altered and diminished freshwater inflow, shoreline development, shoreline stabilization, non-native invasive species, discharge and accumulation of contaminants, loss of tidal wetlands, and periodic dredging for navigation.

2.4.3.6 Status and Factors Affecting Green Sturgeon Critical Habitat in the Action Area

The San Francisco Bay portion of the action area is designated critical habitat for Southern DPS green sturgeon. PBFs for green sturgeon in estuarine areas include food resources, water flow, water quality, migratory corridor, water depth, and sediment quality. These PBFs for green sturgeon critical habitat in the action area are degraded. Habitat degradation is primarily due to altered and diminished freshwater inflow, shoreline development, shoreline stabilization, non-native invasive species, discharge and accumulation of contaminants, loss of tidal wetlands, and periodic dredging for navigation.

2.4.4. Climate Change in the Action Area

As described above in the Status of the Species and Critical Habitat section of this opinion (Section 2.2.5.1), climate change poses a threat to salmonid and sturgeon populations in central California. In the San Francisco Bay region, warm temperatures generally occur in July and August, but with climate change these events will likely begin in June and could continue through September (Cayan *et al*. 2012). Climate simulation models indicate the San Francisco region will maintain its Mediterranean climate regime for the 21st century; however, these models predict a high degree of variability in annual precipitation through at least 2050, leaving

the region susceptible to drought (Cayan *et al*. 2012). These models of future precipitation suggest that, during the second half of the 21st century in this region, most years will be drier than the historical annual average (1950-1999). As noted above in Section (2.2.5.1), California's recent long-term drought, as well as the increased incidence and magnitude of wildfires, have likely been exacerbated by climate change (Williams *et al.* 2022, Diffenbaugh *et al.* 2015, Williams *et al*. 2019).

2.4.5. Previous Section 7 Consultation in the Action Area

Numerous previous consultations pursuant to Section 7 of the ESA have occurred in the action area for a wide range of projects, including prior repairs at PG&E electrical infrastructure. For the majority of these projects, NMFS determined that they were not likely to adversely affect listed salmonids, green sturgeon or designated critical habitat. For the smaller number of projects with potential adverse effects on listed salmonids, green sturgeon, and/or designated critical habitat, NMFS determined that they were not likely to jeopardize the continued existence of listed fish nor adversely modify critical habitat. These formal consultations, where the proposed actions were likely to adversely affect ESA-listed fish species or their designated critical habitat, resulted in opinions containing RPMs to minimize the impacts of incidental take of listed fish species.

One complex formal consultation is the Long-Term Management Strategy (LTMS) for the Placement of Dredged Material in the San Francisco Bay Region. Similar to the proposed Program, the action area includes a large spatial area that overlaps with several ESA-listed fish species and their critical habitat. The LTMS Program also includes conditions for avoiding the migratory periods of listed salmonids to minimize impacts. The biological opinion for the LTMS Program was issued by NMFS to the Corps and the Environmental Protection Agency on July 9, 2015, and concluded the program of routine maintenance dredging in San Francisco Bay was not likely to jeopardize the continued existence of listed fish, or result in the destruction or adverse modification of designated critical habitat.

Research and enhancement projects resulting from NMFS' Section 10(a)(1)(A) research and enhancement permits and section 4(d) limits or exceptions could potentially occur in the action area. Salmonid and sturgeon monitoring approved under these programs includes juvenile and adult net surveys and tagging studies. In general, these activities are closely monitored and require measures to minimize take during the research activities.

2.5. Effects of the Action

Under the ESA, "effects of the action" are all consequences to listed species or critical habitat that are caused by the proposed action, including the consequences of other activities that are caused by the proposed action (see 50 CFR 402.02). A consequence is caused by the proposed action if it would not occur but for the proposed action and it is reasonably certain to occur. Effects of the action may occur later in time and may include consequences occurring outside the immediate area involved in the action (see 50 CFR 402.17). In our analysis, which describes the effects of the proposed action, we considered the factors set forth in 50 CFR 402.17(a) and (b).

The Corps proposes to issue an RGP that will authorize routine O&M activities on PG&E's natural gas and electrical transmission infrastructure throughout nine counties in the San Francisco Bay Area. Additionally, PG&E proposes to conduct maintenance on roads that provide access to these facilities and road maintenance will include the repair and replacement of culverts at stream crossings. O&M activities at electrical towers that would affect listed anadromous fish and designated critical habitat are located in tidal wetlands and tidal waters of San Francisco Bay. Gas line O&M and road maintenance activities are located in areas upland of San Francisco Bay and would affect freshwater streams with listed anadromous fish and designated critical habitat. The effects of PG&E's proposed O&M Program are presented below by activity type.

2.5.1. Effects of O&M Activities at Electrical Infrastructure

PG&E proposes routine maintenance the electrical transmission system in the Bay Area which consists of primary and secondary distribution lines that deliver electricity to customers. Electrical transmission lines are supported by steel-lattice towers, steel poles, and wooden poles. The majority of PG&E's electrical infrastructure in the Bay Area is located in terrestrial areas. No electrical infrastructure is located in freshwater streams. Measures proposed by PG&E in terrestrial areas are expected to prevent the discharge of contaminants and avoid disturbance of soils that could enter waterways with listed anadromous fish. Thus, electrical tower and pole repairs/replacements in terrestrial areas are anticipated to have no effect on listed anadromous fish or designated critical habitat, and this activity is not discussed further in this opinion. Similarly, no in-water work is required for line reconducting between poles and towers in terrestrial areas; thus, no effect on listed anadromous fish or designated critical habitat is anticipated with line reconductoring in terrestrial areas.

As described in Section 1.3.2 above, PG&E has categorized proposed activities at electrical transmission facilities as either "low impact" and "high impact". Proposed activities and their impact level categories are presented in Table 3. High impact activities would be conducted during the LOP (June 1 to November 30) when fewer listed species are likely to occur within the action area. Low impact activities would also be conducted between June 1 and November 30, but low impact activities may extend work until January 15, provided that these activities are initiated prior to November 30.

All electrical infrastructure work activities to be conducted under this RGP that will affect listed anadromous fish are located in tidally-influenced areas in San Francisco Bay; thus, the effects analysis presented in this section applies to the San Francisco Bay estuarine portion of the action area. All four listed anadromous salmonid species addressed in this opinion (CCC steelhead, CCV steelhead, CV spring-run Chinook salmon, and Sacramento River winter-run Chinook salmon) occur in San Francisco Bay during the winter and spring months. The Southern DPS of green sturgeon) occur in San Francisco Bay year-round. Additionally, all of San Francisco Bay is designated critical habitat for the Southern DPS of green sturgeon and portions of the Bay are designated as critical habitat for Sacramento River winter-run Chinook and CCC steelhead. See Section 2.4.3 of this opinion for additional information regarding the status of listed species and critical habitat in the estuarine portion of the action area.

2.5.1.1 Cofferdam Installation and Dewatering

Many O&M Program activities at electrical towers will require dewatering of the work site to facilitate construction. Specifically, tower foundation repairs and replacements can require the installation of a cofferdam to isolate the work area from tidal waters. Placement of a cofferdam has the potential to entrap listed fish during the final stages of installation when the area within the cofferdam is closed off.

PG&E proposes to scheduled cofferdam installation and closure activities during periods of low tide to minimize the amount of water and fish contained within the cofferdam. At most sites, low tide conditions will result in the site being naturally dewatered and there is little risk of fish entrapment when the cofferdam is closed at these shallow water locations. PG&E reports that 92% of the electrical tower foundations in San Francisco Bay are located in water depths at or above MLLW. At sites where water remains within the cofferdams following closure, pumps with fish screens will be deployed. As the area within the cofferdam is dewatered, fish collection will be performed with seines, hand nets, dipnets, and traps. Captured fish will be relocated to suitable aquatic habitat areas outside of the work area in adjacent estuarine waters.

Listed fish that avoid capture during dewatering activities and remain within the cofferdam are likely to be killed by stranding or contact with construction equipment. However, few fish are likely to avoid capture due to the limited amount of hiding cover within each work area. Listed anadromous salmonids are unlikely to be present in the estuary during the period when cofferdams are installed (i.e., June 1 to November 30). Thus, NMFS expects that the entrapment of listed salmon or steelhead in a cofferdam to be improbable. Green sturgeon in the estuary are generally larger than 16 inches in length and should be relatively easy to locate if entrapped within a cofferdam. Fish collections overseen by a qualified biologist are expected to effectively capture and relocate any green sturgeon that may be entrapped within a dewatered cofferdam (see Section 2.5.1.2 below).

Another manner by which fish may be harmed or killed during dewatering activities is to be entrained into the pumps used for dewatering. NMFS expects that entrainment or impingement of listed fish at dewatering pumps will be improbable because PG&E will place screens which meet NMFS intake screen criteria for anadromous salmonids on all water pumps.

Benthic (*i.e.*, substrate dwelling) aquatic macroinvertebrates (i.e., prey of listed fish species) within the Program site will be killed or their abundance reduced when benthic habitat is dewatered within a cofferdam. However, effects to aquatic macroinvertebrates resulting from dewatering will be temporary because construction activities will be relatively short-lived (i.e., not to exceed 35 days at an electrical tower). However, larger scale effects to the benthic community are expected from Program activities and are discussed in Section 2.5.1.6 of this opinion.

2.5.1.2 Fish Handling

During dewatering of areas internal to cofferdam sites, PG&E proposes to capture and relocate fish away from work sites to avoid mortality and minimize the possible stranding of fish within cofferdams. Fish will be captured by seines, hand nets, dip nets, and traps, then transported and

released to nearby suitable habitat. As presented above, listed anadromous salmonids are unlikely to be captured due to the timing of cofferdam installations. However, green sturgeon are present in the estuary year-round and may be entrapped as a cofferdam is closed. Data to precisely quantify the number of green sturgeon that will be collected and relocated from cofferdams is not available, but is expected to be low due to the relatively small number of green sturgeon within the estuary, their wide distribution throughout the estuary, and they are likely to respond behaviorally to construction activities by swimming away from active work sites.

Fish relocation activities pose a risk of injury or mortality to rearing juvenile fish. Any fish collecting gear, whether passive (Hubert 1996) or active (Hayes *et al*. 1996) has some associated risk to fish, including stress, disease transmission, injury, or death. The amount of unintentional injury and mortality attributable to fish capture varies widely depending on the method used, the ambient conditions, and the expertise and experience of the field crew. Potential stress, injury, and mortality of captured and handled green sturgeon during fish relocation will be lessened by the use of qualified biologists. Despite protective measures, NMFS expects the capture, handling and transport of fish will result in stress and potentially injury of a small number of green sturgeon individuals.

Information regarding the mortality of green sturgeon associated with capture and handling is available from annual reports submitted by researchers operating under ESA section 10(a)(1)(A) permits and Exemption 1 of the Southern DPS green sturgeon 4(d) rule. These reports indicate mortalities of green sturgeon associated with handling are very low. The June 2, 2022, NMFS biological opinion for evaluation of research programs submitted for consideration under the ESA's section 4(d) Rule summarized ten years of annual reporting by sturgeon researchers (NMFS 2022). Compilation of these reports showed no mortalities of adult green sturgeon in the ten-year period extending from 2011-2020. Mortalities of juvenile green sturgeon were limited to one event in 2016 where 77 juvenile green sturgeon were captured and 10 were killed unintentionally. All other researchers reported zero mortalities associated with the capture of juvenile green sturgeon in the 10-year period from 2011-2020 (NMFS 2022). Based on this information, it is anticipated that the collection and relocation of adult and juvenile green sturgeon during PG&E's relocation of fish from dewatered cofferdams will result in no mortalities absent an unintentional accident; although stress and sublethal injury will temporarily affect individuals. Recovery of handled individuals is expected to be rapid following relocation in waters adjacent to work sites.

2.5.1.3 Underwater Sound

Elevated levels of underwater sound levels are expected during pile driving in tidal waters. Sheet piles will be installed for cofferdam construction and steel piles installed for tower repairs/replacements. PG&E has proposed prioritizing the use of vibratory hammers, but may also utilize helical pile drivers and impact hammers to install piles.

Fish may be injured or killed when exposed to impulsive sound sources such as those associated with pile driving of steel piles by impact hammers. Pathologies of fish associated with very high sound level exposure and drastic changes in pressure are collectively known as barotraumas. These include hemorrhage and rupture of blood vessels and internal organs, including the swim bladder and kidneys. Death can be instantaneous, occur within minutes after exposure, or occur

several days later. Fish can also die when exposed to lower, continuous sound pressure levels if exposed for longer periods of time. Hastings (1995) found death rates of 50 percent and 56 percent for gouramis (*Trichogaster* sp.) when exposed for two hours or less to continuous sound at 192 decibels (dB) root-mean-square pressure (RMS) (re: 1micropascal [µPa]) at 400 Hertz (Hz) and 198 dB (re: 1[µPa]) at 150 Hz, respectively, and 25 percent for goldfish (*Carassius auratus*) when exposed to sounds of 204 dB (re: 1 µPa) at 250 Hz. Hastings (1995) also reported that acoustic "stunning" a potentially lethal effect resulting in a physiological shutdown of body functions, immobilized gourami within eight to thirty minutes of exposure to these sound levels.

Hearing loss in fishes can occur from exposure to high intensity sounds, which can over-stimulate the auditory system of fishes and may result in temporary threshold shifts. A temporary threshold shift is considered a non-injurious temporary reduction in hearing sensitivity. Physical injury may also occur for fish exposed to high levels or continuous sound, manifested as a loss of hair cells, located on the epithelium of the inner ear (Hastings and Popper 2005). These hair cells are capable of sustaining injury or damage that may result in a temporary decrease in hearing sensitivity. However, this type of noise-induced hearing loss in fishes is generally considered recoverable, as fish possess the ability to regenerate damaged hair cells (Lombarte *et al*. 1993, Smith *et al*. 2006). Permanent hearing loss has not been documented in fish. Even if threshold shifts in hearing do not occur, loud sounds can mask the ability of fish to hear their environment. This effect from loud sound exposure is referred to as acoustic or auditory masking. Masking generally results from an unwanted or unimportant sound impeding a fish's ability to hear sounds of interest, such as sounds made by prey or predators.

Underwater sound exposures have also been shown to alter the behavior of fishes (see review by Hastings and Popper 2005). The observed behavioral changes include startle responses and increases in stress hormones. Exposure to pile driving sound pressure levels may also result in "agitation" of fishes indicated by a change in swimming behavior detected by Shin (1995) or "alarm" detected by Fewtrell (2003). Other potential changes include reduced predator awareness and reduced feeding. The potential for adverse behavioral effects will depend on a number of factors, including the sensitivity to sound, the type and duration of the sound, as well as life stages of fish that are present in the areas affected by underwater sound produced during pile driving. A fish that exhibits a startle response to a sudden loud sound may not necessarily be injured, but it is exhibiting behavior that suggests it perceives a stimulus indicating potential danger in its immediate environment. However, fish do not exhibit a startle response every time they experience a strong hydroacoustic stimulus.

In order to assess the potential effects to fish exposed to pile driving sound, a coalition of federal and state resource and transportation agencies along the West Coast, the Fisheries Hydroacoustic Working Group (FHWG), used data from a variety of sound sources and species to establish interim acoustic criteria for the onset of injury to fishes from impact pile driving exposure (FHWG 2008). Most historical research has used peak pressure to evaluate the effects on fishes from underwater sound. Current research, however, suggests that sound exposure level (SEL), a measure of the total sound energy expressed as the time-integrated, sound pressure squared, is also a relevant metric for evaluating the effects of sound on fishes. An advantage of the SEL metric is that the acoustic energy can be accumulated across multiple events and expressed as the cumulative SEL (cSEL). Therefore, a dual metric criteria was established by the FHWG and

includes a threshold for peak pressure (206 dB) and cSEL (187 dB for fishes 2 grams or larger and 183 dB for fishes smaller than 2 grams). Injury would be expected if either threshold is exceeded. There is uncertainty as to the behavioral response of fish to underwater sound produced when driving piles in or near water. Until new information indicates otherwise, NMFS believes a 150 dB RMS threshold for behavioral responses for green sturgeon and listed salmonids is appropriate.

Different types of piles (e.g., wood, steel, concrete) and different drivers (e.g., impact, vibratory, helical) result in wide range of underwater sound levels. Impact hammers produce the highest elevated underwater sound levels, particularly when used in combination with steel piles. Vibratory hammers produce less sound than impact hammers and are often employed as a measure to reduce the sound generated by pile driving, and in turn, the potential for adverse effects on fish (Buehler *et al.* 2015). Based on the results of hydroacoustic monitoring conducted in San Francisco Bay (Molnar *et al.* 2020), use of vibratory hammers is not expected to produce sound levels that exceed the dual metric criteria described above. Similarly, the use of helical pile driving is not expected to produce sound levels that will exceed the dual metric criteria because this method of installation screws piles into the substrate instead of being driven with a hammer. Sheet piles for cofferdam construction will only be installed by vibratory hammer.

2.5.1.4 Pile Driving in Tidal Waters

As described in Section 1.3.2 of this opinion, high impact activities, such as the use of an impact hammer or dewatering, would be scheduled to occur between June 1 and November 30 to avoid overlap with the primary migratory periods for listed steelhead and salmon in San Francisco Bay. However, unforeseen circumstances may lead to the Program continuing and completing some activities after November 30. Listed salmon and steelhead are generally not present in the Bay until the winter and spring months; thus, PG&E Program activities that continue after November 30 will exposed listed anadromous salmonids to elevated levels of underwater sound. However, O&M Program activities may only extend a maximum of six additional weeks after November 30 because all work must be completed each year by January 15. Green sturgeon, both juveniles and adults, will occur in the action area year-round and would potentially be exposed to the effects of pile driving throughout the year.

For the purposes of this analysis we have used the maximum distances peak SPLs and cSELs could travel as a reasonable worst-case scenario. The highest sound levels associated with the Program's construction activities will occur during the driving of the 60-inch and 72-inch steel pipe piles with an impact hammer, and thus, impact the largest area. During implementation of the Program, tower repairs and replacements could occur at as many as 17 sites per year, and PG&E will utilize piles as large as 72-inches in diameter. Therefore, our analysis assumes that the largest and loudest piles (60-inch and 72-inch) will be used at up to 17 sites per year. In the project's biological assessment, PG&E examined hydroacoustic monitoring results for similar sized piles and in similar conditions presented in the Technical Guidance for the Assessment of Hydroacoustic Effects of Pile Driving on Fish (Molnar *et al.* 2020).

To estimate the peak SPL and cSEL that will occur during pile driving at PG&E tower foundation repair/replacement sites, NMFS used proxy sound levels contained in the NMFS Optional Multi-Species Pile Driving Calculator, Version 1.2-Multi-Species 2022

(https://media.fisheries.noaa.gov/2022-08/BLANK%20Multi-Species%28AUGUST%202022%29PUBLIC_OPR1.xlsx). Most of the proxy values presented in the NMFS Optional Multi-Species Pile Driving Calculator were obtained from Molnar *et al.* (2020). We used this calculator because it provides a conservative and consistent method for estimating sound pressure levels at distance from pile driving, and is appropriate for projecting underwater sound levels at multiple locations throughout the San Francisco Bay

Calculator results are presented in Table 7 and show estimates of distance from a pile to peak SPLs and cSELs (*i.e.,* NMFS dual metric criteria) during impact hammer pile driving of steel piles ranging from 16 inches to 72 inches in diameter. Proxy values were selected from pile driving projects with the same pile type/size and similar water depths. The underwater sound estimates in Table 7 also incorporate sound attenuation by use of an air bubble curtain or cofferdam. Air bubble curtains are constructed by the placement of one or more horizontal concentric rings of perforated tubing around the pile. Air is pumped through the tubes and into the rings to emit a curtain of bubbles that encapsulate the pile. To optimize the sound attenuation capability of the curtain, the amount of bubbles and thickness of the curtain are maximized by adjusting the flow of compressed air delivered to the perforated tubing. If a cofferdam is used, dewatering of the area around the pile will attenuate sound propagation during pile driving. Therefore, the sound level estimates presented in Table 7 include 5 dB of sound attenuation. It should be noted that hydroacoustic monitoring of individual projects have reported sound attenuation levels from bubble curtains as high as 20 dB (Molnar *et al.*, 2020); however, the implementation of bubble curtains and the corresponding attenuation are not consistent. Cofferdams are thought to provide as great, if not greater, attenuation than bubble curtains; however, some acoustic monitoring has provided mixed results. Due to these inconsistencies, no more than 5 dB attenuation is recommended by Molnar *et al.* (2020) when estimating the sound attenuation benefits of air bubble curtains and cofferdams.

Table 7. Projected Impact Hammer Sound Levels with Steel Piles*

Steel Pile Size	Distance (ft) to 206 dB peak	Distance (ft) to 187 dB accumulated SEL/day	Distance (ft) to 150 dB RMS
16-inch	0	30	243
20-inch	20	446	4,458
24-inch	10	552	7,065
36-inch	20	827	7,065
60-inch	30	1,778	15,226
72-inch	30	1,309	15,226

*5 dB reduction assumed for sound attenuation with use of air bubble curtains or cofferdams. All examples in water depths $\leq$ 17 feet and calculations are for 2,000 strikes/day.

The calculator utilized by NMFS predicts SPLs from a pile driven with an impact hammer during O&M Program activities could exceed the 206 dB peak single strike threshold for a distance of up to 30 feet. At this close range, several factors make it unlikely that listed salmonids or green sturgeon will be adjacent to a pile during driving with an impact hammer. If a cofferdam is deployed, PG&E will use plywood or metal sheets to dewater the work site and fish

will not have access to the area immediately surrounding the pile. If a bubble curtain is used, placement of the curtain will occupy about 5-10 feet of the radial distance outward from the pile. Activation of the air bubble curtain prior to the initiation of pile driving is expected to startle fish adjacent to the pile and likely result in a flight response. Although most fish are likely to perceived these construction activities as a stimulus indicating potential danger in its immediate environment, not all fish may flee the area. Thus, there remains a distance up to 30 feet from a pile where peak sound levels are expected to exceed 206 dB and a small number of listed fish in this area are expected to be injured or killed by barotrauma.

In addition to peak sound levels exceeding 206 dB, cSEL is expected to result in injury or mortality of listed fish and cSEL will extend for a significantly greater distance from the pile. In general, the larger the pile diameter, the greater the distance and larger the area impacted by underwater sound levels during driving with an impact hammer. Information available to estimate cSEL for this Program indicates the greatest distance will occur during the driving of 60-inch piles (Table 7). The calculator predicts the extent of SPLs above a cSEL of 187 dB would extend up to a radial distance of approximately 1,778 feet from a 60-inch pile, and encompass the active working area under and around each pile location. For 72-inch piles, cSEL of 187 dB is projected to extend to a distance of 1,309 feet. For the purposes of this analysis, the zone of potential injury or mortality to listed fish is associated with a cSEL equal to or greater than 187 dB and is defined as the area in which fish could experience a range of barotraumas, including the damage to the inner ear, eyes, blood, nervous system, kidney, and liver. These injuries have the potential to result in the mortality of an individual fish either immediately or later in time.

Based on the foraging behavior and movements of green sturgeon within San Francisco Bay, some individuals are expected to be exposed to elevated sound levels during pile driving activities at PG&E electrical tower work sites in the San Francisco, San Pablo and Suisun bays. Similarly, if the Program needs to complete work with an impact hammer outside of the LOP, then listed salmonids would also be subjected to elevated sound levels. NMFS estimates that only a very small number of threatened Southern DPS green sturgeon would likely be injured or killed by the proposed pile driving because few individuals are likely to be exposed to a cSEL of 187 dB or greater. To incur injury or mortality, an individual fish would need to remain continuously within the zone of cSEL (see Table 7) for an extend period of time during pile driving. Thomas *et al*. (2022) examine the movement patterns of juvenile green sturgeon in San Francisco Bay and concluded that there are multiple behavioral movement patterns and a broad use of regional habitats. With this widespread distribution of green sturgeon throughout the Bay, pile driving activities by the O&M Program may expose sturgeon to the impacts of pile driving at any of the electrical tower work sites.

Similarly, NMFS estimates that a very small number of listed salmonids are likely to be injured or killed by high cSEL during the driving of steel piles, because this high impact activity would generally not occur when migrating salmonids are present in San Francisco Bay. Pile driving that occurs after November 30 will overlap with the adult upstream migration periods of Sacramento River winter-run Chinook salmon, CCV steelhead and CCC steelhead. However, adult upstream migrating Chinook and steelhead rapidly pass through the Bay on their way to their natal spawning streams. Adults salmonids in the Bay also make little use of shallow and nearshore

habitats where most pile driving will occur, and therefore, will be exposed to injurious levels of underwater sound in very small numbers. Juvenile and smolt listed anadromous salmonids are more likely to use nearshore habitats in the Bay for rearing and foraging, but the work window will prohibit pile driving activities from occurring after January 15 when juvenile and smolt salmonids are most likely to be present in the Bay.

Within the zone of cSEL of 187 dB (e.g., up to a maximum of 1,778 feet with a 60-inch pile being driven), most exposed listed fish are unlikely to remain in the same location to experience the full duration of a pile driving event due to tidal currents and behavioral movements. However, a few listed fish individuals could remain stationary long enough to be exposed to levels which cause injury or mortality. Although no data are available to quantify the risk of exposure to the cSEL threshold of 187 dB, some listed salmonids and sturgeon are expected to be injured or killed due to the large number of PG&E facilities throughout the action area that may be repaired or replaced during the 10-year duration of the proposed O&M Program.

PG&E also proposes to utilize vibratory hammers and helical pile driving. Vibratory hammers use counter-rotating eccentric weights to transmit vertical vibrations into the pile, causing the sediment surrounding the pile to liquefy and allow the pile to penetrate the substrate. The vibratory hammer produces sound energy that is spread out over time and is generally 10 to 20 dB lower than impact pile driving (Molnar *et al.* 2020). Based on the results of hydroacoustic monitoring of vibratory hammer pile installations (Molnar *et al.* 2020), the sound levels generated by vibratory hammer use over the course of this Program will be considerably below the injury and mortality thresholds for both single strike and cSEL. Helical pile driving involves turning, or screwing, large piles into the substrate instead of using a hammer. This is a relatively new technology and sound levels associated with this method are expected to be less than those associated with pile driving hammers (Byrne and Houlsby (2015). Effects associated with vibratory hammers and helical pile driving during O&M Program activities are expected to be temporary behavioral effects that are discussed below.

Beyond the zone of potential injury or mortality, sound levels are projected to exceed 150 dB RMS to a maximum distance of 15,226 feet during the impact driving of 60-inch and 72-inch steel piles. Fish may demonstrate temporary abnormal behavior within this zone during pile driving indicative of stress or exhibit a startle response. A fish that exhibits a startle response may not be injured, but display behavior that suggests it perceives a stimulus indicating potential danger in its immediate environment. The behavioral impact zone is approximately 16,000 acres for the 60-inch and 72-inch diameter piles.

If listed fish enter or transit the behavior impact zones described above during pile driving, there could be behavioral reactions. Fish may leave the area or avoid the area due to the elevated underwater sound levels. As noted above, many fish species demonstrate an avoidance reaction in the near-field (Dolat 1997). While behavioral impacts of ESA-listed fish during pile driving have not been specifically studied, NMFS anticipates that listed fish species, like other fish studied, will exhibit startle and avoidance behavioral reactions by swimming away from the work site. If elevated SPLs during pile driving result in a level of disturbance that causes salmonids and green sturgeon to leave or avoid the zone of behavioral impacts, foraging and migrating could be interrupted. Assuming the worst-case scenario, elevated sound levels could

render the behavioral impact zone unusable by listed fish during the hours when pile driving operations are underway.

For the Program's use of an impact hammer to install steel piles, no more than 2,000 strikes would be applied per day at each work site. As described above in Section 2.4, the action area provides soft bottom, sub-tidal foraging habitat for green sturgeon and juvenile listed salmonids forage within the upper portion of the water column. This temporal loss of foraging area will affect green sturgeon. Individuals could be displaced from preferred forage areas until each day's pile driving activities have concluded.

Similar to foraging behavior, the zone of behavioral impacts during pile driving may affect the migration of adult salmonids and green sturgeon. In particular, impact hammer pile driving at electrical tower sites within narrow channels or confined sloughs could create a zone of behavioral impacts that spans the channel width, and cause delays and disruption of migration movements. Based on the location of PG&E's electrical towers in San Francisco Bay (Figure 1), the zone of behavioral impacts during pile driving could span the width of Mare Island Strait and the lower Napa River. Migrating listed fish attempting to pass through the zone of behavioral effects during the period of 60- and 72-inch pile driving may temporarily stop migrating or shift their migration path.

If a behavioral response results in a delay/shift in migration or movement away from foraging areas, the duration of these behavioral effects is expected to be short because the Program will only use one impact hammer at a time with no more than 2,000 strikes per day. Depending on the site and type of pile, an impact hammer typically strikes the pile at a rate of once every 1.5 to 2 seconds (Molnar *et al.* 2020). Thus, pile driving events and the associated elevated underwater sound levels will be brief. These short temporary delays/detours to migration and displacement from foraging areas within the zone of behavioral impacts are not expected to result in adverse effects because fish are expected to safely return to these areas and continue migration movements when pile driving ceases. Additionally, high ambient levels of underwater sound in San Francisco Bay are likely to mask the noise of pile driving in the zone of behavioral influence as presented below.

In San Francisco Bay, ambient sound levels are reported to range from 120-155 dB peak (Strategic Environmental Consulting, Inc. 2004, as reported in Molnar *et al.* 2020). Thus, ambient sound levels in the action area are likely similar at times to the 150 dB RMS levels anticipated to occur inside the zone of behavioral effects during pile driving. With this level of ambient sound in the environmental setting of San Francisco Bay, elevated sound levels due to this Program's activities within the zone of behavioral effects may be hard to distinguish from other anthropogenic sources of sound, such as commercial vessels and recreational boats. Thus, elevated sound levels of 150 dB RMS originating from the installation of steel piles by this Program may not result in an avoidance response by listed fish. If there are behavioral responses, the effects of 150 dB RMS will be short term and the temporary delays to migration or displacement from a foraging area are expected to be negligible on listed fish. Based on the above, the temporary behavioral effects described above during pile driving are not expected to result in adverse effects to green sturgeon and listed anadromous salmonids.

Program O&M activities may also install wooden piles to repair or replace electrical infrastructure in the action area. Wooden piles are typically installed with a drop hammer and a cushion block is used between the hammer and the pile. Hydroacoustic monitoring of wooden pile installations have occurred in San Francisco Bay and results reported in Molnar *et al*. (2020). Monitoring results indicated that underwater SPLs from wood piles installed with an impact hammer do not reach the dual metric criteria for fish injury or mortality. Peak sound levels at 33 feet from the pile were generally in the range of 170 to 180 dB, and RMS levels generally ranged from 160 to 170 dB. Therefore, installation of wood piles by the Program are not expected to result in the injury or mortality of listed fish; however, elevated underwater sound levels during the installation of wooden piles will disturb listed fish and result in the disturbance effects described above for steel piles.

PG&E also proposes to use concrete piles at some locations for Program activities. Concrete piles would be cast in place using a hollow steel pile as the casing or form. Thus, installation of a concrete pile would always be preceded by the driving of a hollow steel pile and the effects of steel pile installation are described above. Filling of the hollow steel pile with concrete may affect water quality and potential effects of concrete use by the Program are presented below in Section 2.5.1.5 of this opinion.

2.5.1.5 Line Reconductoring in Tidal Waters

To perform line reconductoring between electrical towers in tidal waters, the O&M Program may use barges and/or helicopters. Work crews install replacement conductors by temporarily splicing them to the ends of the existing conductors and pulling them through travelers (i.e., pulleys) attached to the arms of the towers or pole cross-arms. Reconductoring typically is conducted in 2 to 3-mile sections and on-water pull sites will be located on work barges. Aside from utilizing a work barge, no in-water work is associated with line reconductoring activities.

During line reconductoring activities in shallow water areas, barges will utilize periods of high tide to minimize contact with the bottom of San Francisco Bay, as the barges must navigate along the transmission line in a manner that allows crews to work from the barge platform. When the barges are not in use, they will be docked at existing marina/dock facilities or landed in areas that avoid disturbance of submerged aquatic vegetation and wetland vegetation (NOAABA-AMM-01). For these reasons, disturbance of the substrate by work barges during line reconductoring is expected to be minimal. Benthic habitat disturbance by barges and other O&M activities is discussed further in Section 2.5.1.7 below. Because barges move slowly when working or relocating to and from work sites, any fish swimming near the surface that encounter a barge would be able to easily avoid the barge. Thus, NMFS believes it improbable that any listed fish would be struck by a barge. Any changes in habitat caused by shading from the barge on the water's surface would be minimal and temporary.

Use of helicopters during line reconductoring will result in elevated levels of sound in the air above the water surface. The extent of transmission of this sound to areas underwater is unknown but may be detected by listed fish in Bay waters. As discussed above in Section 2.5.1.3, sound exposures have been shown to alter the behavior of fishes (see review by Hastings and Popper 2005). Observed behavioral changes include startle responses and increases in stress hormones. With high levels of ambient sound in San Francisco Bay (reported to range from 120-155 dB

peak [Strategic Environmental Consulting, Inc. 2004, as reported in Molnar et al. 2020]), any elevated underwater sound levels due to operation of helicopters during line reconductoring are expected to have negligible effects on the behavior of listed salmonids and green sturgeon. If there are behavioral responses, the effects are anticipated to be short term and temporary.

2.5.1.6 Water Quality

Water quality in the estuarine portion of the action area may be degraded at electrical infrastructure work sites during the Program's construction activities. Disturbance of soft bottom sediments during the removal of existing piles and installation of new piles, and the construction of cofferdams is expected to result in temporary increased levels of turbidity. Additionally, water quality may be degraded through the suspension of sediment-associated contaminants in the water column. Program activities also include the use of concrete at tower foundations and to construct concrete piles.

Water quality in the freshwater portion of the action area may be affected by the O&M Program's access road maintenance activities. The effects of routine road maintenance activities on water quality are presented in Section 2.5.3 below.

Turbidity and Suspended Sediment

High concentrations of suspended sediment can disrupt normal feeding behavior (Cordone and Kelley 1961, Bjornn *et al*. 1977, Berg and Northcote 1985, Benfield and Minello 1996), reduce growth rates (Crouse *et al*. 1981, Nightingale and Simenstad 2001), and increase plasma cortisol levels (Servizi and Martens 1992). High and prolonged turbidity concentrations can reduce dissolved oxygen in the water column, result in reduced respiratory functions, reduce tolerance to diseases, and can also cause fish mortality (Sigler *et al*. 1984, Berg and Northcote 1985, Gregory and Northcote 1993, Velagic 1995, Waters 1995). Even small pulses of turbid water can cause salmonids to disperse from established territories (Waters 1995), which can displace fish into less suitable habitat and/or increase competition and predation, thus decreasing chances of survival.

As piles are driven and removed from the Bay substrate by the Program, fine-grain sediments such as clay and silt material will be disturbed and generate increased levels of turbidity in the adjacent water column. Sheet piles and plywood installed for the construction of temporary cofferdams will also disturb the Bay floor and distribute sediment into the water column. The extent of turbidity plumes resulting from Program construction will depend on the substrate, tide, currents, and wind conditions during these activities.

Based on observations of similar pile and cofferdam activities in the San Francisco Bay, increased levels of suspended sediment and turbidity during this Program's construction activities are anticipated to be minor, localized, and short-term. With strong tidal currents in the majority of the action area, any elevated levels of suspended sediment or turbidity are anticipated to rapidly return to background levels after work ceases. In areas with lower rates of tidal exchange, elevated levels of suspended sediments and turbidity will be detectable for two or three tidal cycles prior to returning to ambient levels.

Based on the anticipated extent and levels of turbidity associated with construction activities by the Program, the effects are not expected to result in harm or injury, or behavioral responses that impair migration, foraging, or make listed fish more susceptible to predation. If fish temporarily relocate from areas of increased turbidity, habitat of similar value is available in the surrounding waters adjacent to the PG&E work sites in the action area. Adjacent habitat areas also provide adequate carrying capacity to support individual fish that are temporarily displaced during in-water construction activities that cause increases in turbidity and suspended sediment. For these reasons, the potential effects on listed fish species of minor and localized areas of elevated turbidity and suspended sediment associated with this Program's construction activities are expected to be negligible.

Contaminants

As described above in the Environmental Baseline, water and sediment quality within the action area are affected by stormwater runoff, industrial activities, and other urban influences. Dillon and Moore (1990) reported that major pollutant sources for the San Francisco Bay include the freshwater flow from the Sacramento-San Joaquin River systems, over 50 waste treatment plants, and about 200 industries which are permitted to discharge directly into the Bay (citing Luoma and Phillips 1988). Tire shreds/dust that produce a degradation product (6PPD-quinone) have been found to be ubiquitous where urban roadways drain into waterways (Feist *et al*. 2018, Sutton *et al.* 2019). Environmental contaminants discharged into aqueous systems tend to associate with particulate material in the water column and with consolidated bedded sediments. However, since the U.S. Environmental Protection Agency started the National Pollutant Discharge Elimination System in 1972, water quality in San Francisco Bay has improved considerably.

During the installation and removal of piles and cofferdams, bottom sediments will be suspended and contaminants may be released to the water column. However, based on the types of activities conducted by the Program, the short duration of activities at each work site, and equipment to be used, the suspended plumes of sediment and potential contaminants released during construction are expected to be localized and short-term. Any minor and localized elevations in contaminants which might result from those suspended plumes are expected to be quickly diluted by tidal circulation to levels that are negligible for ESA-listed fish species.

Equipment refueling, fluid leakage, equipment maintenance, and construction activities near open waters pose some risk of contamination of aquatic habitat and subsequent injury or death to listed fish. Oils and similar substances from construction equipment can contain a wide variety of polycyclic aromatic hydrocarbons (PAH) and metals. Both can result in adverse impacts to fish. The Program will have in place spill and prevention measures designed to avoid contamination from equipment refueling, leakage, maintenance or other activities. NMFS anticipates the Program's proposed measures to prevent contamination will adequately protect water quality and avoid adverse effects by contaminants on listed fish.

Use of Concrete

The repair or replacement of tower foundations will involve the pouring and curing of concrete, which can result in increased pH levels in adjacent waters. Exposure to variations in pH in the aquatic environment can result in impacts to fish in the form of gill damage, disruption of

sodium balance, ammonia excretion or in some cases the increased toxicity of other elements in the aquatic environment (McLeay and Associates 1983, Baekken 2014, Foldvik *et al.* 2022). As described in Section 1.3.5, the release of uncured concrete into the water would not be allowed during repair or replacement of electrical infrastructure. All concrete will be contained within forms, for at least 24 hours, to prevent wet concrete from leaching into the aquatic environment. With implementation of the Program's proposed avoid and minimization measures, the risk of increased pH and subsequent impacts to fish and other aquatic organisms in the estuary would be avoided.

2.5.1.7 Benthic Habitat

Disturbance of benthic habitat by PG&E O&M activities has the potential to affect foraging and prey availability for listed fish. Green sturgeon forage throughout the estuarine portion of the action area on demersal fish and benthic invertebrates. Radtke (1966) analyzed stomach contents of juvenile green sturgeon captured in the Sacramento-San Joaquin Delta and found the majority of their diet was benthic invertebrates, such as mysid shrimp and amphipods (*Corophium* spp). In San Francisco Bay, green sturgeon are known to forage in shallow tidal flats dominated by burrowing shrimp and other benthic prey (Dumbauld *et al.* 2008).

For Chinook salmon and steelhead, research indicates salmonid juveniles that use the estuary for rearing appear to prefer shallow water habitats near the shore and the upper portion of the water column (less than 10 feet deep) (Kjelson *et al.* 1982). In the action area of this project, salmonid juveniles have been observed rapidly migrating to the ocean (MacFarlane and Norton 2002), but some juvenile Chinook and steelhead are likely to forage during their migration through San Francisco Bay and feed upon prey items nearshore and in the upper water column. Prey organisms in the upper water column are unlikely to be affected by the Program's activities that disturb benthic habitats. Although benthic disturbance near the shoreline and in tidal marshes have the potential to impact prey of juvenile salmonids in the estuary.

Several proposed O&M Program activities are likely to disturb benthic habitats and the associated community of benthic organisms. The Program's installation and removal of cofferdams and pilings are expected to injure and kill benthic invertebrates that are directly in the footprint of these activities. Cofferdams will temporarily close-off areas and benthic habitat within the enclosures will be disturbed. Work barges that rest on the substrate during low tide will disturb benthic habitat; however, disturbance of the substrate by barges is expected to be minimal and barges in shallow areas will be placed to avoid disturbance of submerged aquatic vegetation and wetland vegetation (NOAABA-AMM-01). Permanent loss of benthic habitat will result from fill associated with new and expanded tower foundations and boardwalks. However, in some instances the installation of these structures will include removal of older, existing structures and there may be little change in the total area of infrastructure on the bay floor. Placement of mats on the substrate during work activities will temporarily cover areas that contain burrowing benthic invertebrates.

At individual work sites the extent of impacts to the benthic community is expected to be small areas immediately surrounding each tower repair/replacement project; although the area affected will be larger if a cofferdam is constructed. PG&E estimates the average footprint of impact at each site is limited to 500 square feet; however, due to the large number of facilities, the

Program's biological assessment estimates proposed activities will annually result in temporary impacts of up to 0.58 acre of habitat (PG&E 2022). Permanent impacts associated with the repositioning/relocation of tower footings and foundations are anticipated to be approximately 0.08 acre of surface area annually (Table 6).

For aquatic benthic invertebrates injured and lost to construction disturbance, sites are expected to be re-colonized within a few months from adjacent undisturbed areas. Although as many as 17 sites may have work performed in a single year, the sites are dispersed throughout a large geographic area and impacts are primarily temporary. NMFS does not expect this temporary loss of benthic prey in the action area will prevent sturgeon and listed salmonids from finding suitable forage at the quantities and quality necessary for normal behavior (e.g., maintenance, growth, reproduction). Permanent loss of benthic habitat where foundations and/or tower footings are relocated is also not expected to adversely affect prey availability and foraging by listed fish because the area impacted is low (approximately 0.08 acre per year), and in some instances abandoned electrical infrastructure will be removed.

To mitigate for permanent impacts to habitat, PG&E intends to contribute funds that will be used for projects to improve fish passage and/or fish habitat within San Francisco Bay and freshwater migratory corridors within the greater San Francisco Bay Area. These mitigation projects would obtain approval from the Corps through separate permits and their effects are not considered in this opinion because they will be addressed in future consultations pursuant to section 7 of the ESA.

2.5.1.8 Effects of O&M Activities at Electrical Infrastructure on Critical Habitat

As described in Section 2.5.1 of this opinion, the O&M Program includes maintenance of electrical transmission lines that are supported by steel-lattice towers, steel poles, and wooden poles. The majority of PG&E's electrical infrastructure in the Bay Area is located in terrestrial areas. No electrical infrastructure is located in freshwater streams and no electrical infrastructure maintenance activities would be conducted in streams. Measures proposed by PG&E in terrestrial areas during work on electrical towers and poles are expected to prevent the degradation of water quality in streams designated as critical habitat for listed anadromous fish. Thus, electrical tower and pole repairs/replacements in terrestrial areas are anticipated to have no effect on designated critical habitat.

Electrical infrastructure O&M activities authorized by this RGP that will affect critical habitat for listed anadromous fish are located in tidally-influenced areas in San Francisco Bay. The San Francisco Bay estuarine portion of the action area is designated as critical habitat for Southern DPS green sturgeon, Sacramento River winter-run Chinook salmon, and CCC steelhead (see Section 2.4.3 of this opinion). Program activities are expected to temporarily alter water quality and impact benthic habitat at work sites in designated critical habitat.

Water Quality

The effects of Program construction activities on water quality are discussed above in Section 2.5.1.5 of this opinion and also apply to designated critical habitat in the action area. As described above, the effects of the proposed Program will result in increased levels of turbidity

and the suspension of sediment-associated contaminants. The impacts on water quality from turbidity and contaminants are not expected to degrade PBFs of ESA-listed fish species because the level of potential contaminants and turbidity is low, and both turbidity and contaminant-laden sediments are expected to be further dispersed (levels reduced) by tides and currents in the action area. The effects of the degradation product (6PPD-quinone) associated with tire shreds are unlikely to be exacerbated by O&M Program activities. Thus, effects of degraded water quality on designated critical habitat are expected to be short-term, minor, and localized.

Benthic Community

The effects of Program activities on benthic habitat are discussed above in Section 2.5.1.6 of this opinion. The Program's installation and removal of cofferdams and pilings are expected to injure and kill benthic invertebrates which could degrade the PBFs of critical habitat associated with foraging. In areas where benthic habitat disturbance is temporary, benthic invertebrates are expected to re-colonize work sites within a few months. Permanent impacts associated with the relocation or expansion of electrical tower foundations would result in the loss of benthic habitat and are estimated to be up to 0.08 acres annually. This permanent habitat loss will be dispersed throughout a large geographic area and sites are non-contiguous. For the reasons presented above and in Section 2.5.1.6 of this opinion, the small disconnected areas of permanent benthic habitat loss by the 10-year program will degrade PBFs of designated critical habitat for the Southern DPS green sturgeon, Sacramento River winter-run Chinook salmon, and CCC steelhead, but not significantly compromise the value of foraging habitat in this large geographic area.

2.5.2. Effects of O&M Activities at Natural Gas Infrastructure

Natural gas infrastructure O&M work activities to be conducted under this RGP that will affect listed anadromous fish are primarily located in the channels of freshwater streams upland from San Francisco Bay, but a small number of gas lines are located in tidal wetlands or estuarine waters (see Table 5 for waterways with gas line crossings). Of the five listed anadromous fish species addressed in this opinion, only CCC steelhead and their designated critical habitat occur in the freshwater portion of the action area. Gas line activities in tidal areas affect CCC steelhead and will also affect CCV steelhead, Sacramento River winter-run Chinook, CV spring-run Chinook, and Southern DPS green sturgeon.

Natural gas line O&M activities consist of site-specific erosion measures over pipelines, pipeline recoating, pipeline replacement, valve recoating, and valve replacement. These activities will affect listed anadromous fish and/or designated critical habitat at gas line crossings in freshwater channels and in tidal wetland areas. PG&E's pre-construction notifications for individual O&M activities will identify specific locations and specify whether or not listed anadromous fish or designated critical habitat may be present at gas line crossing work sites.

The proposed O&M activities associated with gas line infrastructure generally involve the excavation of materials to expose the gas line or valve, performing the recoating or replacement work (valve or pipeline), and then replacing the excavated materials to re-bury the pipeline. For site-specific erosion protection, biodegradable jute netting and other non-hardscape materials will be placed on exposed sections of pipeline in the stream channel to prevent further erosion. PG&E proposes to limit O&M activities associated with gas line crossings at waterways with

listed anadromous fish to periods when the work sites are naturally dry (see NOAABA-AMM-13). By restricting gas line maintenance to sites that are naturally dry, no dewatering with cofferdams will be required. and the potential adverse effects associated with excavation and trenching in wetted areas will be avoided.

Some gas line crossing sites included in Table 5 are located on waterways that do not seasonally dewater during the dry season and these locations are specified on the table as "likely to support year-round flow". At these sites, traditional excavating and trenching methods will not be conducted and PG&E will develop alternative methods for repairing or replacing gas lines. The RGP will not authorize in-water work at these pipeline crossing sites. With PG&E only employing methods that avoid work in channels at crossings with year-round flow, no effects to listed anadromous salmonids and green sturgeon are anticipated at these sites with year-round flow.

Effects on Fish

In tidal wetlands, work on gas line infrastructure would only be performed at sites that are located in high marsh areas. Some high marsh areas would be inducted at extreme high tides, but O&M Program work activities would be scheduled to avoid extreme tide events and be completed without effecting tidal waters. Similarly, on freshwater streams O&M activities on gas lines would be scheduled for the dry season when work sites are naturally dry. No dewatering would be performed to conduct these O&M activities. Under all water year conditions, O&M activities would be scheduled to ensure work is performed when anadromous salmonid streams contain no flowing water at work sites. At gas line valves, excavation of soils to expose valves located near waterways with listed anadromous fish would be performed without disturbing the stream or tidal channel. If work activities impact riparian vegetation, sites will be revegetated with native plant species in a manner consistent with maintaining safety at PG&E's infrastructure.

By avoiding periods when work sites may be inducted by high tides and only working in stream channels that contain no flowing water, no listed fish will be present during work activities on natural gas infrastructure. Construction activities are expected to proceed with no immediate effects on listed fish and no discharge of construction debris into waters with listed fish because no water will be present. O&M activities would be completed before the return of tidal inundation in estuarine areas and prior to the return of fall/winter surface flow in freshwater streams. Thus, no impacts to listed fish would occur during construction activities on gas line infrastructure.

Water Quality

Post-construction, minor turbidity will occur in waters at work sites when the site is re-watered during the following wet season with rainfall or during extreme high tide events in tidal wetlands; however, PG&E's use of erosion control measures and plantings of native vegetation are expected to minimize the mobilization of sediments from areas disturbed by construction activities. The resulting increase in turbidity levels in the waterways is expected to be minor and rapidly dissipate to ambient levels. For these reasons, the effects of O&M activities at gas line infrastructure on listed anadromous fish from changes in water quality in the action area are expected to be negligible.

Channel Form and Function

Site-specific erosion solutions on gas line crossings in waterways with listed anadromous fish could contribute to the long-term preclusion of natural fluvial and geomorphic processes. For example, in most low gradient streams the channel will naturally "meander", eroding laterally to dissipate its hydraulic energy while creating a sinuous longitudinal course. Stream meandering efficiently regulates the erosive forces by lengthening the channel and reducing stream gradient, thus controlling the ability of the stream to entrain and transport available sediment. Meandering streams also create and maintain both the hydraulic and physical components of instream habitat used by fish and other aquatic species. Specific to salmon and steelhead, a meandering, unconstrained stream channel sorts and deposits gravel and other substrate necessary for optimal food production and spawning success, maintains a healthy and diverse riparian corridor that supplies large woody debris to the channel, and inundates adjacent floodplain habitat during appropriate winter/spring flows (Spence *et al.* 1996).

Proposed site-specific erosion solutions at gas line crossings could result in small-scale permanent alteration of channel morphology by altering the physical land/water interface (i.e. streambank) that provides shelter, food, and other ecosystem benefits to aquatic species, including juvenile salmonids. Channel hydraulics could also be affected at erosion solution sites if the channel width is reduced. Channel constrictions, particularly with hardscape, can increase water velocities and cause corresponding increases in shear stress and degradation along stream banks (Simon and Johnson 1999).

For erosion protection actions authorized by this RGP in waterways with listed anadromous fish, PG&E would not utilize hardscape materials. Erosion protection projects would not span more than 20 percent of the active channel width and not exceed 500 square feet per site. Materials, such as jute netting, straw waddles, native plants and hydroseeding will be placed in the channel in a manner that avoids the constriction of flow and will not increase water velocities (NOAABA-AMM-14). These limits on the extent of erosion protection actions will avoid channelization and impairment of natural channel processes. These measures will also ensure fish passage and bedload transport persist in the channel. No significant effects to channel morphology and hydraulic conditions are anticipated by the O&M Program's erosion protection actions on freshwater stream and tidally influenced areas because hardscape will not be used and no erosion protection will be placed in at least 80 percent of the active channel width. Stream channels and tidal sloughs at and adjacent to work sites are anticipated to continue to maintain existing features that provide complex rearing, feeding, spawning, and shelter habitat. Based on the proposed measures and limits for erosion protection activities at gas line crossings, this O&M Program element is expected to have minimal impacts on natural channel functions and habitat condition for anadromous fish in streams throughout the action area.

Riparian Vegetation

O&M Program activities at gas line crossings will result in the removal or disturbance of existing riparian vegetation. Riparian vegetation helps maintain suitable stream habitat conditions for anadromous salmonids. Riparian zones and aquatic vegetation serve important functions in stream ecosystems, such as providing shade (Poole and Berman 2001), sediment storage and filtering (Cooper *et al*. 1987, Mitsch and Gosselink 2000), nutrient inputs (Murphy and Meehan

1991), water quality improvements (Mitsch and Gosselink 2000), channel and streambank stability (Platts 1991), habitat heterogeneity (Bryant 1983, Lisle 1986, Shirvell 1990), and refugia (Bustard and Narver 1975, Wesche *et al.* 1987, Murphy and Meehan 1991). Riparian vegetation disturbance and removal can degrade these ecosystem functions and impair stream habitat. Riparian canopy is considered a primary driver of stream temperature (Poole and Berman 2001). Removal of riparian vegetation increases stream exposure to solar radiation, leading to increases in stream temperature.

Under this RGP, instream and streamside riparian vegetation will be removed from channels to facilitate maintenance activities at PG&E infrastructure. A reduced amount of riparian vegetation often leads to reduced amount of cover used by salmonids (Bisson *et al*. 1988; Bjornn and Reiser 1991) and increases in stream temperature. The effects of riparian disturbance by PG&E O&M activities are expected to be minor because the area of impact at individual work sites is relatively small and sites will be re-vegetated post-construction with appropriate native species (NOAABA-AMM-16). Furthermore, the small number of projects on streams each year (two erosion protection; two pipeline re-coatings, two pipeline replacements, and one valve recoating/replacement) are distributed throughout all the streams in the nine-county action area. This wide distribution will limit the aggregate impacts on riparian zones and no adverse effects to stream ecosystem function are anticipated over the 10-year period of this RGP. Reseeding and revegetating disturbed areas following construction will reduce impacts to largely short-term periods. Disturbed areas are expected to regain lost shading and ecosystem function within a few years following construction.

In tidally-influence areas, the O&M Program's measure to revegetate areas subject to riparian vegetation impacts applies (NOAABA-AMM-16). Regarding eelgrass, beds of this seagrass occur throughout San Francisco Bay. Eelgrass beds are comprised of dense grass-like shoots that provide year-round fish habitat in soft sediments of the lower intertidal and shallow subtidal areas, providing three-dimensional structure in sandy or muddy soft bottom habitat, adding to fish forage and rearing habitat. The O&M Program proposes to avoid activities in all eelgrass beds and will comply with the NOAA Fisheries' California Eelgrass Mitigation Policy and Implementing Guidelines (NOAA Fisheries 2014), when activities are located adjacent to eelgrass (NOAABA-AMM-07). These measures in tidal areas are expected to reduce impacts to riparian vegetation to short-term periods and avoid impacts to eelgrass.

Critical Habitat

Proposed maintenance at gas line crossings has the potential to affect critical habitat through impacts to water quality, impacts to riparian vegetation, impair natural channel processes, and reduce habitat complexity. As discussed above, work will only be performed in dry channels and effects to water quality will be limited to minor increases in turbidity when project sites are re-watered during the following wet season with rainfall. Riparian vegetation will also be impacted by construction activities; however, PG&E will replant work sites with appropriate native species post-construction to mitigate for impacts to riparian vegetation. In tidal areas, work activities will not be performed within eelgrass beds. Site-specific erosion solutions also have the potential to impact designated critical habitat by reducing instream features that provides shelter, food, and other ecosystem benefits to aquatic habitat. For erosion solutions installed by PG&E under this RGP, projects will not include hardscape in streams with CCC steelhead critical

habitat and will not exceed more than 20 percent of the active channel width. Additionally, erosion solutions will not exceed a project footprint area of 500 square feet on streams with listed anadromous salmonids. These measures are expected to largely avoid adverse effects to instream habitat and natural channel functions because no hardscape will be used and work sites are small. Fish passage will be unaffected because erosion solutions materials will be placed in the channel in a manner that does not constrict flow and will not increase water velocities. Based on the above, the effects of O&M projects at natural gas line crossings conducted by PG&E under this RGP are expected to be negligible on designated critical habitat for CCC steelhead.

2.5.2.1 Gas Pressure Limiting Station Construction

In addition to the gas line O&M activities presented above, PG&E proposes to install new pressure limiting stations on natural gas lines. A typical pressure limiting station is constructed within a footprint of approximately 250 feet by 100 feet and all stations are place in upland areas. Pressure limiting stations will not be located in tidal waters or freshwater streams. The O&M Program has proposed sufficient measures during construction activities to prevent the discharge of contaminants and disturbed sediments from entering waterways with listed anadromous fish and designated critical habitat. Accordingly, proposed O&M Program activities associated with construction of pressure limiting stations are anticipated to have no effect on listed anadromous fish or designated critical habitat.

2.5.3. Effects of O&M Activities on Access Roads

The O&M Program proposes to perform routine maintenance on roads that provide access to PG&E's natural gas and electrical infrastructure facilities. Routine road maintenance activities will primary occur in upland areas and the majority of activities will have no effect on waterways in the action area. However, there will be repair and replacement of culverts at stream crossing on non-public roadways within the nine-county Program area. The locations of culvert work at road crossings are not known at this time, but could include streams that support CCC steelhead and/or designated critical habitat for CCC steelhead. CCV steelhead, CV spring-run Chinook salmon, Sacramento River winter-run Chinook salmon, and Southern DPS green sturgeon do not occur in freshwater streams in the action area; therefore, culvert repairs and replacements will have no effect on these four listed fish species.

As with gas line work at stream crossings, construction activities associated with culvert repairs and replacements will not occur in flowing waters on streams with CCC steelhead or their designated critical habitat. PG&E proposes to only conduct culvert maintenance activities when the work sites are naturally dry. No stream dewatering or cofferdams will be used to dewater work sites for road maintenance and culvert repair/replacement. In addition, PG&E will ensure that all culvert repair and replacements in waterways with listed anadromous fish and/or critical habitat will be designed to meet the most current NMFS guidelines for fish passage at stream crossings (NOAABA-AMM-15). Additionally, PG&E proposes to limit the number of culvert repair/replacement projects to a maximum of two per year on streams with CCC steelhead and/or critical habitat.

If temporary bridges are installed, the structure will be clear span and no effects within the channel are anticipated because the bridge ends will be placed on existing roads outside the

channel. Temporary bridges will only remain in place during O&M activities which will range from a few days to 24 weeks. As a clear span structure with no structural elements extending into the channel, stream habitat, water quality, and fish passage are expected to remain unaffected while the temporary bridge is in place. Use of a crane to place and remove the temporary bridge will also avoid disturbance of the channel.

Effects on Fish during Construction

By limiting work at culverts to periods when the work sites are naturally dry, no flowing water and no listed fish will be present during work activities. Construction activities are expected to proceed with no effects to CCC steelhead and no discharge of construction debris into flowing water because no water will be present. O&M activities would be completed prior to the return of fall/winter surface flow in freshwater streams. Thus, no impacts to CCC steelhead are expected to occur during construction activities associated with culvert repairs and replacement.

Water Quality

Post-construction, minor turbidity will occur in waters downstream of culvert work sites when the site is re-watered during the following wet season with rainfall. Some disturbed soils will be discharged into the stream, but use of erosion control measures and plantings of native vegetation are expected to minimize the mobilization of sediments from areas disturbed by construction activities. The resulting increase in turbidity levels in the waterways is expected to be minor and rapidly dissipate to ambient levels. For these reasons, the effects of O&M Program activities at culverts on water quality in the action area are expected to be negligible for CCC steelhead.

Water quality in the freshwater portion of the action area may also be affected by maintenance activities associated with roadway drainage systems. Stormwater runoff from roads drain to waterways with listed anadromous fish and designated critical habitat. These drainage systems carry tire shreds/dust with the degradation product (6PPD-quinone) from roadways to waterways. All freshwater life stages of listed salmonids within the action area are exposed to degraded water quality due to stormwater runoff from roadways, including roads used by PG&E to access their facilities. Although the O&M Program will not construct new roads, PG&E does have maintenance agreements for roads that include drainage systems. While these roads will continue to convey stormwater runoff to streams, NMFS anticipates such runoff will be unlikely to contain large amounts of toxic materials because traffic on these roads will likely be very light and may only be sporadic. As mentioned in Section 2.2.5.2 of this opinion, recent publications have identified a degradation product of tires (6PPD-quinone) as the causal factor in salmonid mortality at concentrations of less than a part per billion (Tian *et al*. 2022, Brinkmann *et al.* 2022, Tian *et al.* 2020; Peter *et al*. 2018). Access roads to PG&E facilities include both public and private ownership. Some roads are located on State and Federal lands. Road maintenance activities conducted under this RGP would not change existing ownership, vehicle traffic levels, or drainage patterns. New roadway construction is not permitted by the RGP. For these reasons, the O&M Program is not expected to contribute meaningful amounts of contaminant loading in waterways of the action area.

Stream Channel Conditions and Fish Passage

By design, bridges and culverts stabilize stream channels at road crossings and prevent lateral channel migration, effectively forcing streams into a simplified linear configuration. Without the ability to move laterally, stream channels tend to erode and deepen vertically (Leopold 1968; Dunn and Leopold 1978). The resulting channel may fail to create and maintain aquatic and riparian habitat through lateral migration, and can instead impair groundwater/stream flow connectivity and repress floodplain and riparian habitat function. Simplified stream reaches typically produce limited macroinvertebrate prey and provide poor functional habitat for rearing juvenile salmonids (Florsheim *et al*. 2008). The Program's proposed maintenance of road crossings by repairing and replacing culverts are expected to maintain the current channel alignments and maintain existing simplification of stream habitat adjacent to culverts.

Culverts can also have significant adverse effects on fish passage. Culverts commonly clog with debris, particularly when undersized. Clogged culverts can physically prevent fish and streamflow from passing at road crossings. Culverts also concentrate flow and accelerate water velocities to levels that exceed the swimming abilities of steelhead, resulting in an impediment to migration. To ensure culverts repaired and replaced by the O&M Program on streams with CCC steelhead, culverts must be designed to conform with NMFS fish passage guidelines for anadromous salmonids at stream crossings (NOAABA-AMM-15). Culvert project designs will be presented to NMFS and the Corps in Pre-Construction Notification packages for NMFS review prior to construction. Via this implementation procedure, all culvert repairs and replacements by the Program will be designed and constructed to ensure fish passage is not impaired. In some cases, the Program's repair and replacement of culverts would improve fish passage conditions over the baseline condition where existing culverts are poorly designed or undersized.

Riparian Vegetation

As described above for work activities at gas line crossings, culvert projects will result in the removal or disturbance of existing riparian vegetation. Riparian vegetation provides several essential functions to maintain suitable habitat and water quality conditions on streams with anadromous salmonids (see Section 2.5.3 of this opinion). Per NOAABA-AMM-16, the Program will revegetate culvert work sites with appropriate native plant species to compensate for riparian vegetation impacts. Revegetation actions are expected to reduce impacts to the riparian zone and restore the ecosystem functions of the riparian zone within a few years following construction. Furthermore, the small number of culvert projects on steelhead streams each year (no more than two per year) will limit the aggregate impacts on riparian zones and no adverse effects to riparian ecosystem function are anticipated over the 10-year period of this RGP.

Critical Habitat

Proposed culvert repair/replacement work has the potential to affect critical habitat through impacts to water quality, impacts to riparian vegetation, and impairment of fish passage. As presented above, work will only be performed in dry channels and effects to water quality will be limited to minor increases in turbidity when project sites are re-watered during the wet season with rainfall. Riparian vegetation will also be damaged and removed by construction activities; however, PG&E will replant work sites with appropriate native species post-construction to mitigate for impacts to riparian vegetation. Culverts constructed on streams can impair fish

passage, stream flow, and bedload transport. To ensure culvert projects do not adversely affect critical habitat, PG&E proposes to design culverts to conform with NMFS guidelines for fish passage at stream crossings. Based on the above, the effects of culvert projects conducted by PG&E under this RGP are expected to be negligible on designated critical habitat for CCC steelhead.

2.6. Cumulative Effects

"Cumulative effects" are those effects of future State or private activities, not involving Federal activities, that are reasonably certain to occur within the action area of the Federal action subject to consultation [50 CFR 402.02 and 402.17(a)]. Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the ESA.

Some continuing non-Federal activities are reasonably certain to contribute to climate effects within the action area. However, it is difficult if not impossible to distinguish between the action area's future environmental conditions caused by global climate change that are properly part of the environmental baseline *vs.* cumulative effects. Therefore, all relevant future climate-related environmental conditions in the action area are described earlier in the discussion of environmental baseline (Section 2.4).

Potential non-Federal actions affecting the action area in the future could include State angling regulation changes, voluntary or State sponsored upslope habitat restoration activities, discharge of stormwater and agricultural runoff, and continued development, including building of private roads, wells, and land use change. Urban development, including rural residential and agricultural development is likely to continue throughout the greater San Francisco Bay Area. NMFS assumes the rate of such development would be similar to that observed in the last decade.

2.7. Integration and Synthesis

The Integration and Synthesis section is the final step in assessing the risk that the proposed action poses to species and critical habitat. In this section, we add the effects of the action (Section 2.5) to the environmental baseline (Section 2.4) and the cumulative effects (Section 2.6), taking into account the status of the species and critical habitat (Section 2.2), to formulate the agency's biological opinion as to whether the proposed action is likely to: (1) reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing its numbers, reproduction, or distribution; or (2) appreciably diminish the value of designated or proposed critical habitat as a whole for the conservation of the species.

The action area of this project encompasses nine counties in the San Francisco Bay Area.[8] CCC steelhead, CCV steelhead, CV spring-run Chinook salmon, Sacramento River winter-run Chinook salmon, and Southern DPS green sturgeon occur in the San Francisco Bay estuarine portion of the action area. Of these species, only CCC steelhead are present in the freshwater

[8] The nine Bay Area counties consist of Alameda, Contra Costa, Marin, Napa, San Francisco, San Mateo, Santa Clara, Solano, and Sonoma counties.

streams portion of the action area. All the above listed fish species have experienced serious declines in abundance, and long-term population trends suggest a negative growth rate. Human-induced factors have reduced populations and degraded habitat, which in turn has reduced the population's resilience to natural events, such as droughts, floods, and variable ocean conditions. Global climate change presents another real threat to the long-term persistence of the population, especially when combined with the current depressed population status and human caused impacts. Within the Program's action area, the effects of shoreline development, bank stabilization, water development, flood control, and urbanization are evident. These activities have degraded instream habitat conditions, reduced water quality, contaminated sediment, altered the hydrology of streams, precluded access into some watersheds, and limited access in other watersheds. Drought conditions from 2012 to 2022 exacerbated these impacts by increasing water temperatures and stream-drying, limiting habitat connectivity in the freshwater portion of the action area.

As described in the Effects of the Action (Section 2.5), several proposed O&M Program activities are expected to adversely affect listed anadromous salmonids, green sturgeon, and their habitat. These activities are associated with electrical infrastructure maintenance in San Francisco Bay, and consist of the following: pile driving, cofferdam construction, permanent loss of benthic habitat, and fish collection and relocation. PG&E proposes to limit impact hammer driving and cofferdam installation to the period between June 1 and November 30 of each year (referred to as the "limited operating period" [LOP]). However, there may be some projects where the cofferdam will remain installed past November 30 and pile driving operations would also continue past November 30. Threatened green sturgeon juveniles, sub-adults and adults are present in San Francisco Bay year-round and will be subjected to adverse effects by O&M Program activities at any time of year. Listed salmon and steelhead are generally not present in the Bay until the winter and spring months; thus, PG&E Program activities that continue after November 30 will adversely affect listed anadromous salmonids. However, O&M Program activities may that may result in adverse effects only extend a maximum of six additional weeks from November 30 because work must be completed each year by January 15.

Injury or mortality of green sturgeon, steelhead, and salmon due to barotrauma will occur during the use of impact hammers at some project sites. NMFS expects the number of PG&E maintenance projects at electrical towers that create conditions with barotrauma effects will be small because the majority of pile driving work will be performed at shallow water sites that naturally dewatered at low tide (approximately 92% of the tower sites are located above MLLW). Sound levels attenuate quickly in shallow water, but some electrical tower sites are located in deeper water. When 60-inch and 72-inch piles are installed by impact hammer in water, the zone of physical injury and mortality adjacent to the pile could extend as far as 1,778 feet due to cSEL above 187 dB. The zone of physical injury and mortality will be less when smaller piles are installed by an impact hammer (see Table 7). As described above in Section 2.5.1.4, only a few listed fish are expected to incur injury or mortality from cSEL when they are continuously exposed to high underwater sound levels in this zone by multiple impact hammer pile strikes. Injury and mortality due to exposure to peak sound levels at and above 206 dB will also occur, but will not extend beyond 30 feet from a pile being installed. The area of injury or mortality associated with peak SPLs is reduced for smaller diameter steel piles.

The use of vibratory hammers to install piles and install cofferdams will not create underwater sound levels that are harmful to listed fish. Vibratory hammers generate lower sound levels with different wave forms than impact hammers (Buehler *et al*. 2015). During use of vibratory hammers, sound levels are not expected to exceed the dual metric criteria for injury and mortality of fish established by the FHWG (*i.e*., peak pressure of 206 dB and cSEL of 187 dB).

Vibratory hammers and impact hammers can also create noise that startle fish and result in temporary dispersal from habitats adjacent to work sites. Behavioral effects during impact hammer pile driving will extend up to 15,226 feet. The zone of behavioral effects will be less for vibratory hammers. If listed green sturgeon, salmon, or steelhead were to react behaviorally to the sound produced by impact hammers or vibratory pile driving, adequate water depths and area within adjacent open waters of San Francisco Bay are expected to provide fish sufficient area to disperse. When pile driving ceases each day, elevated underwater sound levels will conclude and these habitat areas will become available again without disturbance.

Sections 2.5.1.1 and 2.5.1.2 describe the impacts associated with the installation of cofferdams, dewatering work sites, and fish collection/handling. NMFS anticipates that a very small number of green sturgeon will be collected during dewatering events and collection of listed anadromous salmonids is improbable for several reasons. First, cofferdam installation and dewatering will not be initiated after November 30 and listed salmonids are unlikely to be present prior to that time. Second, the majority of work sites where cofferdams will be deployed are located in very shallow water and the sites will naturally dewater at low tide. Closure of cofferdams during periods of low tide will avoid entrapping water and fish. Finally, although green sturgeon will be present during cofferdam construction, construction activities are likely to cause green sturgeon to flee work sites prior to closure of cofferdams. If green sturgeon are collected and relocated for cofferdam construction, they would be subject to injury but mortality is unlikely. A compilation of 10 years of reports submitted to NMFS by fishery researchers indicates collection, handling, and relocation of green sturgeon by qualified biologists rarely results in mortality.

Benthic habitat will be disturbed by Program activities at work sites during construction. Temporary mats will be placed on the substrate to create a work area for personnel and equipment. Barges would temporarily rest on the bottom at low tide. Areas internal to cofferdams will be dewatered and subjected to disturbance by equipment and personnel. These impacts are expected to be temporary disturbance that will recover rapidly following O&M activities due to the small footprint of individual work sites and limited to the surface of the substrate. Any elevated levels of turbidity during disturbance of the substrate are anticipated to not extend beyond one or two tide cycles. Upon removal of cofferdams, mats, and work barges, minimal changes to the surface elevation of the bottom are expected. For these reasons, the potential effects of localized areas of elevated turbidity and benthic habitat disturbance associated with O&M Program activities in San Francisco Bay are expected to be negligible for ESA-listed fish. Permanent loss of benthic habitat is expected when tower footings and foundations are re-located, but the overall area impacted by the program is estimated to be very small (0.08 acres per year) and not adversely affect prey availability and foraging by listed fish. At some sites, abandoned footings and piles will be removed and result in no net increase in the extent of fill in the Bay.

In waterways upstream from San Francisco Bay, freshwater streams with threatened CCC steelhead and designated critical habitat will be affected by the O&M Program's maintenance activities at natural gas line crossings and culvert repair/replacements on access roads. PG&E will only perform work in these stream channels when work sites are seasonally dry. With no flowing water during these construction and maintenance activities, no effects to threatened CCC steelhead are anticipated during construction. The program has also incorporated measures including no placement of new hardscape materials, replanting of native riparian vegetation, and annual limits upon the number and size of projects to ensure O&M activities do not adversely affect steelhead habitat in streams of the action area. Culvert repairs and replacements will be designed to conform with NMFS guidelines for fish passage at stream crossings.

Designated critical habitat for Southern DPS green sturgeon, CCC steelhead, and Sacramento River winter-run Chinook salmon occurs in the action area. While conditions vary across the DPSs, critical habitat is generally impaired by channel modification, habitat alteration and fragmentation, dams and water diversions, groundwater extraction, and estuarine habitat loss. These factors also affect designated critical habitat in the action area of this project.

The estuarine portion of the action area includes areas designated as critical habitat for Southern DPS green sturgeon, CCC steelhead, and Sacramento River winter-run Chinook salmon. Effects to critical habitat in San Francisco Bay include temporary degradation of water quality, benthic disturbance, and elevated levels of underwater sound. A small amount of benthic habitat at widely dispersed sites is also expected to be permanently lost due to relocation or replacement of electrical tower foundations and pilings; however, these permanent impacts to benthic habitat are not expected to exceed 0.08 acre per year at all work sites combined.

Within the freshwater portion of the action area, several streams are designated critical habitat for CCC steelhead. O&M Program activities will affect freshwater CCC steelhead critical habitat at gas line crossings and culverts on streams; however, proposed measures at stream crossing are anticipated to avoid adverse effects to CCC steelhead critical habitat. Measures include prohibiting use of hardscape for erosion protection, limiting the extent of scour protection to not exceed 20 percent of the channel width, and all culverts will be designed to provide unimpeded fish passage by conforming with NMFS guidelines for salmonid passage at stream crossings. The O&M Program will maintain access roads, including existing drainage systems that convey stormwater runoff from roadways. PG&E's maintenance of stormwater drainage on some of these roads is unlikely to meaningfully increase the amount of contaminants from roadways to streams. After considering the O&M Program's measures for work in streams with CCC steelhead critical habitat, NMFS concludes that the value of critical habitat as a whole for species conservation will not be appreciably reduced.

Regarding future climate change effects in the action area, California could be subject to higher average summer air temperatures and lower total precipitation levels. The Sierra Nevada snow pack is likely to decrease by as much as 70 to 90 percent by the end of this century under the highest emission scenarios modeled. Reductions in the amount of rainfall would reduce stream flow levels in rivers of the action area. Estuaries may also experience changes in productivity due to changes in freshwater flows, nutrient cycling, and sediment amounts. California's most recent period of drought began in approximately 2012. This long-term drought, as well as the

increased incidence and magnitude of wildfires in California, have likely been exacerbated by climate change (Williams *et al*. 2019, Williams *et al.* 2020, Williams *et al*. 2022, Diffenbaugh *et al*. 2015,). For PG&E's O&M Program, the immediate effects of construction activities would occur over the next five to 10 years, and the long-term effects of climate change are unlikely to be detected within this time frame. If these effects of climate change are detected over the short term, they will likely materialize as moderate changes to the current climate conditions with the action area. These changes may place further stress on ESA-listed fish populations. Most of the effects of the proposed action are likely to occur during these nearer term climate change effects (droughts with occasional years of heavy rainfall) as described in the Environmental Baseline Section of this opinion (Section 2.4). Long-term impacts from the proposed action are limited to very small areas of permanent habitat loss in the action area and, thus are unlikely to exacerbate the impacts of climate change on listed species and their critical habitat. Considering the above, we do not expect climate change to alter conditions in the action area beyond the scope already considered in this opinion.

While PG&E's O&M Program will result in adverse effects to listed fish during pile driving and cofferdam construction, we expected these losses to be very small fraction of the ESU and DPS populations. Benthic habitat losses due to new and expanded tower foundations and pilings are also expected to be very small (0.08 acres year) in relation to the amount of estuarine habitat area in San Francisco Bay. In consideration of the O&M Program's proposed avoidance and minimization measures (Section 1.3.5 of this opinion), actions conducted by PG&E in freshwater streams will avoid adverse effects to listed CCC steelhead. Culvert projects on streams will be designed to conform with NMFS guidelines for fish passage at stream crossings and these upgrades may improve existing passage conditions for steelhead, particularly at undersized culverts. NMFS does not expect any of the aforementioned effects of PG&E's O&M Program to combine with other effects in any significant way. Effects from proposed activities under the RGP are limited in time and area, and anticipated adverse effects are minimal and only affect a small number of listed fish during the five to 10-year period of this RGP. Ultimately, the effects of the proposed activities that would be conducted under this RGP, when added to the environmental baseline, cumulative effects, and species status, are not expected to appreciably reduce the likelihood of survival or recovery of listed salmonids and green sturgeon, nor does it appreciably degrade the value of their critical habitat.

2.8. Conclusion

After reviewing and analyzing the current status of the listed species and critical habitat, the environmental baseline within the action area, the effects of the proposed action, the effects of other activities caused by the proposed action, and the cumulative effects, it is NMFS' biological opinion that the proposed PG&E O&M Program is not likely to jeopardize the continued existence of threatened CCC steelhead, threatened CCV steelhead, threatened CV spring-run Chinook salmon, endangered Sacramento River winter-run Chinook salmon, and threatened Southern DPS green sturgeon or destroy or adversely modify designated critical habitat for CCC steelhead, Sacramento River winter-run Chinook salmon, and Southern DPS green sturgeon.

2.9. Incidental Take Statement

Section 9 of the ESA and Federal regulations pursuant to section 4(d) of the ESA prohibit the take of endangered and threatened species, respectively, without a special exemption. "Take" is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. "Harm" is further defined by regulation to include significant habitat modification or degradation that actually kills or injures fish or wildlife by significantly impairing essential behavioral patterns, including breeding, spawning, rearing, migrating, feeding, or sheltering (50 CFR 222.102). "Harass" is further defined by interim guidance as to "create the likelihood of injury to wildlife by annoying it to such an extent as to significantly disrupt normal behavioral patterns which include, but are not limited to, breeding, feeding, or sheltering." "Incidental take" is defined by regulation as takings that result from, but are not the purpose of, carrying out an otherwise lawful activity conducted by the Federal agency or applicant (50 CFR 402.02). Section 7(b)(4) and section 7(o)(2) provide that taking that is incidental to an otherwise lawful agency action is not considered to be prohibited taking under the ESA if that action is performed in compliance with the terms and conditions of this ITS.

2.9.1. Amount or Extent of Take

In this opinion, NMFS determined that incidental take of threatened CCC steelhead, threatened CCV steelhead, threatened CV spring-run Chinook salmon, endangered Sacramento River winter-run Chinook salmon, and threatened Southern DPS green sturgeon in the form of injury, harm, or mortality is reasonably certain to occur in association with impact hammer pile driving in San Francisco Bay. Additionally, the incidental take of Southern DPS green sturgeon will occur during fish collection and relocation associated with cofferdam construction.

For impact hammer pile driving, NMFS is not able to estimate the specific number of CCC steelhead, CCV steelhead, CV spring-run Chinook salmon, winter-run Chinook salmon, and green sturgeon that will be incidentally taken by elevated underwater sound levels due to the large geographic scope of the action area, varying environmental conditions between project sites, and the number of proposed sites for the Program. Additionally, monitoring or measuring the number of listed fish actually injured or killed by elevated sound levels during pile driving is also not feasible. Injured or killed fish are unlikely to be observed because they may not float to the surface or may be carried away by strong currents in portions of the action area. Due to the difficulty in quantifying the number of listed fish that could be injured or killed by pile driving, a surrogate measure of incidental take is necessary to establish a limit to take exempted by this incidental take statement. NMFS will therefore use the following incidental take surrogate pursuant to 50 CFR 402.14(i)(1)(i) for elevated underwater sound levels during impact hammer pile driving:

The extent of incidental take will be considered exceeded if elevated sound levels during pile driving are greater than 206 dB peak or 187 dB cSEL at the following specified distances for each steel pile size:

Steel Pile Size	Distance (ft) to 206 dB peak	Distance (ft) to 187 dB accumulated SEL/day
16-inch	0	30
20-inch	20	446
24-inch	10	552
36-inch	20	827
60-inch	30	1,778
72-inch	30	1,309

For cofferdam construction, NMFS is not able to estimate the specific number of Southern DPS green sturgeon that will be collected and relocated during construction of cofferdams; however, it is expected to be a low number of individual fish during implementation of O&M Program activities for the reasons presented above in this opinion.

Unintentional injury of green sturgeon during capture, handling, and relocation will occur; however, mortality is unlikely absent an unintentional accident. The amount of incidental take during dewatering and fish relocation will be considered exceeded if more than one green sturgeon is killed during dewatering and fish relocation activities.

2.9.2. Effect of the Take

In the biological opinion, NMFS determined that the amount or extent of anticipated take, coupled with other effects of the proposed action, is not likely to result in jeopardy to the species or destruction or adverse modification of critical habitat.

2.9.3. Reasonable and Prudent Measures

"Reasonable and prudent measures" are measures that are necessary or appropriate to minimize the impact of the amount or extent of incidental take (50 CFR 402.02).

NMFS believes the following reasonable and prudent measures are necessary and appropriate to minimize take of listed fish:

1. Undertake measures to ensure that harm and mortality to listed fish resulting from fish relocation and dewatering activities is low.
2. Ensure proposed culvert repair and replacement actions are designed to provided unimpeded fish passage.
3. Prepare and submit post-construction reports for each O&M program activity that includes cofferdam construction in San Francisco Bay and/or pile driving with an impact hammer on steel piles 20 inches or greater in diameter.
4. Prepare and submit annual reports for O&M program activities performed on streams with listed anadromous salmonids and/or designated critical habitat.

2.9.4. Terms and Conditions

In order to be exempt from the prohibitions of section 9 of the ESA, the Federal action agency must comply (or must ensure that any applicant complies) with the following terms and conditions. The Corps or any applicant has a continuing duty to monitor the impacts of incidental take and must report the progress of the action and its impact on the species as specified in this ITS (50 CFR 402.14). If the entity to whom a term and condition is directed does not comply with the following terms and conditions, protective coverage for the proposed action would likely lapse.

1. The following terms and conditions implement reasonable and prudent measure 1:

    a. PG&E shall retain qualified fisheries biologist(s) with expertise in the areas of identification, handling, collecting, and relocating anadromous fish species to oversee cofferdam construction and fish relocation at work sites in San Francisco Bay. The qualified biologist(s) must be on site during all dewatering events to capture, handle, and safely relocate ESA-listed fish.

    b. Biologists shall conduct fish collections in a manner which minimizes potential risks to ESA-listed fish. The biologist must monitor construction sites during placement and removal of cofferdams to ensure that any adverse effects to listed fish are minimized.

    c. ESA-listed fish shall be handled with extreme care and kept in water to the maximum extent possible during rescue activities. Captured fish will be relocated, as soon as possible, to a location with suitable habitat conditions.

    d. If any salmonids or sturgeon are found dead or injured, the biologist shall contact NMFS biologist Sara Azat by phone at 707-575-6067, by email at sara.azat@noaa.gov or the NMFS Santa Rosa Area Office at 707-387-0737. The purpose of the contact is to review the activities resulting in take and to determine if additional protective measures are required. All mortalities of listed fish must be retained. Tissue samples are to be acquired from each mortality per the methods identified in the NMFS Southwest Fisheries Science Center Genetic Repository protocols (contact the above NMFS office at the phone number provided) and sent to: NOAA Coastal California Genetic Repository, Southwest Fisheries Science Center, 110 McAllister Way, Santa Cruz, CA 95060.

2. The following terms and conditions implement reasonable and prudent measure 2:

    a. The Corps or PG&E shall submit draft design plans for projects that include culvert repair or replacement on streams with listed anadromous fish to NMFS for review and approval at least 120 days prior to construction. Design plans are to be submitted to NMFS North Central Coast Office, Attention: San Francisco Bay Branch Chief, 777 Sonoma Avenue, Room 325, Santa Rosa, California 95404-6528.

3. The following terms and conditions implement reasonable and prudent measure 3:

   a. PG&E shall provide a written post-construction report to NMFS within 60 days of completion of work for each project site in San Francisco Bay that includes cofferdam construction and/or driving of steel piles 20 inches or greater in diameter. The report must include the following information:

      - Summary of construction activities, including: dates construction began and ended; use of a cofferdam and other measures to protect aquatic habitat; a description of the minimization measures taken to address any unanticipated issues; photographs pre-, during, and post-construction; and any other relevant information.

      - Summary of fish relocation activities, including: the number of fish collected by species; the condition of fish at the time of release; the number and species of fish injured or killed; description of the equipment and methods used to collect, hold, and transport fish; and a description of any problems which may have arisen during the relocation activities and a statement as to whether or not the activities had any unforeseen effects.

      - Summary of pile driving activities and hydroacoustic monitoring, including: size and number of piles installed by impact hammer; results of hydroacoustic monitoring, if any was performed; functionality of air bubble curtain, if any was used; and a description of any problems which may have arisen during the pile driving and associated unforeseen effects.

   b. Post-construction reports are to be submitted to NMFS North Central Coast Office, Attention: San Francisco Bay Branch Chief, 777 Sonoma Avenue, Room 325, Santa Rosa, California 95404-6528.

4. The following terms and conditions implement reasonable and prudent measure 4:

   a. PG&E shall include the following additional information in the annual reports to NMFS (to be submitted on March 31 per BA-AMM-03):

      - Summary of construction activities at gas line crossings and access roads (*i.e.*, culvert repair/replacements), including: dates construction began and ended; measures to protect riparian habitat and riparian revegetation; a description of the minimization measures taken to address any unanticipated issues; photographs pre-, during, and post-construction; and any other relevant information.

   b. Annual reports are to be submitted to NMFS North Central Coast Office, Attention: San Francisco Bay Branch Chief, 777 Sonoma Avenue, Room 325, Santa Rosa, California 95404-6528.

2.10. Conservation Recommendations

Section 7(a)(1) of the ESA directs Federal agencies to use their authorities to further the purposes of the ESA by carrying out conservation programs for the benefit of the threatened and endangered species. Specifically, "conservation recommendations" are suggestions regarding discretionary measures to minimize or avoid adverse effects of a proposed action on listed species or critical habitat or regarding the development of information (50 CFR 402.02).

- NMFS recommends that hydroacoustic monitoring be performed at all sites that utilize an impact hammer on steel piles greater than 20-inches in diameter to improve the breadth of information related to elevated underwater sound levels during pile driving in the San Francisco Bay.

2.11. Reinitiation of Consultation

This concludes formal consultation for the PG&E's Bay Area Operation and Maintenance Program.

Under 50 CFR 402.16(a): "Reinitiation of consultation is required and shall be requested by the Federal agency or by the Service where discretionary Federal agency involvement or control over the action has been retained or is authorized by law and: (1) If the amount or extent of taking specified in the incidental take statement is exceeded; (2) If new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not previously considered; (3) If the identified action is subsequently modified in a manner that causes an effect to the listed species or critical habitat that was not considered in the biological opinion or written concurrence; or (4) If a new species is listed or critical habitat designated that may be affected by the identified action."

2.12. Not Likely to Adversely Affect" Determinations

Under the ESA, "effects of the action" are all consequences to listed species or critical habitat that are caused by the proposed action, including the consequences of other activities that are caused by the proposed action. A consequence is caused by the proposed action if it would not occur but for the proposed action and it is reasonably certain to occur. Effects of the action may occur later in time and may include consequences occurring outside the immediate area involved in the action (50 CFR 402.02). In our analysis, which describes the effects of the proposed action, we considered 50 CFR 402.17(a) and (b). When evaluating whether the proposed action is not likely to adversely affect listed species or critical habitat, NMFS considers whether the effects are expected to be completely beneficial, insignificant, or discountable. Completely beneficial effects are contemporaneous positive effects without any adverse effects to the species or critical habitat. Insignificant effects relate to the size of the impact and should never reach the scale where take occurs. Effects are considered discountable if they are extremely unlikely to occur.

2.12.1. Background and Action Agency's Effects Determination

The Corps has determined that the proposed action is not likely to adversely affect the following species and critical habitat (Evolutionarily Significant Units [ESU]) or (Distinct Population Segments [DPS]) under the jurisdiction of NMFS:

California Coastal (CC) Chinook salmon ESU (*Oncorhynchus tshawytscha*)
Threatened (70 FR 37160; June 28, 2005)
Critical habitat (70 FR 52488; September 2, 2005);

South-Central California Coast (S-CCC) steelhead DPS (*Oncorhynchus ykiss*)
Threatened (71 FR 834; January 5, 2006)
Critical habitat (70 FR 52488; September 2, 2005);

Central California Coast (CCC) coho salmon ESU (*Oncorhynchus kisutch*)
Endangered (70 FR 37160, June 28, 2005)
Critical habitat (64 FR 24049; May 5, 1999).

The life history of Chinook salmon is summarized in Myers *et al.* (1998) and the most recent NMFS status review (NMFS 2016e). The CC Chinook salmon ESU are typically fall spawners, entering their natal streams in the early fall. Adults tend to spawn in the mainstem or larger tributaries of rivers, and eggs are deposited in redds for incubation. When the 0+ age fish emerge from the gravel in the spring, they typically migrate to salt water shortly after emergence. Prey resources during early freshwater rearing and out-migration are critical to Chinook salmon survival as they grow and move out to the open ocean.

The life history of steelhead is summarized in Busby *et al.* (1996) and the most recent NMFS status review (Williams *et al*. 2016). S-CCC Steelhead are anadromous forms of *Oncorhynchus mykiss,* spending some time in both fresh- and saltwater. Juveniles – typically in spring as smolts – migrate to the ocean where they mature. Adult steelhead return to freshwater rivers and streams to reproduce, or spawn. Unlike Pacific salmon, steelhead are iteroparous, or capable of spawning in multiple years before death (Busby *et al.* 1996; Moyle 2002). Within the S-CCC steelhead DPS, adults typically enter freshwater between December and April, with peaks occurring in January through March (Fukushima and Lesh 1998). Eggs (laid in gravel nests called redds), alevins (gravel dwelling hatchlings), fry (juveniles newly emerged from stream gravels), and other juvenile life stages all rear in freshwater until they migrate to the ocean where they reach maturity.

The life history of coho salmon in California is summarized by NMFS (1995; 2016f). Coho are also anadromous salmonids, spending some time in both freshwater and saltwater. In California coastal streams, adult coho salmon upstream migration occurs between November and February, and smolt outmigration occurs between March and June, peaking March through May (Fukushima and Lesh 1998). CCC coho salmon were historically abundant in the Russian River and tributaries. Presently, however, coho are rare throughout the action area.

Critical habitat for CC Chinook, S-CCC steelhead, and CCC coho salmon is present in the action area. The PBFs of designated critical habitat for CC Chinook salmon and S-CCC steelhead in freshwater include:

1. Freshwater spawning sites with water quantity and quality conditions and substrate supporting spawning, incubation, and larval development;

2. Freshwater rearing sites with:
   a) Water quantity and floodplain connectivity to form and maintain physical habitat conditions and support juvenile growth and mobility;
   b) Water quality and forage supporting juvenile development; and
   c) Natural cover such as shade, submerged and overhanging large wood, log jams and beaver dams, aquatic vegetation, large rocks and boulders, side channels, and undercut banks;

3. Freshwater migration corridors free of obstruction and excessive predation with water quantity and quality conditions and natural cover such as submerged and overhanging large wood, aquatic vegetation, large rocks and boulders, side channels, and undercut banks supporting juvenile and adult mobility and survival.

For CCC coho salmon critical habitat, the following essential habitat types were identified: 1) juvenile summer and winter rearing areas; 2) juvenile migration corridors; 3) areas for growth and development to adulthood; 4) adult migration corridors; and 5) spawning areas. Within these areas, essential features of coho salmon critical habitat includes adequate: 1) substrate, 2) water quality, 3) water quantity, 4) water temperature, 5) water velocity, 6) cover/shelter, 7) food, 8) riparian vegetation, 9) space, and 10) safe passage conditions (64 FR 24029).

2.12.2. Effects of the Action

As described in Section 2.5.1 of this opinion, the O&M Program includes maintenance of electrical transmission lines that are supported by steel-lattice towers, steel poles, and wooden poles. The majority of PG&E's electrical infrastructure in the Bay Area is located in terrestrial areas. Electrical infrastructure facilities to be maintained by the proposed O&M Program in tidal waters are limited to San Francisco Bay. Threatened CC Chinook salmon, threatened S-CCC steelhead, endangered CCC coho salmon, and their designated critical habitat are not present in San Francisco Bay.

In the freshwater portion of the action area, no electrical infrastructure is located in freshwater streams and no electrical infrastructure maintenance would be conducted in streams. Measures proposed by PG&E in terrestrial areas during work on electrical towers and poles are expected to prevent the degradation of water quality in streams with listed anadromous fish. Thus, electrical tower and pole repairs/replacements in terrestrial areas are anticipated to have no effect on threatened CC Chinook salmon, threatened S-CCC steelhead, endangered CCC coho salmon and their designated critical habitat.

Within the action area, PGE&E O&M Program activities that will affect threatened CC Chinook salmon, threatened S-CCC steelhead, and endangered CCC coho salmon are associated with

natural gas line maintenance and culvert repair/replacements on freshwater streams. Natural gas system O&M activities are described in Section 1.3.3 of the opinion. At stream crossings with listed anadromous fish, these activities consist of site-specific erosion measures over pipelines, pipeline recoating, pipeline replacement, valve recoating, and valve replacement. Proposed maintenance activities at access roads are described in Section 1.3.4 of the opinion. For access road maintenance at stream crossings with listed anadromous fish, the Program proposes to repair and replace culverts.

Table 5 of the opinion presents the known streams with listed anadromous fish and/or designated critical habitat in the action area where PG&E gas line activities may occur. There may be additional gas line crossings on streams with listed anadromous fish in the action area that were not identified by PG&E during consultation and are not listed in Table 5. For road maintenance work on culverts, the location of these stream crossing activities could occur throughout the nine-county O&M Program area, including sites on streams with listed anadromous fish and/or critical habitat. During implementation of the RGP, PG&E's pre-construction notifications for individual O&M activities will identify specific locations and specify whether or not listed anadromous fish or designated critical habitat may be present at work sites.

The proposed O&M activities associated with gas line infrastructure generally involve the excavation of soils to expose the gas line or valve, performing the recoating or replacement work (valve or pipeline), and then replacing the excavated materials to re-bury the pipeline. For site-specific erosion protection, biodegradable jute netting and other non-hardscape materials will be placed on exposed sections of pipeline in the stream channel to prevent further erosion. PG&E proposes to limit O&M activities associated with gas line crossings at waterways with listed anadromous fish to periods when the work sites are naturally dry (see NOAABA-AMM-13). By restricting gas line maintenance to sites that are naturally dry, no dewatering with cofferdams will be required and the potential adverse effects associated with excavation and trenching in wetted areas will be avoided. Similarly, proposed repair and replacement of culverts on streams with listed anadromous fish, will only be conducted by PG&E when work sites are naturally dry.

Sections 2.5.3 and 2.5.4 of the opinion present the potential effects of gas line O&M activities and culvert maintenance on freshwater streams with threated CCC steelhead and their designated critical habitat. These effects also apply to threatened CC Chinook salmon, threatened S-CCC steelhead, and endangered CCC coho salmon. With no flowing water present during work at sites on freshwater streams during O&M Program activities, no listed salmon or steelhead will be present and no effects during construction are expected. Post-construction, minor turbidity will occur in waters at work sites when the site is re-watered during the following wet season with rainfall, but use of erosion control measures and plantings of native vegetation are expected to minimize the mobilization of sediments from areas disturbed by construction activities. For these reasons, the effects of O&M activities at gas line infrastructure and culvert repair/replacement sites on water quality and riparian vegetation are expected to be insignificant for CC Chinook salmon, S-CCC steelhead, and CCC coho salmon.

Proposed site-specific erosion solutions on exposed gas line crossing have the potential to prevent lateral channel migration, effectively forcing streams into a simplified linear configuration. Simplified stream reaches typically produce limited macroinvertebrate prey and

provide poor functional habitat for rearing juvenile salmonids (Florsheim *et al*. 2008). Meandering streams create and maintain both the hydraulic and physical components of healthy instream habitat used by fish and other aquatic species (Spence *et al.* 1996). For erosion protection actions authorized by this RGP in waterways with listed anadromous fish, PG&E will not utilize any hardscape materials. Erosion protection materials will include jute netting, straw waddles, native plants, and hydroseeding. Materials will be placed in the channel to avoid constricting flow and not increase water velocities in the channel. Additionally, erosion protection projects will not span more than 20 percent of the active channel width and not exceed 500 square feet per site (NOAABA-AMM-14). These measures will significant limit the extent of impacts on channel morphology and stream hydraulics. The 20 percent channel width limit, combined with placement of materials to not constrict flow nor increase water velocities, will ensure fish passage is unaffected and the channel maintains existing features that provide complex rearing, feeding, spawning, and shelter habitat. On average, only two site-specific erosion protection projects would be performed per year in anadromous salmonid streams throughout the nine-county action area. Based on the proposed measures and limits for erosion protection activities at gas line crossings, the effects of this O&M Program element are expected to be insignificant on CC Chinook salmon, S-CCC steelhead, and CCC coho salmon.

Culverts can impair fish passage, streamflow and bedload transport in streams. To ensure all culvert projects on streams with listed anadromous salmonids do not produce adverse effects, PG&E proposes to design culverts to conform with NMFS guidelines for fish passage at stream crossings (NOAABA-AMM-15). Culvert project designs will be presented to NMFS and the Corps in Pre-Construction Notification packages for NMFS review prior to construction. Via this implementation procedure, all culvert repairs and replacements by the Program will be designed and constructed to ensure fish passage is not impaired, and streamflow and bedload transport are unimpeded. In some cases, the Program's repair and replacement of culverts would improve fish passage conditions over the baseline condition at existing undersized culverts. For these reasons, the effects of O&M activities at culverts on fish passage and streams in the action area are expected to be insignificant on CC Chinook salmon, S-CCC steelhead, and CCC coho salmon.

The action area is located within designated critical habitat for CC Chinook salmon, S-CCC steelhead, and CCC coho salmon. Effects to designated critical habitat will include minor levels of turbidity post-construction, channel and habitat impairment from erosion solutions, and fish passage impairment at culverts. For reasons presented above, these construction and post-construction effects on designated critical habitat are expected to be insignificant.

2.12.3. Conclusion

Based on this analysis, NMFS concurs with the Corps that the proposed action is not likely to adversely affect the subject listed species and designated critical habitats.

2.12.4. Reinitiation of Consultation

Reinitiation of consultation is required and shall be requested by the Corps or by NMFS, where discretionary Federal involvement or control over the action has been retained or is authorized by law and (1) the proposed action causes take; (2) new information reveals effects of the action that may affect listed species or critical habitat in a manner or to an extent not previously considered;

(3) the identified action is subsequently modified in a manner that causes an effect to the listed species or critical habitat that was not considered in the written concurrence; or (4) a new species is listed or critical habitat designated that may be affected by the identified action (50 CFR 402.16).

3. MAGNUSON–STEVENS FISHERY CONSERVATION AND MANAGEMENT ACT ESSENTIAL FISH HABITAT RESPONSE

Section 305(b) of the MSA directs Federal agencies to consult with NMFS on all actions or proposed actions that may adversely affect EFH. Under the MSA, this consultation is intended to promote the conservation of EFH as necessary to support sustainable fisheries and the managed species' contribution to a healthy ecosystem. For the purposes of the MSA, EFH means "those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity", and includes the physical, biological, and chemical properties that are used by fish (50 CFR 600.10). Adverse effect means any impact that reduces quality or quantity of EFH, and may include direct or indirect physical, chemical, or biological alteration of the waters or substrate and loss of (or injury to) benthic organisms, prey species and their habitat, and other ecosystem components, if such modifications reduce the quality or quantity of EFH. Adverse effects on EFH may result from actions occurring within EFH or outside of it and may include site-specific or EFH-wide impacts, including individual, cumulative, or synergistic consequences of actions (50 CFR 600.810). Section 305(b) of the MSA also requires NMFS to recommend measures that can be taken by the action agency to conserve EFH. Such recommendations may include measures to avoid, minimize, mitigate, or otherwise offset the adverse effects of the action on EFH [CFR 600.905(b)].

This analysis is based, in part, on the EFH assessment provided by the Corps and descriptions of EFH for Pacific Coast Groundfish (Pacific Fishery Management Council (PFMC 2020), Coastal Pelagic Species (CPS) (PFMC 1998), and Pacific Coast Salmon (PFMC 2014) contained in the fishery management plans (FMPs) developed by the PFMC and approved by the Secretary of Commerce.

3.1. Essential Fish Habitat Affected by the Program

The Corps has determined that the proposed action would adversely affect EFH for various life stages of fish species managed under the Pacific Coast Groundfish, Coastal Pelagic, and Pacific Coast Salmon FMPs. This determination is based on the potential for O&M activities to result in disturbance of benthic habitat, increased turbidity, increased in-water sound and vibration, and other adverse effects to water quality. In addition, the Program action area includes areas designated as Habitat Areas of Particular Concern (HAPC) for various species of fish with the Pacific Coast Groundfish and Pacific Coast Salmon FMPs; estuaries and eelgrass are designated HAPC for both FMPs.

3.2. Adverse Effects on Essential Fish Habitat

NMFS has determined the proposed action would adversely affect EFH for various life stages of fish species managed under the Pacific Coast Groundfish, Coastal Pelagic, and Pacific Coast Salmon FMPs through (1) elevated levels of underwater sound, (2) disturbance to benthic

habitat, (3) impacts to water quality in the form of increased turbidity in the water column and suspension of sediments, (4) stream channel disturbance during repair and replacement gas lines at stream crossings, and (5) impacts to water quality associated with access road maintenance.

EFH may also be temporarily impacted by dewatering of construction areas in San Francisco Bay. Culvert repair and replacements in streams throughout the action area may have beneficial effects on EFH for Pacific Coast Salmon by upgrade passage conditions. The short-term and long-term effects of the Bay Area O&M Program's activities on EFH for the Pacific Coast Groundfish and Coastal Pelagic FMPs are generally the same as that presented in Section 2.5.1.8 of this opinion for designated critical habitat for the Southern DPS of green sturgeon. Effects to EFH for the Pacific Coast Salmon FMP are generally the same extent and type as described in Section 2.5.1.8 of this opinion for CCC steelhead designated critical habitat.

3.3. Essential Fish Habitat Conservation Recommendations

NMFS determined that the following conservation recommendations are necessary to avoid, minimize, mitigate, or otherwise offset the impact of the proposed action on EFH.

The Corps and PG&E should avoid and minimize adverse effects of EFH quantity and quality by:

1. follow Term and Condition #2(a) from the ITS in Section 2.9.2 above;
2. complete the monitoring and reporting described in Terms and Conditions #3(a), 3(b) 4(a) and 4(b) from the ITS in Section 2.9.2 above; and
3. follow the ESA conservation recommendation described in Section 2.10 above.

3.4. Statutory Response Requirement

As required by section 305(b)(4)(B) of the MSA, the Corps must provide a detailed response in writing to NMFS within 30 days after receiving an EFH Conservation Recommendation. Such a response must be provided at least 10 days prior to final approval of the action if the response is inconsistent with any of NMFS' EFH Conservation Recommendations unless NMFS and the Federal agency have agreed to use alternative time frames for the Federal agency response. The response must include a description of the measures proposed by the agency for avoiding, minimizing, mitigating, or otherwise offsetting the impact of the activity on EFH. In the case of a response that is inconsistent with the Conservation Recommendations, the Federal agency must explain its reasons for not following the recommendations, including the scientific justification for any disagreements with NMFS over the anticipated effects of the action and the measures needed to avoid, minimize, mitigate, or offset such effects [50 CFR 600.920(k)(1)].

In response to increased oversight of overall EFH program effectiveness by the Office of Management and Budget, NMFS established a quarterly reporting requirement to determine how many conservation recommendations are provided as part of each EFH consultation and how many are adopted by the action agency. Therefore, we ask that in your statutory reply to the EFH portion of this consultation, you clearly identify the number of conservation recommendations accepted.

3.5. Supplemental Consultation

The Corps must reinitiate EFH consultation with NMFS if the proposed action is substantially revised in a way that may adversely affect EFH, or if new information becomes available that affects the basis for NMFS' EFH Conservation Recommendations [50 CFR 600.920(l)].

4. DATA QUALITY ACT DOCUMENTATION AND PRE-DISSEMINATION REVIEW

The Data Quality Act (DQA) specifies three components contributing to the quality of a document. They are utility, integrity, and objectivity. This section of the opinion addresses these DQA components, documents compliance with the DQA, and certifies that this opinion has undergone pre-dissemination review.

4.1. Utility

Utility principally refers to ensuring that the information contained in this consultation is helpful, serviceable, and beneficial to the intended users. The intended users of this opinion are the Corps. Other interested users could include PG&E, California Department of Fish & Wildlife, San Francisco Bay Conservation and Development Commission, and San Francisco Bay Regional Water Quality Control Board. Individual copies of this opinion were provided to the Corps and PG&E. The document will be available within 2 weeks at the NOAA Library Institutional Repository [https://repository.library.noaa.gov/welcome]. The format and naming adhere to conventional standards for style.

4.2. Integrity

This consultation was completed on a computer system managed by NMFS in accordance with relevant information technology security policies and standards set out in Appendix III, 'Security of Automated Information Resources,' Office of Management and Budget Circular A-130; the Computer Security Act; and the Government Information Security Reform Act.

4.3. Objectivity

Information Product Category: Natural Resource Plan

Standards: This consultation and supporting documents are clear, concise, complete, and unbiased; and were developed using commonly accepted scientific research methods. They adhere to published standards including the NMFS ESA Consultation Handbook, ESA regulations, 50 CFR 402.01 et seq., and the MSA implementing regulations regarding EFH, 50 CFR part 600.

Best Available Information: This consultation and supporting documents use the best available information, as referenced in the References section. The analyses in this opinion and EFH consultation contain more background on information sources and quality.

Referencing: All supporting materials, information, data and analyses are properly referenced, consistent with standard scientific referencing style.

Review Process: This consultation was drafted by NMFS staff with training in ESA and MSA implementation, and reviewed in accordance with West Coast Region ESA quality control and assurance processes.

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United States Department of the Interior

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In reply refer to:
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August 6, 2021

Katerina Galacatos, Ph.D.
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U.S. Army Corps of Engineers
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Subject: Final Programmatic Formal Consultation for the Pacific Gas and Electric Company's (PG&E) Bay Area Operation and Maintenance (O&M) Program in Alameda, Contra Costa, Marin, Napa, Santa Clara, San Francisco, San Mateo, Solano, and Sonoma Counties, California (Corps File Number: 2018-00490)

Dear Dr. Galacatos:

This letter is in response to the U.S. Army Corps of Engineers' (Corps) June 11, 2020, letter requesting formal consultation with the U.S. Fish and Wildlife Service (Service) on the Corps issuance of a Regional General Permit (RGP) for PG&E's Bay Area O&M Program in Alameda, Contra Costa, Marin, Napa, Santa Clara, San Francisco, San Mateo, Solano, and Sonoma Counties, California. In the June 11, 2020, letter, the Corps determined that activities covered under the RGP may affect, and are likely to adversely affect the following species not included in PG&E's Bay Area O&M Habitat Conservation Plan (HCP): the endangered California least tern (*Sterna antillarum browni*) (CLT), the threatened western snowy plover (*Charadrius nivosus nivosus*) (WSP), endangered palmate-bracted bird's-beak (*Cordylanthus palmatus*), and the endangered soft bird's-beak (*Chloropyron molle* ssp. *molle*). The Corps also determined that activities covered under the RGP may affect, but are not likely to adversely affect the WSP designated critical habitat, and the soft bird's-beak designated critical habitat. The Corps initially requested consultation on the threatened delta smelt (*Hypomesus transpacificus*) and its critical habitat and the endangered Sonoma alopecurus (*Alopecurus aequalis* var. *sonomensis*) but later withdrew those requests.

The Corps also requested concurrence from the Service that the proposed Federal action and any associated incidental take of the federally listed species listed below were considered in the intra-Service section 7 consultation for PG&E's Section 10(a)(1)(B) permit for PG&E's Bay Area O&M HCP. The species included in the HCP that may be affected by the activities under the RGP are: the endangered California freshwater shrimp (*Syncaris pacifica*), the endangered

conservancy fairy shrimp (*Branchinecta conservatio*) and its designated critical habitat, the endangered longhorn fairy shrimp (*Branchinecta longiantenna*), the threatened vernal pool fairy shrimp (*Branchinecta lynchi*) and its designated critical habitat, the endangered vernal pool tadpole shrimp (*Lepidurus packardi*) and its designated critical habitat, the threatened Delta green ground beetle (*Elaphrus viridis*) and its designated critical habitat, the threatened California tiger salamander (*Ambystoma californiense*) (Central California distinct population segment (DPS)) and its designated critical habitat, the endangered California tiger salamander (Sonoma County DPS) and its designated critical habitat, the threatened California red-legged frog (*Rana draytonii*) and its designated critical habitat, the threatened Alameda whipsnake (*Masticophis lateralis euryxanthus*) and its designated critical habitat, the endangered San Francisco garter snake (*Thamnophis sirtalis tetrataenia*), the endangered California clapper rail (*Rallus longirostris obsoletus*)[1], the endangered salt marsh harvest mouse (*Reithrodontomys raviventris*), the endangered Burke's goldfields (*Lasthenia burkei*), the endangered Contra Costa goldfields (*Lasthenia conjugens*) and its designated critical habitat, the endangered fountain thistle (*Cirsium fontinale* var. *fontinale*), and the endangered Sebastopol meadowfoam (*Limnanthes vinculans*).

This response is provided under the authority of the Endangered Species Act of 1973, as amended (16 U.S.C. § 1531 *et seq*.) (Act), and in accordance with the implementing regulations pertaining to interagency cooperation (50 CFR 402).

In reviewing this project, the Service has relied upon: (1) the Corps' June 11, 2020, letter requesting consultation; (2) the June 2020, *Biological Assessment for the Regional General Permit for Pacific Gas and Electric Company's Bay Area Operation and Maintenance Program* (BA) prepared by Insignia Environmental (consultants); (3) the updated December 2020, BA; (4) PG&E's Bay Area O&M HCP; (5) electronic mail, telephone, and teleconference communications between the Service, PG&E, the Corps, and PG&E's consultants; and (6) other information available to the Service.

PG&E's Bay Area O&M HCP

The purpose of this programmatic consultation is to evaluate the effects of PG&E's Bay Area O&M Program on listed species that were not covered under PG&E's Bay Area O&M HCP (ICF 2017). The Service issued an Incidental Take Permit (Permit Number TES6826C-0 (Service 2017)) (ITP) to PG&E, in October of 2017 pursuant to section 10(a)(1)(B) of the Act. The Service also issued the September 28, 2017 intra-Service biological opinion (2017 BO) (Service File No. 08ESMF00-2013-F-0102) for issuance of the ITP. This programmatic consultation and the appurtenant species evaluations serve to coincide with the 30-year term of PG&E's Bay Area O&M HCP set to expire October 2, 2047 which would leave the remainder of approximately 26 years for the term of this PBO. In the 2017 BO, the Service concluded that the effects of PG&E's O&M activities and level of incidental take were not likely to jeopardize the continued existence of endangered California freshwater shrimp, the endangered conservancy fairy shrimp, the endangered longhorn fairy shrimp, the threatened vernal pool fairy shrimp, the endangered vernal pool tadpole shrimp, the threatened Delta green ground beetle, the threatened California tiger salamander (Central California DPS), the endangered California tiger salamander (Sonoma County DPS), the threatened California red-legged frog, the threatened Alameda whipsnake, the

[1] Until the Service officially adopts recent nomenclature changes made by the American Ornithologists' Union to Ridgway's Rail (*Rallus obsoletus*), we maintain the use of California clapper rail (*Rallus longirostris obsoletus*) in this correspondence. Note, the change in taxonomic assignment does not change the listing status of the species.

endangered San Francisco garter snake, the endangered California clapper rail, the endangered salt marsh harvest mouse, the endangered Burke's goldfields, the endangered Contra Costa goldfields, the endangered fountain thistle, and the endangered Sebastopol meadowfoam or result in the adverse modification or destruction of their respective designated critical habitats. We do not anticipate any additional adverse effects to the aforementioned 17 species or their critical habitats that were not previously evaluated in our 2017 BO. Thus, no incidental take beyond that anticipated in the 2017 biological opinion is likely to occur as a result of issuance of the RGP for PG&E's Bay Area O&M Program. Consistent with the 2017 BO, the Service concludes that issuance of the RGP for PG&E's Bay Area O&M Program is not likely to jeopardize the aforementioned 17 species or result in the adverse modification or destruction of their respective designated critical habitats. Activities under the RGP, if implemented as described in the updated BA, comply with all applicable conditions required by the PG&E Bay Area O&M HCP, ITP, and our intra-Service 2017 biological opinion and its associated incidental take statement. Therefore, by this consultation, incidental take for the aforementioned 17 species for this RGP is exempted by the ITP for the Bay Area O&M HCP.

Soft Bird's-beak Critical Habitat

The Service concurs that activities covered under the RGP may affect and are not likely to adversely affect the soft bird's-beak critical habitat. Although the Action Area intersects critical habitat for soft bird's-beak, overall impacts to critical habitat are anticipated to be short term and relatively minor due to the nature of the O&M activities. PG&E anticipates up to 0.02 acre of temporary impacts and no permanent impacts to soft bird's-beak critical habitat as a result of the proposed activities. Habitat affected by temporary disturbance is anticipated to return to its functionality as critical habitat for the species. Impacts are anticipated to be further minimized with the implementation of PG&E's avoidance and minimization measures (AMMs).

The Service does not concur that activities covered under the RGP may affect, but are not likely to adversely affect the WSP designated critical habitat. Although PG&E has identified that activities will likely result in only a small percentage of permanent impacts to the WSP designated critical habitat, the permanent loss of critical habitat, particularly over an annual basis, is still a reduction of the overall critical habitat and/or the primary constituent elements (PCEs) which therefore constitutes an adverse effect and warrants formal consultation.

The remainder of this document represents the Service's programmatic biological opinion on the effects of PG&E's Bay Area O&M Program on the CLT, the WSP and its critical habitat, the palmate-bracted bird's-beak, and the soft bird's-beak.

ADMINISTRATION OF THIS PROGRAMMATIC BIOLOGICAL OPINION

Many of the proposed O&M activities, projects, and conservation measures occur in waters regulated by the Corps and require a Corps' permit. Many of these projects have a small, individual footprint and can be permitted under the Corps' RGP. By providing a programmatic-level biological opinion for these O&M activities and projects, the Corps would not have to consult separately for each activity described in this programmatic biological opinion (PBO). The Service supported this approach because it allows for a more efficient workload and is more appropriate than the current approach of consulting on individual projects that are covered activities under the HCP.

Projects determined inconsistent with this biological opinion are those that exceed minimal effects to this species and would require a separate consultation. Restoration projects proposed as a conservation measure and associated with mitigation for these on-site O&M activities are not included in the analysis for this PBO and will require separate consultation with the Service.

CONSULTATION HISTORY

June 11, 2020	The Service receives the Corps' initiation letter for the project.
October 6, 2020	The Service requests a meeting with the Corps and PG&E to discuss PG&E's application for a RGP and to recommend a PBO to cover species not covered under the PG&E Bay Area O&M HCP.
October 16, 2020	The Service attends a meeting with the Corps, PG&E, and PG&E's consultant via teleconference. The Service, the Corps, and PG&E agree that a PBO would be appropriate for the issuance of the RGP. The Service recommended that PG&E and the Corps utilize the Service's December 1, 2004 PBO for delta smelt for activities proposed under PG&E's Bay Area O&M Program.
December 28, 2020	The Service receives an updated BA which addresses utilization of the Service's December 1, 2004, PBO for delta smelt and updated conservation measures with regard to CLT and WSP.
March 16, 2021	The Corps requests an official "Draft" of the PG&E O&M programmatic biological opinion and requests to withdraw the delta smelt and the delta smelt critical habitat from the consultation.
April 28, 2021	The Corps requests to withdraw the delta smelt and the Sonoma alopecurus from the consultation. The Corps will address effects to delta smelt by appending appropriate projects to the Service's December 1, 2004 PBO for delta smelt for activities proposed under PG&E's Bay Area O&M Program. The Corps determined that the Sonoma alopecurus would not be affected by the proposed project as the species is not anticipated to occur within the Action Area.
June 11, 2021	PG&E proposed modifications to their conservation measures. For the two plant species (i.e., palmate-bracted bird's-beak and soft bird's-beak), PG&E will create Map Book Zones and implement conservation measure Plant-04 to be consistent with the HCP. PG&E also proposed changes to the breeding season avoidance window for the CLT and WSP to be consistent with the Don Edwards Fish and Wildlife Refuge's Special Use Permit.
June 15, 2021	The Service issued a Draft PBO to the Corps and PG&E for their review and to provide comment.

July 21, 2021 PG&E provided minor comments to the Draft PBO.

July 27, 2021 The Service met with the Corps and PG&E to discuss comments provided by PG&E. After minor language edits, the Corps and PG&E agreed they were satisfied with the Draft PBO and requested issuance of a Final PBO.

BIOLOGICAL OPINION

Description of the Proposed Action

Electrical System Activities

PG&E's electric system consists of a transmission system and a distribution system. The electric transmission system consists of approximately 4,430 miles of transmission lines, 23,015 miles of distribution lines, and 207 substations. Within this system, approximately 2,699 electric structures (e.g., poles, boardwalks, pole foundations, and tower footings) are located within waters of the U.S. in the nine Bay Area counties.
Substation Maintenance

Typical major maintenance tasks include transformer, switch, fuse, cutout, meter, and insulator repair and replacement. Maintenance of substation systems requires this type of work approximately once per year. Load demands may require modifications to station equipment or installation of new facilities. Maintenance activities could require use of station property or adjacent property for construction staging, materials storage, permanent facilities, and land management. Substation maintenance is anticipated to result in approximately 20,000 square feet of temporary disturbance, which is not anticipated to occur every year.

Tower Replacement and Repair

PG&E performs routine O&M activities on towers throughout the Bay Area, including tower replacement and tower foundation repair. Old tower footings may be abandoned in place as necessary. 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 large quantity of material is needed at the job site, PG&E builds a temporary section of boardwalk laterally from the existing boardwalk or utilizes barges for work areas. A helicopter or barge is then used to place the material on the temporary boardwalk, and workers move the material to the work site by hand or wheelbarrow. A barge with a crane or helicopter is used to repair or replace the upper portion of the tower. In areas where there are no existing boardwalks, and/or construction of a temporary boardwalk is not feasible, all work will be conducted from a barge or helicopter. Barges may rest on the bottom of the bay at low tide depending on the local conditions.

For typical foundation repair procedures, the material is first brought to the site by helicopter or barge, or a combination of both. To repair foundations submerged in shallow water, such as in the fringes of San Francisco Bay, a cofferdam is installed during low tide around the footing to be repaired (or around the entire tower). The cofferdam is usually built out of 1.125-inch plywood and 4-inch by 4-inch strong backs, or with metal sheet piles. In the case of plywood cofferdams, mud near the base of the footing is removed using hand tools and the cofferdam is

pushed down to the required depth to expose the solid piling, which is usually 3 feet below the mud line. Metal sheet piles will be driven by a vibratory hammer to the appropriate depth. Typically, any removed mud or sediments are placed in bags and taken to a landfill. If there is limited mud collected, then it is returned to the base of the footing after the repair is complete.

To strengthen tower foundations, concrete from the existing footings is removed to expose the steel reinforcements. New pins are inserted, a new rebar cage is installed, and forms are constructed. The concrete is then poured, allowed to cure, and the form is removed. In some instances, grade beams are installed between adjacent foundations. This involves installing forms, pouring concrete, and removing the forms. Once the repair is complete, the cofferdam is removed by excavating around the outside and hoisting it from the workspace.

New tower piles are installed by first installing a cofferdam within the tower work area. The cofferdam keeps the enclosed area dry and minimizes the mobilization of sediment during construction activities. Any water in the cofferdam is pumped directly onto the adjacent land or into the adjacent water. Once the cofferdam is installed and dewatered, a barge-mounted pile driver is used to embed piles approximately 70 feet into the ground. The piles are usually composed of wood and surrounded by metal cages and cement. Temporary effects result from the approximately 25-foot by 40-foot footprint for the crane (when necessary for repairs) and an approximately 25-foot by 100-foot work area.

A crew of six to ten personnel is typically required, and tower/foundation repairs usually take 1 to 5 weeks to complete for each tower. Access occurs primarily on existing roads, though some overland access with small trucks or sport utility vehicles is also expected. In-water access will occur with the use of boats and barges primarily for towers within the San Francisco, San Pablo, Suisun, and Grizzly bays, and tributaries that are large enough for barges to access.

Boardwalk Replacement or Repair

PG&E has many miles of boardwalks that service transmission facilities in the vegetated margins, mudflats, and open water around the San Francisco Bay. The boardwalks typically extend from levees and provide access across marshes and salt ponds to transmission tower footings. Support equipment for replacement and repair may include, but is not limited to boats, barges, and helicopters. Barges may rest on the bottom of the bay at low tide depending on the local conditions. A staging yard located on land is often also used to store materials. All boardwalk replacement and repair activities are completed manually and require the use of generators and handheld equipment including, but not limited to, drills, chain saws, and skill saws. A crew of three to five personnel conduct the repair or replacement activities, which typically take 2 months to complete. Crews typically work from existing installed sections of boardwalks, which minimizes the need for access below and around the boardwalk. However, in some instances, work is conducted from barges and/or from the mudflat during low tide.

Replacement pilings are pushed into the ground using a steel bar for leverage, or hammered in using sledge hammers or similar tools. Degraded piles that have been replaced will be removed as close to the mudline as possible. Replacement planking is transported along the boardwalk on special hand-dollies. Planking is then slid into place, drilled, and bolted. The handrails are wood planks that are connected to the boardwalk by the support beams. If the existing boardwalk is substantially degraded, crews perform the work within an approximately 10-foot radius around the boardwalk being replaced. Handrails are then installed, which are wood planks that are

connected to the boardwalk with support beams. Support beams and then handrails are put in place, drilled, and bolted.

Pole Reinforcement and Replacement

Pole reinforcement methods may include attaching trusses to existing poles to provide additional support, or 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. The most common way to restore ground-level strength to utility poles involves the installation of a single (or in some cases, a double) steel truss. Steel trusses are usually galvanized to reduce corrosion potential. Steel trusses are driven to pre-defined depths and secured to the pole with high-strength steel banding. The pole is not removed to install the truss. Composite or fiberglass installations involve excavating around the pole, cleaning the pole, and treating the pole to arrest any decay. Composite fabric sheets are wrapped around the pole in layers, and a resin material is applied to each layer. The excavated area around the pole is then backfilled. The pole is not removed to install the composite materials. PG&E determines the type of reinforcement method after reviewing the results of an inspected line segment. This may require the installation of guy wires and anchors, by line truck auger, which could consist of a screw or a concrete structure. The work is generally performed by a crew of two to five personnel and takes 1 to 2 days to complete. Temporary impacts typically total approximately 6,500 square feet per year from work areas. When replacing a wooden transmission or distribution pole, the new pole is framed (i.e., crossarms, 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 auger is used to drill a hole, the new pole is placed into the new hole, the void is backfilled and compacted, and 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. This may require the installation of guy wires and anchors, which could consist of a screw or a concrete structure. Pole and equipment replacement and repair require an approximately 10-foot-long by 7-foot-wide work area. The work is generally performed by a crew of four to five personnel and is completed in 1 day for a distribution pole and up to 3 days for a transmission pole. Temporary impacts typically total approximately 0.80 acre per year as a result of using the work areas.

Line Reconductoring

PG&E replaces conductors (i.e., wires) once the wires have outlasted their usefulness or if increased capacity is required. Work crews install replacement conductors by temporarily splicing them to the ends of the existing conductors and pulling them through travelers (i.e., pulleys) attached to the arms of the towers or pole cross-arms. Conductor replacement begins with the installation of travelers 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. Once the travelers are in place, the conductor is unclipped from the insulators and a hoist is used to lower the existing conductor onto the travelers. Next, the existing conductor removed from the structures within a pull section. Once the new conductor is pulled into place, it is removed from the travelers and clipped onto the insulators. The travelers are then removed.

Reconductoring typically is done in 2- to 3-mile sections with the use of pull and tension sites (i.e., 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 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 (i.e., 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 on site, typically deliver and remove the reels. On-site cranes move the conductor reels on and off the semi-trucks. Pull sites are generally rectangular and vary in size from 50 to 350 feet wide for small pull sites and 100 to 1,250 feet long for large pull sites. Distances between pull sites vary, but on average, approximately 2.70 miles of conductor separates single pull sites or groups of pull sites. Vegetation mowing and minor grading may be required to prepare pull sites for use. Mats or gravel may also be used in wet locations. The work is generally conducted by a crew of three to eight personnel and potentially one helicopter crew over a period of 1 to 2 months.

Facility Access

Electric transmission and distribution O&M activities may require routine access road maintenance, including blading to smooth over washouts, eroded areas, and washboard surfaces as needed. Access road maintenance could include cleaning ditches, moving and establishing berms, clearing and making functional drain inlets to culverts, culvert repair, clearing and establishing waterbars, and cleaning and repairing over-side drains. Prefabricated bridges or culverts may need to be installed to ensure safe access and reduce environmental impacts. If the bridge is needed for only a short duration, a portable bridge is assembled onsite and secured with a crane to span the crossing. If a longer term crossing is required, a culvert may be installed after PG&E obtains all appropriate permits and authorizations. Likewise, existing culverts may need to be repaired or replaced from time to time. Access road maintenance includes the repair, replacement and installation of storm water diversion devices on an as-needed basis.

Where PG&E cannot complete O&M activities from an existing workspace, construction crews may place a mat as a work area. Equipment is then driven or placed onto the mats, and work is conducted from that location. Workers place the mats in such a way to help protect the vegetation within the temporary workspace during the maintenance activity. Mats are removed once the O&M activity has been completed.

Natural Gas System Activities

PG&E’s natural gas system consists of a transmission system and a distribution system. The transmission system in the nine-county area comprises 16 primary gas transmission lines totaling approximately 1,820 miles of pipeline, and the distribution system consists of 19,350 miles of distribution pipelines.

Fencing

Protective security fencing is sometimes installed around pipeline facilities to discourage vandalism. Fencing these areas requires digging holes to install fence posts using an auger. Chain-link fencing is then installed between the fence posts. Fence installation typically requires a disturbance area of approximately 50 feet by 50 feet for each location. A crew of three personnel usually performs the fence installation within a few days.

Site-Specific Erosion Solutions

In some locations, scour and erosion within a waterway can result in pipe exposure. In these instances, site-specific solutions to the erosion problem (e.g., installing biodegradable jute netting, riprap, and rock fill) may be employed over the pipeline and within the waterway to protect the pipeline from potential damage. These erosion solutions are typically permanent to protect the exposed pipeline and prevent further erosion from occurring. The extent of the erosion solution will typically not be longer than 100 feet or wider than 50 feet on any stream in the RGP area. Installation will typically begin with preparing the site for installation of the erosion solution. This may involve clearing existing vegetation and minor recontouring in the area of existing erosion. Once prepared, the erosion solution will be delivered to the site on a truck and placed in the prepared area. The erosion solution will then be installed according to the manufacturer's specifications. PG&E installs erosion solutions at three to five locations per year. A crew of two to eight personnel is usually required over a period of approximately 2 weeks.

Internal Pipeline Inspection

PG&E is required to confirm the integrity of its natural gas pipeline system in accordance with the Pipeline Safety Act. PG&E inspects the pipeline integrity by use of an internal inspection tool that identifies potential anomalies (e.g., pipe corrosion, cracks, or indentations). If an anomaly is found during the inspection of the pipeline, it is reviewed, inspected, and repaired as necessary. To evaluate the identified anomaly, a crew of two to four personnel is deployed to excavate a bell hole using a backhoe. The area of the exposed pipeline depends on the size and type of the anomaly found, as well as the current ground conditions and depth of the pipe. Once the pipeline is exposed, technicians measure and document the anomaly and a Pipeline Engineer determines the appropriate repair method.

Anomaly repairs may include welding a sleeve around the pipe. This process begins with sandblasting the section of pipe that will be sleeved and preparing the sleeve itself. Once prepared, the sleeve is wrapped around the anomaly, secured in place, and welded to the pipe. The sleeve and adjacent pipe are coated and the surrounding area is backfilled as appropriate. Sleeve repairs typically require a crew of four to six personnel and can take 1 to 2 days to complete. If the anomaly is particularly severe, the segment of pipe may have to be replaced. Internal pipeline inspection typically takes approximately 1 week to complete. PG&E estimates that disturbance associated with these inspection activities totals approximately 50 by 100 feet for each instance.

Pipeline Recoating

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 Electronic Test System Station and then measures for a loss of voltage. The integrity of pipeline coating may also be inspected visually on exposed areas, such as spans, valves, or stations. Once recoating is determined to be required, the pipeline to be recoated is excavated using a backhoe. In some instances, excavation and backfill may be required in wetlands or waterways. PG&E will only conduct pipeline recoating activities when wetlands and waterways are dry to avoid impacts to aquatic species and habitat. A crew of approximately four to six personnel removes the old coating by jetting, scraping, or sandblasting

and typically places plastic sheeting or tarps below the pipe to collect the residue. PG&E tests the residue to determine if it is hazardous and disposes of it in accordance with regulations. The surface of the pipe is then prepared for the new coating by running a self-contained grit- or shot-blasting machine over the exposed area. The pipeline continues to operate while a coating machine applies the coating. On average, an approximately 20-foot-wide work area is needed for this activity. The estimated annual temporary fill is approximately 440 square feet. The activity typically takes approximately 3 to 5 days to complete.

Valve Recoating and Replacement

Valves regulate the flow of gas through the pipeline and enable crews to isolate portions of the pipeline. Occasionally, these valves malfunction or wear out. Depending on the condition of the valve, PG&E either recoats or replaces approximately five valves annually. Prior to replacing or installing valves, a portion of the gas line will need to be blown down (i.e., gas is evacuated to the atmosphere from the affected section of pipe through a blowdown stack). Equipment required for recoating valves typically includes a flatbed truck/trailer or dump truck with a trailer, a backhoe, a water truck, an excavator, a vacuum excavator, welding trucks, a trailer-mounted compressor, a truck-mounted crane, a side boom, a front-end loader, crew trucks, barricades, and safety fencing. Recoating is conducted by a crew of six to 13 personnel by sandblasting the valve over tarps, collecting the debris, and recoating the valve with a specialized epoxy that protects against corrosion. To coat the entire valve down to where it connects to the pipeline, the area around the valve must be excavated to expose the pipe and then backfilled once recoating is complete. In some cases, the existing valves are located in wetlands and waterways. PG&E will only conduct valve recoating and replacement activities when streambeds and waterways are dry to avoid impacts to aquatic species and habitat. Workspace dimensions can vary and are dependent on available space in the easement. In most cases, a workspace footprint for a valve replacement measures approximately 40 feet by 60 feet. The process generally takes 4 to 6 days to complete. Valve replacement involves excavation to access the existing valve and adjacent segment of pipeline, removal of the existing valve (and potentially a segment of the adjacent pipeline), installation of the new valve, and backfill of the excavated area. Equipment required for replacing or installing valves is generally the same as the equipment required for valve recoating as discussed previously. Each valve replacement typically takes 4 to 5 weeks to complete, and crews conduct maintenance within the existing facility footprint.

Pipeline Cathodic Protection

Cathodic protection is a technique to control pipeline corrosion by making the pipeline the cathode of an electrochemical cell. As a pipeline’s coating degrades over time, it requires increased cathodic protection to prevent corrosion. A cable rated for the expected current output connects the negative terminal of a rectifier to the pipeline. The cable is installed underground usually via open trench. 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 installation of a cathodic protection system requires a type of anode (e.g., horizontal anode bed, flex anode, deep well anode) to be installed parallel and adjacent to the pipeline. The

distance from the anode installation to the pipeline may range from several hundred feet to several miles. Depending on the type of anodes installed, the equipment required may include pickup trucks, a trencher, a welding truck, a flatbed truck/trailer or dump truck with a trailer, a backhoe, a lowboy trailer, a tractor cat-loader, and/or a water truck. The anode installation is placed in the trench parallel to the pipeline, and the excavations are backfilled and recontoured to their original conditions. The pipeline continues to operate during installation or replacement of the anodes. The installation of certain types of anode beds requires excavation. The installation of cathodic protection equipment requires a crew of six to ten personnel and typically takes 7 to 10 days to complete. PG&E undertakes many cathodic protection activities each year using the methods described previously. An approximately 100-foot by 10-foot work area is needed to install the cable, excavate the soil, and stockpile soil.

Pipeline Lowering and Replacement

State and Federal code, as well as PG&E procedures dictate when pipeline segments need to be replaced. Public safety sometimes necessitates the replacement or abandonment of pipeline sections when they are damaged by construction projects, acts of nature, or aging and corrosion. The equipment typically required for pipeline segment replacement or abandonment includes a truck, bulldozer, excavator, frac tank, forklift, lowboy and trailer, sideboom, water truck, and a welding rig. Pipeline segment replacement begins with clearing and grading the right-of-way (ROW) and trenching and excavating the existing pipeline. A new trench is excavated for the new pipeline segment parallel and adjacent to the existing pipeline. PG&E typically places the new section of pipe as close to the abandoned pipeline as possible and modifies any existing easements by expanding the easement width to accommodate the new section of pipeline. For longer pipeline segment replacements, a welded and coated pipe is lifted and lowered into the trench by side boom tractors and excavators. Padded slings are used so the tractors can lower the pipe without damaging the pipe's protective coating. For shorter pipeline replacements, especially sections damaged by third parties or corrosion, replacements are typical within the same alignment.

Before the old pipeline is removed from service, it is blown down (i.e., gas is evacuated to the atmosphere from the affected section of pipe through a blowdown stack). The new pipeline segment is tested and X-rayed, and then tied in to the existing pipeline at the points where the old segment was removed. An existing pipeline is usually abandoned in place by first cleaning it, and then filling it with slurry before the pipeline is capped. Slurry is used if the pipeline crosses a waterbody or needs to be stabilized. If the old pipeline segment is removed instead of being abandoned, it is cut into smaller sections and transported to a facility where segments may be recycled or disposed of properly. All trenches are then backfilled. Backfilling the trench involves replacing and compacting the excavated subsoil into the trench and re-spreading the stockpiled topsoil, if appropriate, to return the surface to its original grade. The topsoil may be mounded slightly over the trench to accommodate any future settling of the trench backfill. Where possible, native material excavated from the pipeline trench is used to backfill the trench. If rock conditions are encountered during trench excavation, the trench bottom is first padded with a layer of imported rock-free sand.

The length of pipe affected varies, depending on the reason for replacement. The minimum length of pipe replaced is typically approximately 40 feet (for one joint of pipe), though up to 1 mile could be replaced during each replacement effort. A crew of 15 to 20 personnel is typically required for pipeline segment replacement and lowering projects. Two to 4 weeks are needed to

complete small replacements and approximately 24 weeks to complete large replacements. Trenching and soil excavation, soil stockpiling, staging, and construction vehicles typically disturb an approximately 100-foot-wide work area, which includes the 10-foot excavation area. However, if pipeline replacement takes place within an environmentally sensitive area, the width of the work area is typically narrowed to 40 to 60 feet in width depending on the terrain and site specific conditions to minimize impacts.

Pipeline lowering and replacement activities may require the installation of prefabricated bridges or culverts 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 on site 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.

Water Diversion Techniques

Pipeline crossings within water features that have flowing water require the implementation of water diversion techniques to minimize the potential for impacts to water quality and create a dry and safe work area. This requires a crew of two to three personnel installing a diversion structure (e.g., a dam or weir and a pump or headgate) to divert water through a temporary ditch or pipe to convey the water around the section of pipeline that requires O&M work. However, many of the water features in the Action Area are ephemeral, and work will most likely be conducted when the features are dry and diversion is not necessary. Upon completion of work on the pipeline segment, the water diversion structure is removed and the flow of the water feature is restored to its original state. Water diversion, including restoring flow of the water feature to its original state, typically takes 3 to 5 days to complete. Water diversion techniques temporarily disturb an approximately 10-foot-long and 20-foot-wide work area.

Pipeline Access

Pipeline O&M activities may require routine access road maintenance, including blading to smooth over washouts, eroded areas, and washboard surfaces as needed. Access road maintenance could include cleaning ditches, moving and establishing berms, clearing and making functional drain inlets to culverts, culvert repair, clearing and establishing waterbars, and cleaning and repairing over-side drains. O&M may require the installation of prefabricated bridges or culverts to ensure safe access and reduce environmental impacts. If the bridge is needed for only a short duration, a portable bridge is assembled onsite and secured with a crane to span the crossing. If a longer term crossing required, a culvert is installed after PG&E obtains all appropriate permits and authorizations. Likewise, existing culverts may need to be repaired or replaced from time to time. Access road maintenance includes the repair, replacement, and installation of storm water diversion devices on an as-needed basis. Where PG&E cannot complete O&M activities from an existing workspace, construction crews may place a mat as a work area. Equipment is then driven or placed onto the mats, and work is conducted from that location. Workers place the mats in such a way to help protect the vegetation within the temporary workspace during the maintenance activity. Mats will be removed after the O&M activity has been completed.

Conservation Measures

PG&E has developed general and species-specific conservation measures or AMMs to minimize or reduce the potential impacts to federally-listed species and their habitats that are located within the Action Area. Relevant AMMs were taken from the Bay Area O&M HCP and supplemented with additional species-specific measures for species that were not covered in the HCP. Please refer to the project BA and/or the PG&E HCP for standard best management practices, spill prevention plans, storm water pollution prevention plans, and other general conservation measures.

Bay Area O&M HCP Measures

PG&E will apply the following Field Protocols (FP), Hot Zone (HZ) AMMs, and Habitat-Specific AMMs described in the Bay Area O&M HCP to avoid and minimize potential impacts at they pertain to federally-listed species addressed in this document:

FP-02: Park vehicles and equipment on pavement, existing roads, or other disturbed or designated areas (barren, gravel, compacted dirt).

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.

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).

FP-06: Minimize potential for species to seek refuge or shelter in pipes and culverts. Inspect pipes and culverts, of diameter wide enough to be entered by a 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 special-status species is suspected or discovered.

FP-07: Vehicle speeds on unpaved roads will not exceed 15 miles per hour.

FP-08: Prohibit trash dumping, firearms, open fires (such as barbecues), hunting, and pets (except for safety in remote locations) at work sites.

FP-10: Reduce activity footprint wherever possible and minimize the amount of time spent at a work location to reduce the potential for take of species.

FP-11: Utilize standard erosion and sediment control best management practices (pursuant to the most current version of Permittee's *Stormwater Field Manual for Construction Best Management Practices*) to prevent construction site runoff into waterways.

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.

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 qualified 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.

FP-14: If an activity disturbs 0.1 acre or more of habitat for a special-status species in grasslands, the field crew will revegetate the area with a commercial seed mix.

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 when feasible. If refueling must be conducted closer to wetlands, construct a secondary containment area subject to review by an environmental field specialist and/or qualified biologist. Maintain spill prevention and cleanup equipment in refueling areas.

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.

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.

HZ-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.

HZ-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. Activities that cannot avoid vernal pool impacts will be completed when pools are clearly dry.

Wetland-1: Identify vernal pools and establish buffers. Maintain a buffer of 250 feet around vernal pools and vernal pool complexes when feasible. 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 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.

Wetland-2: Identify wetlands, ponds, and riparian areas and establish buffers. Maintain a buffer of 50 feet around wetlands, ponds, and riparian areas when feasible. 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 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.

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).

Plant-02: Heavy equipment shall remain on access roads or other previously disturbed areas unless otherwise prescribed by a land planner or biologist.

Plant-03: Stockpile separately the upper 4 inches of topsoil during excavations associated with covered activities. Stockpiles topsoil will be used to restore the disturbed ROW.

Plant-04: When activities greater than 0.1 acre in size within a MBZ will have direct impacts on special-status species, work with the crew to place flagging, fencing, or other physical exclusion barriers to minimize disturbances. If the work will directly impact special-status plant species, implement Plant-05, -06, -07, and -08 AMMs.

Plant-05: If a special-status 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 Service review and approval.

Plant-06: If a special-status annual plant species is present and it cannot be avoided, conduct activities after seeds have matured to the extent possible.

Plant-07: If a special-status 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).

The following conservation measures or AMMS proposed by PG&E are specific to CLT and WSP for this document:

1. O&M activities within 600 feet of actively nesting CLT will not be conducted during the breeding season (March 1 through August 31). Work will occur within the limited operating period of September 1 through February 28 or 29 if CLT are nesting within 600 feet.

2. No O&M activities will be performed within 600 feet of an active WSP nest or brood during the WSP breeding season (March 1 through September 14). Work will occur within the limited operating period of September 15 through February 28 or 29 if WSP are nesting within 600 feet. Vehicles driving on levees and pedestrians walking on boardwalks or levees will remain at least 600 feet away from WSP nests and broods. If WSP chicks are present near any levee that will be accessed by vehicles (e.g., for construction, inspection, or access), vehicle use will be under the supervision of a qualified biologist to ensure that no chicks are present within the path of the vehicle.

3. Helicopter flight paths will avoid active CLT colonies and WSP nests. Helicopter landings will take place on existing levees or roads. No landings in tidal marshes are permitted.

The Following conservation measure or AMM proposed by PG&E are specific to the palmate-bracted bird's-beak and the soft bird's-beak for this document:

1. For the palmate-bracted bird's-beak and soft bird's-beak, PG&E will create Map Book Zones and implement Plant-04 to be consistent with the HCP.

Compensatory Mitigation

PG&E is proposing to mitigate for permanent impacts to CLT and WSP habitat at a ratio of 3:1. PG&E will also provide compensatory mitigation for any permanent impacts to federally listed plant species at a ratio of 1:1. PG&E proposes to follow a similar mitigation process as outlined in the Bay Area O&M HCP for the federally-listed wildlife and plant species. This may include funding the acquisition, management, enhancement, and/or restoration of affected species' habitat. All proposed mitigation must be submitted to the Service for review and approval prior to implementation. PG&E will secure mitigation in advance of the work. As work is performed, the actual impacts to species' habitat will be tracked, and mitigation efforts will be adjusted accordingly to ensure that the appropriate amount of mitigation is provided. PG&E will report the annual mitigation acreage used to the applicable agencies and confirm that the remaining acreage is adequate for future mitigation.

Compensatory mitigation for all permanent impacts to wildlife habitat and federally-listed plant species will occur using one or a combination of the following options as deemed appropriate from the Service through a submittal, review and approval process: (1) Developing permittee-responsible mitigation sites; (2) purchasing credits from conservation banks; and/or; (3) contributing to habitat restoration and/or enhancement programs. Please refer to the BA and/or the PG&E HCP for details regarding the mitigation submittal, review, and approval process.

With this RGP specifically in mind, PG&E is in the process of developing sites that can provide compensatory mitigation for the impacts to species covered under this RGP. This includes potential sites that could be used for multiple terrestrial species, including the three plant species, at various Sonoma Land Trust projects within the Petaluma River and Sonoma Creek watersheds. All sites will be acquired in coordination with the Service. PG&E will receive credit for the mitigation following the development and recordation of the easement, equivalent conservation instrument, or ownership (County, State, or Federal land donation), establishment of an endowment or other financial mechanism for long-term funding, and development of a long-term management plan.

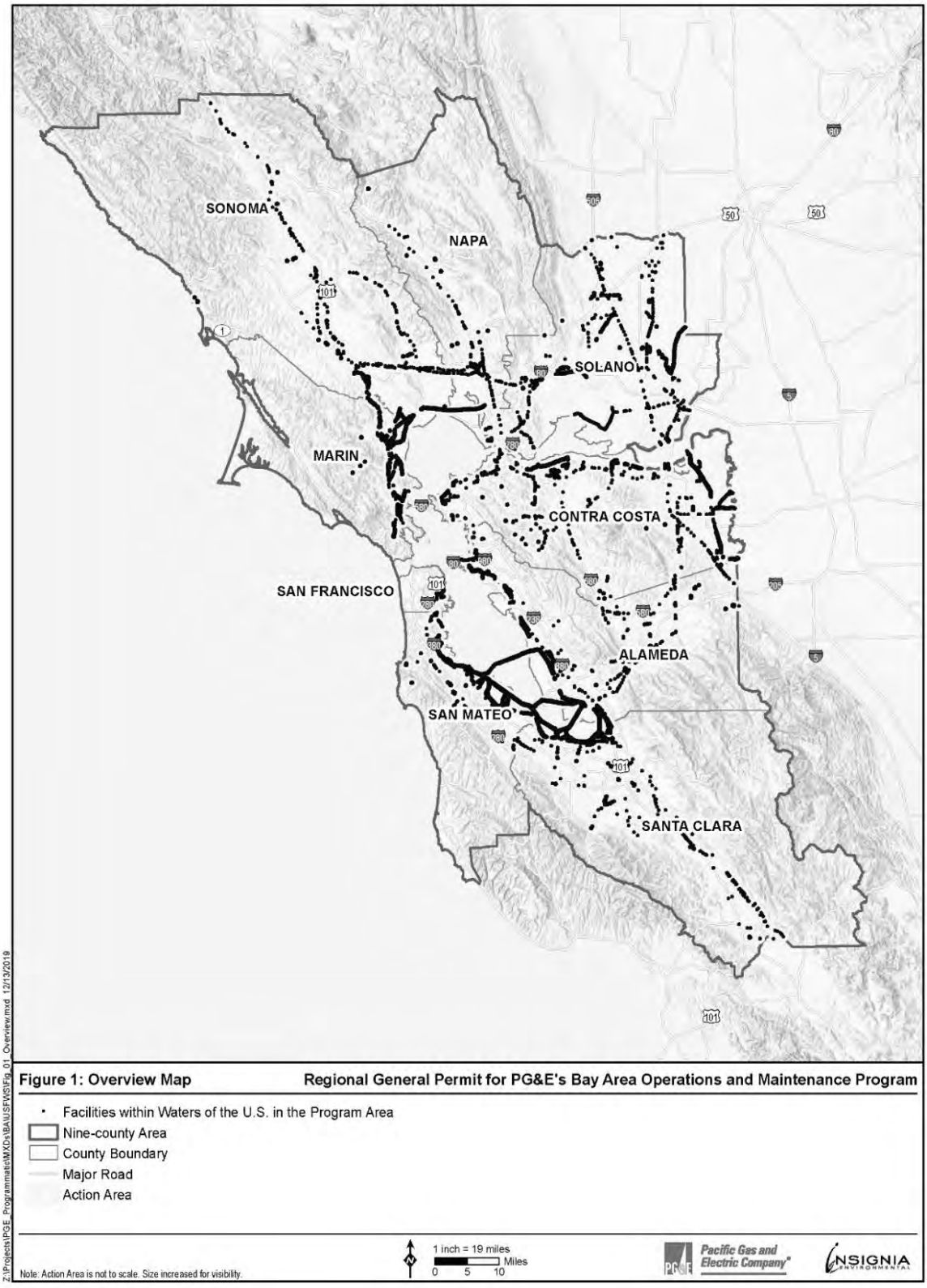
All conservation bank credits will be acquired in coordination with the Service. PG&E will receive credit for the site following the submittal of the bill of sale for the purchase of the credits.

All contributions to habitat restoration and/or enhancement programs will be coordinated with the Service. In cases where PG&E funds restoration efforts, mitigation credit will be conditionally approved upon funding and fully approved once the performance criteria for the restoration project are met.

Action Area

The Action Area is defined as “all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action,” (50 Code of Federal Regulations [CFR] 402.02). For the purposes of the effects assessment, the Action Area is located within the nine Bay Area Counties of Alameda, Contra Costa, Marin, Napa, Santa Clara, San Francisco, San Mateo, Solano, and Sonoma, California. The Action Area is defined as the gas and electric structures that occur within waters and wetlands, plus an approximately 1,000-foot buffer where effects (e.g., nest disturbance, turbidity, unanticipated spills, etc.) could occur. PG&E does not anticipate that pipeline replacement or repair will occur within the San Francisco, San Pablo, or Suisan bays as part of the program. Therefore, pipelines within bay waters were excluded from the Action Area. The Action Area for the program is approximately 160,400 acres (250 square miles)(Figure 1.).

Figure 1. Action Area for the PG&E O&M PBO



ANALYTICAL FRAMEWORK for the JEOPARDY DETERMINATION

Section 7(a)(2) of the Act requires that Federal agencies ensure that any action they authorize, fund, or carry out is not likely to jeopardize the continued existence of listed species. "Jeopardize the continued existence of" means to engage in an action that reasonably would be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of that species (50 CFR § 402.02).

The jeopardy analysis in this biological opinion considers the effects of the proposed Federal action, and any cumulative effects, on the range wide survival and recovery of the listed species. It relies on four components: (1) the *Status of the Species*, which describes the current range wide condition of the species, the factors responsible for that condition, and its survival and recovery needs; (2) the *Environmental Baseline*, which analyzes the current condition of the species in the Action Area without the consequences to the listed species caused by the proposed action, the factors responsible for that condition, and the relationship of the Action Area to the survival and recovery of the species; (3) the *Effects of the Action*, which includes all effects that are caused by the proposed Federal action; and (4) the *Cumulative Effects*, which evaluates the effects of future, non-Federal activities in the Action Area on the species. The *Effects of the Action* and *Cumulative Effects* are added to the *Environmental Baseline* and in light of the status of the species, the Service formulates its opinion as to whether the proposed action is likely to jeopardize the continued existence of listed species.

ANALYTICAL FRAMEWORK for the DESTRUCTION or ADVERSE MODIFICATION DETERMINATION

Section 7(a)(2) of the Act requires that Federal agencies ensure that any action they authorize, fund, or carry out is not likely to destroy or to adversely modify designated critical habitat. A final rule revising the regulatory definition of "destruction or adverse modification" (DAM) was published on August 27, 2019 (84 FR 44976). The final rule became effective on October 28, 2019. The revised definition states:

"*Destruction or adverse modification* means a direct or indirect alteration that appreciably diminishes the value of critical habitat as a whole for the conservation of a listed species."

The DAM analysis in this biological opinion relies on four components: (1) the *Status of Critical Habitat*, which describes the current range-wide condition of the critical habitat in terms of the key components (i.e., essential habitat features, primary constituent elements, or physical and biological features) that provide for the conservation of the listed species, the factors responsible for that condition, and the intended value of the critical habitat overall for the conservation/recovery of the listed species; (2) the *Environmental Baseline*, which analyzes the current condition of the critical habitat in the Action Area without the consequences to designated critical habitat caused by the proposed action, the factors responsible for that condition, and the value of the critical habitat in the Action Area for the conservation/recovery of the listed species; (3) the *Effects of the Action*, which determines all consequences to designated critical habitat that are caused by the proposed Federal action on the key components of critical habitat that provide for the conservation of the listed species, and how those impacts are likely to influence the conservation value of the affected critical habitat; and (4) *Cumulative Effects*,

which evaluate the effects of future non-Federal activities that are reasonably certain to occur in the Action Area on the key components of critical habitat that provide for the conservation of the listed species and how those impacts are likely to influence the conservation value of the affected critical habitat. The *Effects of the Action* and *Cumulative Effects* are added to the *Environmental Baseline* and in light of the status of critical habitat, the Service formulates its opinion as to whether the action is likely to destroy or adversely modify designated critical habitat. The Service's opinion evaluates whether the action is likely to impair or preclude the capacity of critical habitat in the Action Area to serve its intended conservation function to an extent that appreciably diminishes the rangewide value of critical habitat for the conservation of the listed species. The key to making that finding is understanding the value (i.e., the role) of the critical habitat in the Action Area for the conservation/recovery of the listed species based on the *Environmental Baseline* analysis.

Status of the Species

California Least Tern

The California least tern is a subspecies of the least tern. It was federally listed in 1969 under the Endangered Species Preservation Act of 1966 which was implemented under the June 2, 1970, Proposed Rule, Part 17 - Conservation of Endangered Species and Other Fish or Wildlife (35 FR 8491)(Part 17). The CLT was formally added to the list of endangered species in the October 13, 1970, amendment to Part 17 under Appendix D United States List of Endangered Native Fish and Wildlife (35 FR 16047). The CLT was then subsequently considered an endangered species under the current Endangered Species Act of 1973 which repealed the Endangered Species Preservation Act of 1966. Critical habitat has not been designated for this species. The Service issued the *Revised California Least Tern Recovery Plan* on April 2, 1980 (Service 1980). A 5-year review was conducted in 2006 where it was recommended to be downlisted to threatened (Service 2006a). Another 5-year review was conducted in 2020 where no change of status was recommended (Service 2020) due to the decreasing trend in numbers, increasing age of some populations, sustained poor productivity over the last 10 years, and ongoing threats (e.g., predation, food availability). Please refer to the Service's July 7, 2020, 5-year review for the species' description, habitat preference, and life history.

Western Snowy Plover

The western snowy plover is a subspecies of snowy plover. The Pacific coast population of the WSP was federally listed as threatened in 1993 (58 FR 12864). The Pacific coast population is defined as those individuals that nest within 50 miles of the Pacific Ocean on the mainland coast, peninsulas, offshore islands, bays, estuaries, or rivers of the United States and Baja California, Mexico (58 FR 12864). The Pacific coast population of the western snowy plover breeds on the Pacific coast from southern Washington to southern Baja California, Mexico. Critical habitat for the species was designated on September 29, 2005, (70 FR 56970) and revised on June 19, 2012, to increase the size of the critical habitat (77 FR 36727). The Service issued the *Recovery Plan for the Pacific Coast Population of the Western Snowy Plover* on August 13, 2007 (Service 2007). A 5-year review was conducted in 2006 (Service 2006b) where no change in status was recommended. Another 5-year review was conducted in 2019 (Service 2019) where again no change in status was recommended. Please refer to the Service's August 13, 2007, *Recovery Plan for the Pacific Coast Population of the Western Snowy Plover* for the species' description, habitat preference, and life history.

Palmate-bracted Bird's-beak

Palmate-bracted bird's-beak is an annual herb in the Orobanchaceae (broomrape) family. It was listed as endangered on July 1, 1986 (51 FR 23765). Critical habitat has not been designated for this species. The Service issued the *Recovery Plan for Upland Species of the San Joaquin Valley, California* on September 30, 1998 (Service 1998) which covered several species including the palmate-bracted bird's-beak. A 5-year review was conducted in 2009 (Service 2009a) where no change in status was recommended. Please refer to the Service's September 30, 1998, *Recovery Plan for Upland Species of the San Joaquin Valley, California* for the species' description, habitat preference, and life history.

Soft Bird's-beak

Soft bird's-beak is an annual herb in the Orobanchaceae (broomrape) family. It was listed as endangered on November 20, 1997 (62 FR 61916). Critical habitat was designated for the species in 2007 (72 FR 18518). The Service issued the *Recovery Plan for Tidal Marsh Ecosystems of Northern and Central California* on August 27, 2013 (Service 2013) which covered several species including the soft bird's-beak. A 5-year review was conducted in 2009 (Service 2009b) where no change in status was recommended. Please refer to the Service's August 27, 2013, *Recovery Plan for Tidal Marsh Ecosystems of Northern and Central California* for the species' description, habitat preference, and life history.

Status of Western Snowy Plover Critical Habitat

The Service designated critical habitat for the Pacific Coast population of the western snowy plover in 2005 (70 FR 56969). The Service published a proposed revision to critical habitat on March 22, 2011 (76 FR 16046) and a final rule revising designating critical habitat on June 19, 2012 (77 FR 36268). In total, approximately 24,527 acres of critical habitat for the Pacific Coast population of the western snowy plover in Washington, Oregon, and California, fall within the boundaries of the critical habitat designation. Pursuant to the Act and its implementing regulations under 50 CFR 424.12, the Service is required to identify the physical or biological features essential to the conservation of western snowy plover in areas occupied at the time of listing, focusing on the features' PCEs. We consider PCEs to be the elements of physical or biological features that provide for a species' life history processes and are essential to the conservation of the species. Based on the best available information, the PCEs essential to the conservation of the western snowy plover are the following: sandy beaches, dune systems immediately inland of an active beach face, salt flats, mud flats, seasonally exposed gravel bars, artificial salt ponds and adjoining levees, and dredge spoil sites, with: (1) areas that are below heavily vegetated areas or developed areas and above the daily high tides; (2) shoreline habitat areas for feeding, with no or very sparse vegetation, that are between the annual low tide or low water flow and annual high tide or highwater flow, subject to inundation but not constantly under water, that support small invertebrates, such as crabs, worms, flies, beetles, spiders, sand hoppers, clams, and ostracods, that are essential food sources; (3) surf- or water-deposited organic debris, such as seaweed (including kelp and eelgrass) or driftwood located on open substrates that supports and attracts small invertebrates described in PCE 2 for food, and provides cover or shelter from predators and weather, and assists in avoidance of detection (crypsis) for nests, chicks, and incubating adults; and (4) minimal disturbance from the presence of humans, pets, vehicles, or human-attracted predators, which provide relatively undisturbed areas for individual and population growth and for normal behavior.

Environmental Baseline

Environmental Baseline refers to the condition of the listed species or its designated critical habitat in the Action Area, without the consequences to the listed species or designated critical habitat caused by the proposed action. The *Environmental Baseline* includes the past and present impacts of all Federal, State, or private actions and other human activities in the Action Area, the anticipated impacts of all proposed Federal projects in the Action Area that have already undergone formal or early section 7 consultation, and the impact of State or private actions which are contemporaneous with the consultation in process. The consequences to listed species or designated critical habitat from ongoing agency activities or existing agency facilities that are not within the agency's discretion to modify are part of the *Environmental Baseline*.

Due to the size of the Action Area, the *Environmental Baseline* will be described in general terms for each species addressed in this PBO. Habitat conditions for each species within the Action Area range from relatively undisturbed areas to areas in active and inactive agriculture to areas of extensive urbanization. PG&E's facilities, other than those that might be built as a result of minor new construction, pre-exist and are a baseline condition throughout the Action Area. Ongoing O&M activities that will be covered under this PBO are currently occurring on the landscape in roughly the same scope and frequency as was described in the PG&E's Bay Area O&M HCP. Thus, for establishing the *Environmental Baseline,* O&M activities described in this PBO, excluding minor new construction, are existing conditions with regard to PG&E facilities and ROWs within the Action Area.

California Least Tern

Within the San Francisco Bay region, CLT have more recently nested at several known locations, including Alameda Point with the largest numbers, Vandenberg Air Force Base, PG&E's Pittsburg Power Plant, Eden Landing Ecological Reserve, and Hayward Regional Shoreline. Since 2009, CLT have established small nesting colonies at new locations in the northeast portion of the San Francisco Bay estuary, including in Suisun Bay at the Montezuma Wetlands and at Green Island within the Napa-Sonoma Marshes Wildlife Area.
The Action Area includes estuary/bay habitats; therefore, suitable nesting and foraging habitat is present in the Action Area. California least tern nesting and foraging habitat occurs in the vicinity of substations at Mallard Slough and Bair Island. Towers and boardwalks are located in or near occupied CLT foraging and nesting habitat on Bair Island, in Alviso ponds, near Mount Eden Creek in the Eden Landing Ecological Reserve ponds, and at Mallard Slough. Poles are also located in or near occupied foraging and nesting habitat on Bair Island and Alviso ponds. Gas facilities are located in or near CLT occupied foraging and potential nesting locations off Cordelia Slough, Bay Farm Island, and Bair Island.

Western Snowy Plover

Within the San Francisco Bay region, WSP breeds primarily above the high tide line on coastal beaches, sand spits, beaches at creek and river mouths, salt pans at lagoons and estuaries, and river bars. The largest known coastal breeding population of this species is located in and around the San Francisco Bay. Due to human disturbance at coastal beaches, many WSP in the Bay Area nest in dry salt ponds or on large, open salt pan areas. The Action Area includes estuary/bay habitats; therefore, suitable nesting and foraging habitat is present in the Action Area. Potential and known nesting locations for WSP are in the vicinity of PG&E substations at Bair Island, Don

Edwards San Francisco Bay National Wildlife Refuge, Mount Eden Creek in the Eden Landing Ecological Reserve ponds, and the Ravenswood salt ponds. Boardwalks and towers are located in or near occupied foraging and nesting habitat in the San Francisco Bay, south of the San Mateo-Hayward Bridge. PG&E poles are also located in or near occupied foraging and nesting habitat at Don Edwards San Francisco Bay National Wildlife Refuge. PG&E gas facilities are located in occupied WSP habitat near the mouth of San Francisquito Creek.

Palmate-bracted Bird's-beak

Palmate-bracted bird's-beak is found in alkaline soils within chenopod scrub and valley and foothill grassland habitats. There are California Natural Diversity Database (CNDDB) records for palmate-bracted bird's-beak within the City of Livermore in Alameda County at the Springtown Preserve and suitable habitat is present in the Action Area. A previous PG&E assessment for the Bay Area O&M HCP found that a distribution line crosses one occurrence approximately 0.5 west of N. Vasco Road and approximately 1 mile north of Interstate 580 in the City of Livermore, California, but there are no gas or electric facilities located in occupied habitat as represented in the CNDDB occurrence. There is potential to encounter palmate-bracted bird's-beak in suitable habitats that have not been surveyed.

Soft Bird's-beak

Soft bird's-beak is found in coastal salt marshes and blooms from June through November. Designated critical habitat for soft bird's-beak occurs in the Action Area near Suisun City and in the vicinity of Joyce Island off Suisun Bay and in Benicia State Park off the Carquinez Strait in Solano County; in Napa County off the Napa River near the confluence with Carneros Creek; and in Point Pinole Regional Shoreline in Contra Costa County. CNDDB records for soft bird's-beak are concentrated in the designated critical habitat for the species, but there are also records in Contra Costa County off Suisun Bay in marshes near the City of Concord and the community of Bay Point (CNDDB 2021). The Action Area includes estuary and bay habitats; therefore, suitable habitat is present in the Action Area. Towers and boardwalks are located in marshes in the vicinities of Suisun City and Benicia State Park, and poles are located in Hastings Slough at the former Concord Naval Weapons Station. However, very few facilities are located within occupied habitat, and there are no substations in occupied habitat. Gas facilities are located in the marshes in the vicinity of Benicia State Park, but only a few facilities are located in occupied habitat. A previous PG&E assessment for the Bay Area O&M HCP found that electric distribution lines cross two occurrences of soft bird's-beak in Solano County. The first occurrence is located south of Interstate 780 in the Benicia State Park and the second occurrence is located south of Highway 12 and southwest of Suisun City. In addition, there is the potential to encounter soft bird's-beak in suitable habitats that have not been surveyed.

Western Snowy Plover Designated Critical Habitat

Three subunits occur in the Eden Landing Ecological Preserve. All three units were occupied at the time of listing and were documented as occupied in 2017 (CNDDB 2021). Subunit CA 13A is approximately 237 acres and encompasses salt ponds designated as E11, E15B, and E16B. It is located just south of Highway 92 and the San Mateo Bridge and west of Union City in Alameda County. Approximately 228 acres are State owned and approximately 8 acres are privately owned. Essential features provided by the subunit include sparsely vegetated areas above daily high tides, such as salt pans, artificial salt ponds, and adjoining levees, for nesting and foraging.

Subunit CA 13B is approximately 171 acres and encompasses a salt pond designated as E14, just south of Eden Creek. This subunit is located west of Union City in Alameda County. The entire subunit is State owned. Essential features provided by the subunit include sparsely vegetated areas above daily high-tides, such as salt pans, artificial salt ponds and adjoining levees, for nesting and foraging. Subunit CA 13C, Eden Landing is approximately 609 acres and encompasses salt ponds designated as E6A and E6B. This subunit is located just north of Old Alameda Creek and west of Union City in Alameda County. Essential physical or biological features provided by the subunit include sparsely vegetated areas above daily high-tides, such as salt pans, artificial salt ponds, and adjoining levees, for nesting and foraging.

The Ravenswood Subunit CA 14 is approximately 89 acres and consists of the southwestern portion of salt pond SF2 located east of the City of East Palo Alto in San Mateo County near the western approach to the Dumbarton Bridge on the Don Edwards San Francisco Bay National Wildlife Refuge. This subunit was occupied at the time of listing and was documented as occupied in 2017 (CNDDB 2021). The role of this critical habitat unit is to provide nesting and foraging habitat for the western snowy plover in South San Francisco Bay. Pond SF2 has undergone renovations intended to provide ponded areas, islands, and salt pan for several species of shorebirds, including western snowy plovers. The Ravenswood unit was drawn to encompass the salt pan area. This unit was occupied at the time of listing and is currently occupied. Essential physical or biological features provided by the unit include sparsely vegetated areas above daily high-tides, such as salt pans, artificial salt ponds and adjoining levees, for nesting and foraging.

The Warm Springs Subunit CA 15 is approximately 168 acres and encompasses the northeastern portion of salt evaporation ponds designated as A22 and A23 in the Warm Springs area of the South San Francisco Bay between the Cities of Fremont and Milpitas in Alameda County. This subunit was occupied at the time of listing and was documented as occupied in 2017 (CNDDB 2021). The entire unit is federally owned. Essential physical or biological features provided by the unit include sparsely vegetated areas above daily high-tides, such as salt pans, artificial salt ponds, and adjoining levees, for nesting and foraging.

Effects of the Action

Effects of the Action are all consequences to listed species or critical habitat that are caused by the proposed action, including the consequences of other activities that are caused by the proposed action. A consequence is caused by the proposed action if it would not occur but for the proposed action and it is reasonably certain to occur. *Effects of the Action* may occur later in time and may include consequences occurring outside the immediate area involved in the action.

PG&E's O&M Activities will be undertaken almost entirely on existing facilities within the Action Area. The effects of habitat loss resulting from individual O&M activities are expected to be small. Habitat disturbance is most often temporary in nature, and distributed throughout these species' ranges in the Action Area rather than condensed into one location, thereby minimizing the effects of implementation of individual activities. The expected permanent loss resulting from implementation of O&M activities over the term of this programmatic biological opinion (to coincide with the 30-year term of the PG&E Bay Area O&M HCP permit), in comparison to the habitat remaining to this species throughout its range, is small (less than 2 acres for each species over the approximate 26-year term). PG&E has committed to conserving habitat for each species, through the various measures described in the *Conservation Measures*. Individual species and critical habitat effects are described below.

California Least Tern and Western Snowy Plover

The proposed project will likely generate temporary noise and visual disturbance that will exceed ambient conditions in areas that may support CLT and WSP. Equipment noise, vibration, and visual disturbance may interfere with normal behaviors. These behaviors include feeding, sheltering, movement between refugia and foraging grounds, and other essential behaviors. Intolerable levels of disturbance that may force individuals to flush from cover or prevent them from seeking available cover could expose them to a predation risk or other dangers that otherwise would not occur. As O&M activities are typically discrete, CLT and WSP would likely be able to avoid the area of disturbance and would likely be able to find alternate suitable foraging opportunities in the surrounding areas.

Anthropogenic disturbance associated with the proposed action that could occur near known and potential CLT and WSP nesting locations could contribute to a lack of nest success, as well as deter the use of nearby foraging locations. For these reasons, PG&E will not perform any O&M activities while inside suitable CLT or WSP habitat during their respective nesting seasons. PG&E will also limit helicopter hovering and flying over known nesting locations during the nesting season for CLT and WSP.

Electric system O&M activities could result in the loss of suitable habitat used for both nesting and foraging in the vicinity of substations. PG&E anticipates that the proposed action will temporarily impact approximately 0.70 acre of suitable foraging and nesting habitat for CLT and approximately 0.70 acre of suitable foraging and nesting habitat for WSP on an annual basis. It is anticipated that the proposed action will permanently impact approximately 0.07 acre of potentially suitable foraging and nesting habitat for CLT and approximately 0.07 acre of potentially suitable foraging and nesting habitat for WSP on an annual basis. These impacts are anticipated to occur annually over the 26-year term of this PBO to coincide with the 30-year term of the PG&E O&M HCP set to expire October 2, 2047. This would equate to a total of approximately 18.2 acres of temporary impacts each and approximately 1.82 acres of permanent impacts each for the CLT and WSP. Impacts to nesting habitat are anticipated to be minimal. Annual construction will be relatively short in duration for most O&M activities. Disruption to foraging habitat will be temporary and are not anticipated to substantially reduce the overall availability of foraging habitat for the CLT or WSP. In addition, habitat disturbance will also be minimized by confining disturbance areas to the smallest practicable area. PG&E proposes to compensate for all permanent impacts to CLT and WSP habitat at a ratio of 3 to 1.

CLT and WSP prey species can also be affected if a hazardous material spill results in a decrease in the availability of fish and the benthic prey species for the fish due to immediate contamination and residual contamination after construction activities have ended. In addition, fish and benthic species can be exposed to hazardous contaminants that have settled in sediments during the installation and removal of cofferdams. Implementation of the general AMMs will minimize the risk of exposure to hazardous contaminants. As a result, the risk of exposure to contaminants that may affect prey species for CLT and WSP are expected to be prevented.

PG&E currently implements AMMs as part of the PG&E Bay Area O&M HCP for other federally listed species during O&M activities. PG&E proposes to minimize adverse effects to CLT, WSP, and their nesting and foraging habitats by implementing the Bay Area O&M HCP measures, which include parking vehicles and equipment on previously disturbed areas, using existing access and ROW roads, restrictions on boat docking, avoidance of helicopter use near

active nests, and not conducting O&M activities within suitable habitat for during their nesting season.

Palmate-bracted Bird's-beak and Soft Bird's-beak

Listed plants may be affected where the movement or parking of vehicles and/ or the placement of equipment and staging materials may damage or crush adult plants and seedlings. Ground disturbance such as blading and excavation can destroy or damage individual plants, destroy or bury seeds, and provide opportunities for colonization by invasive plants. Excavation and grading has the potential to alter soil properties, create conditions unsuitable for the growth of some species (for other species it may promote germination or seedling establishment), and can change surface drainage patterns. The roots of perennial species are susceptible to damage from soil compaction by equipment or staging materials. Additional effects could result from activities that cause erosion that degrades habitat, ground disturbance that facilitates the establishment of invasive plant species that compete with native vegetation, or accidental ignition of a fire that damages or kills individuals. Sidecast soil from excavation, spilled materials, and other substances (such as broadcast herbicides) could be carried by ditches or swales to nearby sensitive areas, causing physical or physiological damage to the plants there.

Habitat may be permanently lost during O&M activities when towers or poles are replaced or when foundations are expanded during tower repairs. Temporary impacts to federally-listed plants and/or their habitat may occur during the installation of fencing and site-specific erosion solutions, as well as during excavations related to pipeline inspection, recoating, cathodic protection, pipeline lowering and replacement, and water diversion techniques. PG&E proposes to implement the Bay Area O&M HCP measures which include measures for managing hazardous material, reducing the introduction of noxious weeds, reporting species encounters, and frac-out response. Habitat disturbance will also be restricted to the minimum area necessary to complete O&M activities and PG&E proposes to compensate for the loss of habitat for all O&M activities.

Western Snowy Plover Designated Critical Habitat

WSP critical habitat will be impacted by the activities from the PG&E Bay Area O&M Program. PG&E anticipates up to 0.04 acre of annual temporary impacts and 0.01 acre of annual permanent impacts to WSP critical habitat as a result of the proposed activities. All four of the PCEs for this critical habitat unit will be affected from the permanent loss of habitat by activities occurring in WSP critical habitat units CA 13A, CA13B, CA 13C, CA 14, and CA 15. In addition, the habitat could be temporarily impacted by potential spills during construction which could cause contamination of soil and water and detriment to invertebrate prey. The habitat could be impacted by project personnel using the temporary work areas and causing contouring of the soils and changes in sediments, rocks, and shells that could be used as nesting sites. PG&E will implement the AMMs to minimize impacts to WSP critical habitat, including BMPs for soil erosion and spill prevention and containment, as well as providing compensatory mitigation for impacts to WSP habitat at a 3:1 ratio.

Cumulative Effects

Cumulative effects include the effects of future State, Tribal, local, or private actions that are reasonably certain to occur in the Action Area considered in this biological opinion. Future

Federal actions that are unrelated to the proposed project are not considered in this section; they require separate consultation pursuant to section 7 of the Act. The Service is not aware of specific projects that might affect the CLT, WSP, palmate-bracted bird's-beak, or the soft bird's-beak in the Action Area that are currently under review by State, county, or local authorities.

Most lands included in the 160,400-acre Action Area are privately owned but within a ROW or easements deed with PG&E. Under the terms of these deeds, the landowner may use the ROW lands for any purpose which will not interfere with PG&E's use of the ROW. Buildings or other structures cannot be erected within the boundary of the right-of-way, as these would interfere with PG&E's activities. Consequently, the ROW easement deed provides no protection from land-use change within the ROWs, with the exception that buildings will not be constructed within the ROW boundaries. Other State or private activities are expected to occur within these ROWs, including cattle grazing, agricultural or urban development, road building, and herbicide use. Although housing development is not expected within the boundary of a right-of-way, development or other land-use changes may occur on lands directly bordering the ROWs. Although land-cover in a ROW area may stay in a natural condition, development or other land-use changes on bordering lands would substantially reduce the habitat value of the ROW lands. These future activities may not be subject to section 7 consultation (and thus are considered to enter into cumulative effects). These activities are not associated with the proposed project.

Continued human population growth in the Action Area is expected to drive further development of agriculture, cities, industry, transportation, and water resources in the foreseeable future. This future development, and the associated infrastructure will further contribute to the continued loss and fragmentation of natural areas, including areas harboring the species covered in this biological opinion. Ongoing loss and fragmentation of natural land-cover in the Action Area and anthropogenic factors such as pesticides and invasion of exotic species is expected to continue through the 26-year term of this PBO to coincide with the 30-year term of the PG&E Bay Area O&M HCP.

Conclusion

After reviewing the current *Status of the Species*, the *Environmental Baseline*, the *Effects of the Action*, and the *Cumulative Effects*, it is the Service's biological opinion that the issuance of the RGP for PG&E's Bay Area O&M activities is not likely to jeopardize the continued existence of the CLT, WSP, palmate-bracted bird's-beak, or the soft bird's-beak. This is based on the current status of the federally-listed species' population range-wide, implementation of the *Conservation Measures* to minimize the adverse effects on individual of the species and their habitats during O&M activities, and the small scope and size of habitat impacts to localized areas for individual O&M activities.

After reviewing the current *Status of the Critical Habitat* for WSP critical habitat, the *Environmental Baseline* for the Action Area, the *Effects of the Action*, and the *Cumulative Effects*, it is the Service's biological opinion that the proposed project is not likely to result in destruction or adverse modification to WSP critical habitat. The small size of the temporary (approximately 0.04 acre annually) and permanent impacts (approximately 0.01 acre annually) will not diminish the value of critical habitat as a whole for the conservation of the WSP. This is anticipated to occur over the term of the PBO which coincides with the 30-year term of the PG&E O&M HCP set to expire October 2, 2047. This equates to a total of approximately 1.04 acres of temporary impacts and approximately 0.26 acre of permanent impacts over

approximately 26 years. The permanent impact (approximately 0.26 acre) represents 0.0002 % of the total area of the 5 subunits designated as critical habitat for the WSP. Therefore, the proposed project is not likely to impair or preclude the capacity of critical habitat in the Action Area to serve its intended conservation function to an extent that appreciably diminishes the rangewide value of critical habitat for the conservation of the WSP.

INCIDENTAL TAKE STATEMENT

Section 9 of the Act and Federal regulation pursuant to section 4(d) of the Act prohibit the take of endangered and threatened species, respectively, without special exemption. Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. Harass is defined by Service regulations at 50 CFR 17.3 as an intentional or negligent act or omission which creates the likelihood of injury to wildlife by annoying it to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding, feeding, or sheltering. Harm is defined by the same regulations as an act which actually kills or injures wildlife. Harm is further defined to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing essential behavior patterns, including breeding, feeding, or sheltering. Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered to be prohibited taking under the Act provided that such taking is in compliance with the terms and conditions of this Incidental Take Statement.

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

Sections 7(b)(4) and 7(o)(2) of the Act generally do not apply to listed plant species. However, limited protection of listed plants from take is provided to the extent that the Act prohibits the removal and reduction to possession of federally-listed endangered plants or the malicious damage of such plants on areas under federal jurisdiction, or the destruction of endangered plants on non-federal areas in violation of State law or regulation or in the course of any violation of a State criminal trespass law.

Amount or Extent of Take

The Service anticipates that individual CLT and WSP will be subject to incidental take in the form of harm. All CLT and WSP will be subject to harm through the temporary (approximately 18.2 acres) and permanent (approximately 1.82 acres) modification of habitat, and harm through the use of vehicles and large equipment during construction activities that could interfere with

normal behaviors within suitable habitat in the Action Area. Take in the form of harm from interference of normal behaviors to individual CLT and WSP may be difficult to quantify due to seasonal fluctuations in their numbers, random environmental events, or additional environmental disturbances. The Service does not anticipate any take through physical injury of individuals or lethal take of CLT or WSP as a result of O&M activities. Conservation measures proposed by PG&E and described in the *Description of the Proposed Action* will reduce, but not eliminate, the potential for incidental taking of CLT and WSP. Upon implementation of the *Reasonable and Prudent Measures*, incidental take associated with the project will become exempt from the prohibitions described under section 9 of the Act.

Effect of the Take

In the accompanying programmatic biological opinion, the Service determined that this level of anticipated take is not likely to result in jeopardy to the species or destruction or adverse modification of critical habitat.

Reasonable and Prudent Measures

The following reasonable and prudent measures are necessary and appropriate to minimize the effects of the proposed project to the CLT and WSP:

1. The Corps shall require PG&E minimize effects to listed species from O&M activities.

2. The Corps shall require PG&E implement the *Conservation Measures* as described in the *Description of the Proposed Action*.

Term and Condition

In order to be exempt from the prohibitions of section 9 of the Act, the Corps shall ensure that PG&E complies with the following term and condition, which implement the respective reasonable and prudent measures described above. This term and condition is non-discretionary.

1. Term and Condition 1 implements Reasonable and Prudent Measures 1 and 2:

    a. PG&E shall educate and inform personnel involved in the project as to the *Conservation Measures* and *Term and Condition* in this PBO.

    b. The Corps shall ensure PG&E complies with the *Reporting Requirements* below.

Reporting Requirements

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

1. The Service must be notified within 24 hours of the finding of any injured or dead listed species or any unanticipated damage to its habitat associated with the proposed project. Injured listed species shall be cared by a licensed veterinarian or other qualified person. Notification will be made to Jana Affonso, the Assistant Field Supervisor of the Endangered Species Division at: San Francisco Bay-Delta Fish and Wildlife Office, 650 Capitol Mall, Suite 8-300, Sacramento, California 95814 or by telephone at (916) 930-2664, and must include the date, time, and precise location of the individual/incident clearly indicated on a U.S. Geological Survey 7.5 minute quadrangle or other maps at a finer scale, as requested by the Service, and any other pertinent information. When an injured or dead individual of the listed species is found, the applicant through the Navy shall follow the steps outlined in the *Disposition of Individuals Taken* section below.

2. Sightings of any listed or sensitive animal species shall be reported to the Service and CNDDB (https://www.wildlife.ca.gov/Data/BIOS).

3. PG&E shall maintain a full and accurate account of all temporary and permanent habitat loss throughout the term of this PBO.

4. PG&E shall submit an annual report of all temporary and permanent habitat loss from O&M activities and projects covered under this PBO to the Corps and the Bay-Delta Fish and Wildlife Office.

Disposition of Individuals Taken

Injured listed species must be cared for by a licensed veterinarian or other qualified person(s), such as the Service-approved biologist. Dead individuals must be sealed in a resealable plastic bag containing a paper with the date and time when the animal was found, the location where it was found, and the name of the person who found it, and the bag containing the specimen frozen in a freezer located in a secure site, until instructions are received from the Service regarding the disposition of the dead specimen. The Service contact persons are Jana Affonso, the Assistant Field Supervisor of the Endangered Species Division at: San Francisco Bay-Delta Fish and Wildlife Office, 650 Capitol Mall, Suite 8-300, Sacramento, California 95814 or by telephone at (916) 930-2664.

CONSERVATION RECOMMENDATIONS

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

1. The Service recommends PG&E maintain current knowledge of San Francisco Bay Area species biology, ecology, and status to inform project design and species-specific *Conservation Measures*.

2. Encourage or require the use of appropriate California native species in restoration efforts.

3. Facilitate additional educational programs geared toward the importance and conservation of tidal marsh and seasonal wetlands.

4. Assist the Service with implementing other recovery actions identified within the most current recovery plans for CLT and WSP.

5. Encourage the participation in programs being developed by the Federal and State resource agencies to limit and reverse the spread of non-natives, such as Spartina, Phragmites, Lepidium, and other invasives within San Francisco Bay Area.

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

REINITIATION – CLOSING STATEMENT

This concludes the Programmatic Formal Consultation for the Pacific Gas and Electric Company's (PG&E) Bay Area Operation and Maintenance (O&M) Program as provided in 50 CFR §402.16,

1. Reinitiation of consultation is required and shall be requested by the Federal agency or by the Service, where discretionary Federal involvement or control over the action has been retained or is authorized by law and:

    a. If the amount or extent of taking specified in the incidental take statement is exceeded;

    b. If new information reveals effects of the action that may affect listed species or critical habitat in a manner or to an extent not previously considered;

    c. If the identified action is subsequently modified in a manner that causes an effect to the listed species or critical habitat that was not considered in the biological opinion or written concurrence; or

    d. If a new species is listed or critical habitat designated that may be affected by the identified action.

2. An agency shall not be required to reinitiate consultation after the approval of a land management plan prepared pursuant to 43 U.S.C. 1712 or 16 U.S.C. 1604 upon listing of a new species or designation of new critical habitat if the land management plan has been adopted by the agency as of the date of listing or designation, provided that any authorized actions that may affect the newly listed species or designated critical habitat will be addressed through a separate action-specific consultation. This exception to reinitiation of consultation shall not apply to those land management plans prepared pursuant to 16 U.S.C. 1604 if:

a. Fifteen years have passed since the date the agency adopted the land management plan prepared pursuant to 16 U.S.C. 1604; and

b. Five years have passed since the enactment of Public Law 115-141 [March 23, 2018] or the date of the listing of a species or the designation of critical habitat, whichever is later.

Please address any questions or concerns regarding this response to Brian Hansen, Senior Fish and Wildlife Biologist, at Brian_Hansen@fws.gov or (916) 930-5642 or Kim Squires, Section 7 Division Manager, at Kim_Squires@fws.gov. Please refer to Service file number 08FBDT00-2020-F-0197 in any future correspondence regarding this project.

Sincerely,

JANA AFFONSO Digitally signed by JANA AFFONSO Date: 2021.08.06 13:44:14 -07'00'

Jana Affonso
Acting Field Supervisor

REFERENCES

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