Appendices

PACIFIC GAS AND ELECTRIC COMPANY'S APPLICATION TO CONSTRUCT LAKEVILLE-SONOMA 115 kV TRANSMISSION LINE PROJECT CPUC A.04-11-011

Draft Mitigated Negative Declaration

Prepared for:
California Public Utilities Commission

December 2005

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Prepared for:
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APPENDIX A

Route Comparison Report

APPENDIX A – Route Comparison Report[1]

Introduction

During the initial planning phases of the project, PG&E considered various routes in addition to the Proposed Project. Four routes in addition to the Proposed Project were considered to be feasible and capable of meeting project objectives and therefore were carried forward for analysis in the Proponent's Environmental Assessment (PEA). **Figure A-1 (Modified Figure 3-1 from PEA)** shows the Proposed Project and additional routes[2] evaluated by PG&E between the Lakeville and Sonoma substations. These routes are made up of various combinations of numbered segments as listed below.

Routes	Segments	Total Miles
PG&E		
Proposed Project	1-2-17	7.23
Route A	1-3-12-11-9-8-7-5-6	8.45
Route B	1-2-13-12-4-5-6	7.85
Route C	14-10-11-4-5-6	8.30
Route D	14-15-16-8-7-5-6	8.78

In response to concerns raised by the City and County of Sonoma, the CPUC considered an additional two routes that include the following:

Routes	Segments	Total Miles
CPUC		
Route E	14-15-16-4-5-6 Plus new alignment (*See* written description below)	Unknown
Preferred Route	1-2-17 Underground part of Segment 17	7.23

For informational purposes, the following sections describe the Proposed Project and various routes comparison evaluated by PG&E and the preferred route evaluated by the CPUC. Each of these routes has been evaluated under the following criteria based on their environmental effects:

- Impacts to environmental resources.
- Unnecessary creation of new utility corridors and number of roadway and utility crossings.
- Minimization of issues related to land use impacts and disturbances.

Proposed Project

The Lakeville–Sonoma 115 kV Transmission Line Project proposes to add a second 115 kV transmission circuit to an existing transmission line corridor between the Lakeville Substation and the Sonoma Substation. Co-locating the two circuits on a single set of double-circuit tubular steel poles (TSPs) and wood poles would minimize project impacts, and modifying these two substations would be

[1] Although an analysis of alternatives under CEQA (CEQA Guidelines Section 15126.6 (a)) is not required for a MND, PG&E evaluated several route alternatives to the proposed Lakeville-Sonoma 115kV Transmission Line Project in accordance with Section IX.B.1.c of CPUC General Order 131-D.

[2] The word "route" is referred to the word "alternative" in the PEA.

necessary to accommodate the new circuit. For the portion of the Proposed Project located in Segment 1 on the Moon Ranch property, the transmission line would be installed within the existing right of way (ROW) pole for pole. (*See* Pacific Gas And Electric Company's Application to Construct Lakeville-Sonoma 115 kV Transmission Line Project CPUC A.04-11-011, Draft Mitigated Negative Declaration **Figure 1-3**)

The double-circuit transmission line would begin at the Lakeville Substation, parallel Adobe Road northeast, and then pass north and east through vineyards and ranch lands (Segment 1). The line would then roughly parallels Felder Road near the junction of Felder Road and Felder Creek to the junction of Felder Road and Leveroni Road (Segment 2). From there it would follow Leveroni Road to Sonoma Substation (Segment 17).

The Proposed Project would also include modifying and adding equipment at the Lakeville and Sonoma substations. At the Lakeville substation, an existing chain link fence would be moved slightly closer to Frates Road to accommodate additional equipment; whereas, at the Sonoma substation, all new equipment would be installed within the existing fence line.

The Proposed Project was not selected as the preferred project due to the concerns raised by the City of Sonoma regarding the visual and land use designation impacts associated with the Proposed Project on the Sonoma Creek and Four Corners "gateways" area. For a more detailed evaluation of the Proposed Project please see the MND/IS.

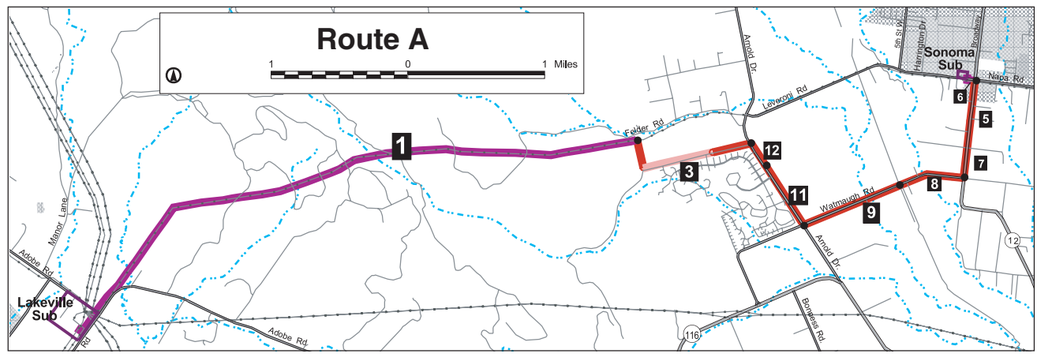
Route A (Segment 1,3,12,11,9,8,7,5,6)

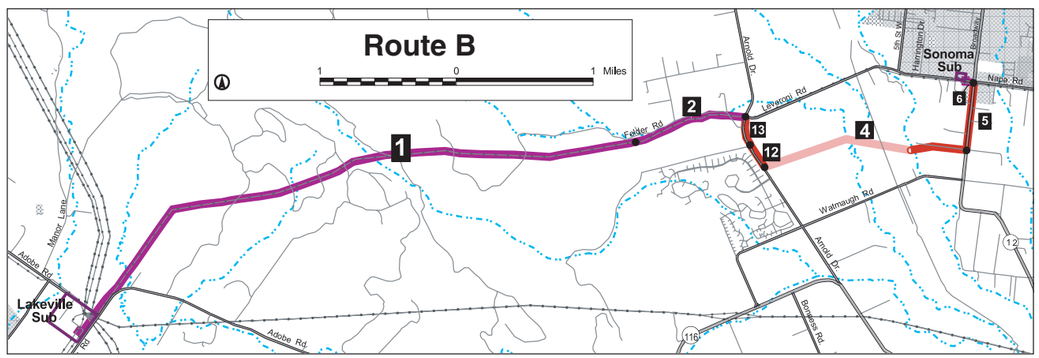
Route A follows the same alignment as the Proposed Project along the west half of the route (Segment 1). As with the Proposed Project, for the portion of the project in Segment 1 located on the Moon Ranch property, the transmission line would be installed within the existing ROW. Near the junction of Felder Road and Felder Creek, at approximately pole 71 of the Proposed Project, the route turns south and runs adjacent to Temelec, a residential subdivision (Segment 3,12, 11), before turning east at Watmaugh Road (Segment 9, 8) and north along Highway 12 (Segment 7,5,6). As with the Proposed Project, Segment 1 would replace an existing single-circuit wood pole 115 kV transmission line with a double-circuit 115 kV transmission line on tubular steel poles. The eastern half of Route A would involve installing a new single-circuit transmission line that would carry existing distribution lines underneath. Note that approximately 3,000 feet of the route on Segment 3 would involve installing a new transmission line adjacent to a portion of the Temelec subdivision where no distribution or transmission lines currently exist. Construction methods and equipment usage for Route A would be the same as those described for the Proposed Project in the MND/IS. Route A is over one mile longer than the Proposed Project.

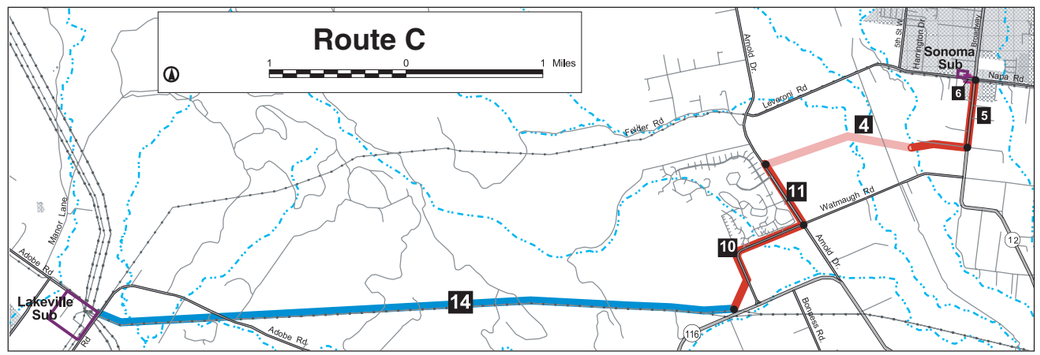
Evaluation of Environmental Factors

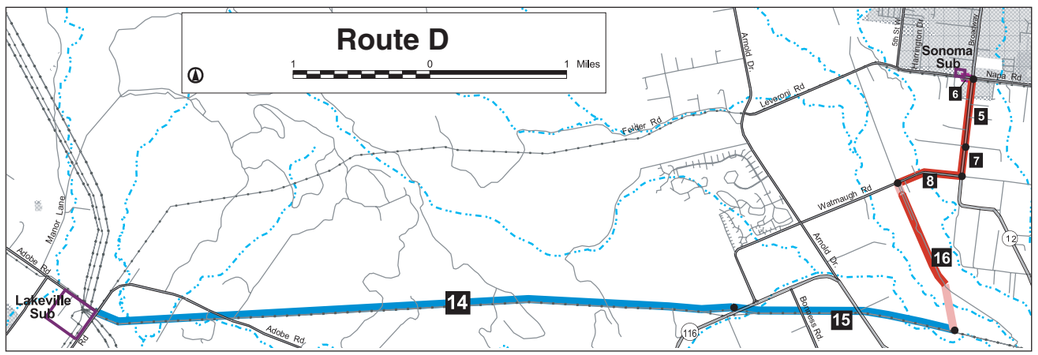
For those issue areas where there would be no difference in environmental impacts between Route A and the Proposed Project, an analysis is provided in the Draft MND/IS for Segment 1 of the Proposed Project for all issues areas. For Segment 3, 5, 6, 7, 8, 9, 11, 12 the differences are as follows:

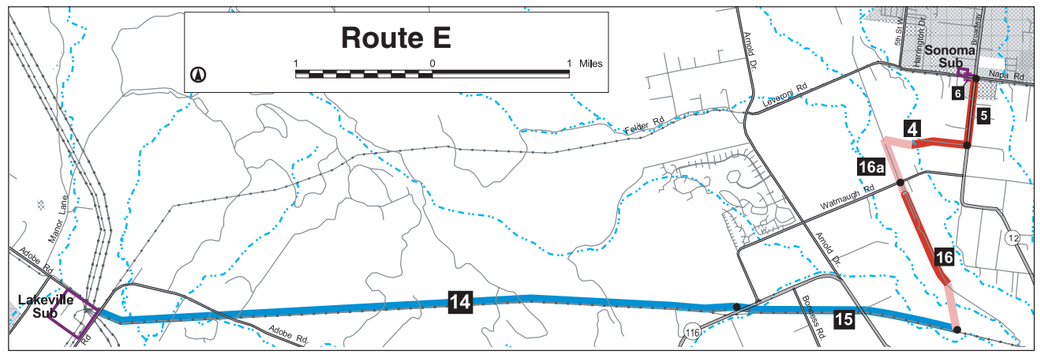
Aesthetics: Although Route A would reduce visual impacts of the Proposed Project at the Sonoma Creek Gateway and the scenic vista located at Leveroni Road at Harrington Drive, other visual impacts would occur. Segments 5, 7, 11, and 12 would involve installing a new transmission line along Highway 12 and Arnold Drive, which are county-designated scenic corridors for a distance of about 3/4-mile on each road. Highway 12 is also considered "eligible" for the State Scenic Highway program, but it has not officially been designated. However, since there are existing distribution poles and lines in place along Highway 12 and Arnold Drive that would be used to co-locate the new line with the existing distribution lines on shared poles (albeit taller than the existing poles), this would be a less-than-significant impact.

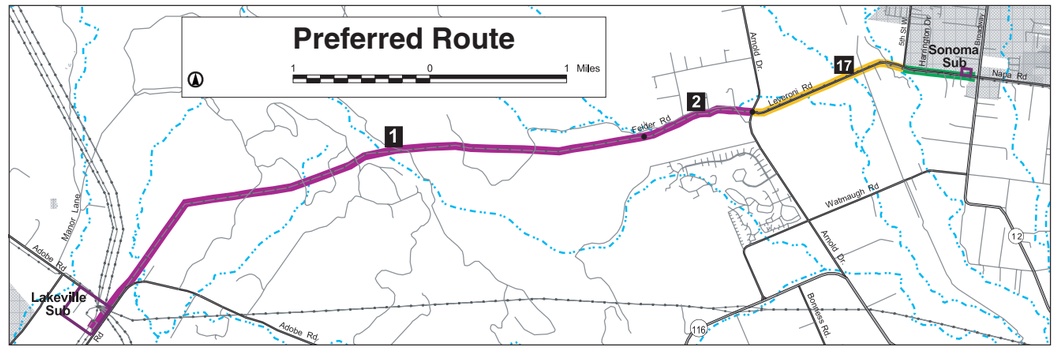












Proposed / Alternative Transmission Lines

- TSP Single Circuit
- TSP Double Circuit
- Wood Pole Single Circuit (new line)
- Underground Transmission Line
- Wood Pole Single Circuit w/ Dist Under
- Wood Pole Double Circuit w/ Dist Under (Some TSP used mostly for angle poles.)
- 1 Route Segment #
- Existing Transmission Line
- Existing Substation

SOURCE: PG&E/EDAW Inc. 2003-05, ESA 2005

Lakeville-Sonoma 115 kV Transmission Line Project . 204202

Figure A-1
Route Comparisons

Segments 5 and 6 would conflict with the City of Sonoma's General Plan policy to "enhance" the appearance of its designated Four Corners "gateway" at the Broadway/Highway 12 & Napa Road intersection (City of Sonoma 1995). However, as the new transmission line would be co-located with existing transmission and distribution lines on shared poles (albeit taller), there would not be a significant change from the existing visual character of the intersection and thus would not represent a significant visual impact.

Route A could result in a significant visual impact by installing a new transmission line along the north side of the Temelec residential subdivision where there is a neighborhood walkway with views of adjacent open space and vineyards. Currently there are no transmission or distribution lines along the western half of Segment 3; Route A would likely be a significant change to the existing visual character of the walkway and would likely be noticed by people who regularly use this walkway for relaxation, exercise, and views of adjacent open space. Therefore, Route A would result in greater visual impacts than the Proposed Project.

For a portion of Segment 8 along Watmaugh Road, extensive tree removal and cutting of cypress trees would be necessary for safety reasons. Removal and/or cutting would adversely affect the existing visual character of Watmaugh Road, as well as the view of the trees from Highway 12, which could be a significant visual impact, depending on the amount of cutting or tree removal needed.

Due to the potential of significant visual impacts to the residences of the Temelec subdivision and to Watmaugh Road, this route would have slightly greater impacts than the Proposed Project.

Agricultural Resources: Segment 3 contains some vineyard farmland which is under Williamson Act contract. A small amount would be taken up by pole footprints; however, this would not conflict with the Williamson Act contract, however the potential impact is greater than in the Proposed Project since no contracted lands would be affected.

Air Quality: Impacts would be similar to the Proposed Project.

Biological Resources: Impacts associated with Route A would be similar to the Proposed Project. Cutting or removal of the cypress trees along Watmaugh Road (Segment 8) would not constitute a significant impact on biological resources as long as removal occurs during non-nesting season to protect birds, and would not conflict with County ordinances which permit tree trimming around utility lines.

Cultural Resources: Route A could impact a cultural resource (CA-Nap-260 prehistoric habitation site) and require mitigation which may include archaeological excavation. There are four previously identified cultural resources along Route A: the Petaluma Adobe building (State Historic Landmark 18) inside the Petaluma Adobe State Historic Park; a historic stone wall, Temelec Hall (State Historic Landmark 237), and site CA-Nap-260 (a prehistoric habitation site). Temelec Hall was erected in 1858 by Granville P. Swift, a member of the Bear Flag Party. General Percifor Smith, U.S. military commander in California, lived nearby in 1849. CA-Nap-260 was first identified in 1958 when obsidian and clamshells were noted in midden deposits. The site is extensive, measuring approximately 250' x 135' at the time it was originally recorded. Like the Proposed Project, impacts to the Petaluma Adobe State Historic Park and the stone wall would be less-than-significant. There would be no impact on Temelec Hall (near Segment 3) under Route A, although there could be impacts to CA-Nap-260 should the site extend into the area where new transmission line poles would be installed. Therefore, Route A would have slightly greater impacts than the Proposed Project.

Geology, Soils, and Seismicity: Impacts would be similar to the Proposed Project.

Hazards and Hazardous Materials: Impacts would be similar to the Proposed Project.

Hydrology and Water Quality: Impacts would be similar to the Proposed Project.

Land Use and Planning: Segments 5 and 6 would conflict with the City of Sonoma's General Plan policy to "enhance" the appearance of its designated Four Corners "gateway" at the

Broadway/Highway 12 & Napa Road intersection. Since the new transmission line would be combined with existing transmission and distribution lines on shared poles (albeit taller), this would not result in a significant change from the existing visual character of the intersection and thus would not represent a significant visual impact.

Route A would also bring the transmission line adjacent to a greater number of residences and businesses than the proposed project; adjacent to homes (Segments 3, 12, 11, 9, 8, 7 and 5), adjacent to businesses (Segments 5 and 7), as well as adjacent to a school on the west side of Highway 12 in the middle of Segment 5, where no transmission line currently exists. Note, no residences or businesses along Segments 5 and 7 would need to be relocated.

New right-of-way would be acquired along part of Segment 3, but this would not create significant land use impacts on the vineyard and residential subdivision, as property owners would be compensated for the value of the easement and restrictions on land uses under the transmission line.

Due to the proximity of the Route to a greater number of residences and businesses than the proposed project as well as the need to acquire new right-of-way, Route A would have slightly greater impacts than the Proposed Project.

Mineral Resources: Impacts would be similar to the Proposed Project.

Noise: The primary difference between the Proposed Project and Route A relative to noise is the proximity of sensitive receptors (schools, residences, churches, etc.). Route A would bring the transmission line adjacent to a greater number of residents (e.g., Segments 3, 11, 12, 9, 8, 5 and 7) constituting a temporary impact to nearby residents. Therefore, Route A would have slightly greater impacts than the Proposed Project.

Population and Housing: Impacts would be similar to the Proposed Project.

Public Services: Impacts would be similar to the Proposed Project.

Recreation: Impacts would be similar to the Proposed Project.

Transportation and Traffic: Impacts would be similar to the Proposed Project. However this route would parallel California State Highway 12. Therefore, construction efforts would need to be coordinated with Caltrans; and long-term plans for widening Highway 12 may be needed in this area.

Utilities and Services Systems: Impacts would be similar to the Proposed Project.

Conclusion: While Route A would reduce visual impacts at the Sonoma Creek Gateway and the scenic vista located at Leveroni Road at Harrington Drive; Route A was not selected as the preferred route because of the potential impacts related to Aesthetics, Agricultural Resources, Biological Resources, Noise and Land Use.

Route B (Segment 1-2-13-12-4-5-6)

Route B follows the same alignment as the Proposed Project along the western half of the route (Segment 1, 2). As with the Proposed Project, for portion of Segment 1 located on the Moon Ranch property, the transmission line would be installed within the existing ROW pole for pole. At the junction of Felder Road and Leveroni Road, Pole 89 of the Proposed Project, the route then turns south at Arnold Drive (Segment 13, 12), continuing approximately 2,000 feet and then cuts east across agricultural lands, crossing Sonoma Creek (Segment 4), before turning north along Highway 12 (Segment 5,6). The portion of Segment 4 that cuts east from Arnold Drive to just before the crossing of Sonoma Creek would involve installing a new single-circuit transmission line where no distribution or transmission lines currently exist. Construction methods and equipment usage for Route B would be the same as those described for the Proposed Project in the MND/IS. Route B is about half a mile longer than the Proposed Project.

Evaluation of Environmental Factors

For those issue areas where there would be no difference in environmental impacts between Route B and the Proposed Project, an analysis is provided in the MND/IS for Segment 1 and 2 of the Proposed Project for all issues areas. For Segment 4, 5, 6, 12 and 13 the differences are as follows:

Aesthetics: Route B would reduce visual impacts of the Proposed Project at the Sonoma Creek Gateway and the scenic vista located at Leveroni Road at Harrington Drive, however other visual impacts would occur. Segments 5, 13, and 12 would involve installing a new transmission line along Highway 12 and Arnold Drive, which are county-designated scenic corridors for a distance of about 3/4-mile on each road. Highway 12 is also considered "eligible" for the State Scenic Highway program, but it has not officially been designated. However, since there are existing distribution poles and lines in place along Highway 12 and Arnold Drive that would be used to co-locate the new line with the existing distribution lines on shared poles (albeit taller than the existing poles), this would be a less-than-significant impact.

Segments 5 and 6 would conflict with the City of Sonoma's General Plan policy to "enhance" the appearance of its designated Four Corners "gateway" at the Broadway/Highway 12 & Napa Road intersection (City of Sonoma 1995). However, as the new transmission line would be co-located with existing transmission and distribution lines on shared poles (albeit taller), there would not be a significant change from the existing visual character of the intersection and thus would not represent a significant visual impact.

Installation of Segment 4 would conflict with Sonoma County General Plan policies to retain the largely open, scenic character of important scenic landscape units (Sonoma County 1998) and could therefore create a significant visual impact, as it would be placed in open space/agricultural lands where there currently are no electrical lines. Additionally, Segment 4 conflicts with the County policy to preserve scenic values along designated scenic highway corridors, as it would be visible from Arnold Road. Visual impact on the eastern end of Segment 4 would not be significant as there are exiting distribution lines within that area.

Therefore, due to the potential of significant visual impacts to open space/agricultural lands and the direct conflict with the Sonoma County General Plan policies, this route would have slightly greater impacts than the Proposed Project.

Agricultural Resources: Impacts would be similar to the Proposed Project.

Air Quality: Impacts would be similar to the Proposed Project.

Biological Resources: Route B impacts would be similar to the Proposed Project with the exception of an additional vernal pool in Segment 4 that could potentially be affected. Therefore, Route B would have a slightly great impact than the Proposed Project.

Cultural Resources: Impacts would be the same as the Proposed Project.

Geology, Soils, and Seismicity: Impacts would be similar to the Proposed Project.

Hazards and Hazardous Materials: Impacts would be similar to the Proposed Project.

Hydrology and Water Quality: Impacts would be similar to the Proposed Project.

Land Use and Planning: Segments 5 and 6 would conflict with the City of Sonoma's General Plan policy to "enhance" the appearance of its designated Four Corners "gateway" at the Broadway/Highway 12 & Napa Road intersection. Since the new transmission line would be combined with existing transmission and distribution lines on shared poles (albeit taller), this would not result in a significant change from the existing visual character of the intersection and thus would not represent a significant visual impact.

Route B would also bring the transmission line adjacent to a greater number of residences and businesses than the Proposed Project; adjacent to homes where no transmission line exist (Segments 13, 12, 4, and 5), adjacent to businesses (Segments 5), as well as adjacent to a school on the west side of Highway 12 in the middle of Segment 5, where no transmission line currently exists. Note, no residences or businesses along Segments 5 would need to be relocated.

Acquisition of a new right-of-way and placement of a transmission line across active agricultural lands where no lines currently exist along most of Segment 4 could cause a significant impact as farmers would have to operate around the transmission poles in their fields. However, generally this can be mitigated to a less-than-significant level with the strategic placement of the transmission line poles or monetary compensation.

Due to the proximity of the Route to a greater number of residences and businesses than the proposed project as well as the need to acquire new right-of-way, Route B would have slightly greater impacts than the Proposed Project.

Mineral Resources: Impacts would be similar to the Proposed Project.

Noise: The primary difference between the Proposed Project and Route B relative to noise is the proximity of sensitive receptors (schools, residences, churches, etc.). Route B would bring the transmission line adjacent to a greater number of residents (e.g., Segments 12, 5 and 6) constituting a temporary impact to nearby residents. Therefore, Route B would have slightly greater impacts than the Proposed Project.

Population and Housing: Impacts would be similar to the Proposed Project.

Public Services: Impacts would be similar to the Proposed Project.

Recreation: Impacts would be similar to the Proposed Project.

Transportation and Traffic: Impacts would be similar to the Proposed Project. However, as with Route A, this route would parallel California State Highway 12. Therefore, construction efforts would need to be coordinated with Caltrans; and long-term plans for widening Highway 12 may be needed in this area.

Utilities and Services Systems: Impacts would be similar to the Proposed Project.

Conclusion: While Route B would reduce visual impacts at the Sonoma Creek Gateway and the scenic vista located at Leveroni Road at Harrington Drive; Route B was not selected as the preferred route because of the additional potential impacts related to Aesthetics, Biological Resources, Noise and Land Use.

Route C (Segment 14-10-11-4-5-6)

Route C proposes a new single-circuit 115 kV transmission line on tubular steel poles that would run parallel to an existing 120-foot 230 kV lattice tower transmission line near Adobe Road and Highway 116 (Segment 14). At approximately ¼ mile before the intersection of Watmaugh Road and Highway 116, a wood pole line would be installed, running in a northwesterly direction until intersecting Watmaugh Road where it would continue north (Segment 10). Then the route continues along the south and east sides of the Temelec residential subdivision (Segment 10, 11), approximately ½ mile on Arnold Drive, before cutting across agricultural lands (Segment 4) and turning north along Highway 12 (Segment 5, 6). Portion of Segment 4, which cuts east from Arnold Drive to just before the crossing of Sonoma Creek, would involve installing a new single-circuit transmission line where no distribution or transmission lines currently exist. Construction methods and equipment usage for Route C would be the same as those described for the Proposed Project in the MND/IS. Route C is over one mile longer than the Proposed Project.

Evaluation of Environmental Factors

While certain construction related impacts would be the same as the Proposed Project, certain resource impacts would be different as Route C does not have any segments in common with the Proposed Project.

Aesthetics: Route C would reduce visual impacts of the Proposed Project at the Sonoma Creek Gateway and the scenic vista located at Leveroni Road at Harrington Drive, however other visual impacts would occur. Segments 5 and 11 would involve installing a new transmission line along Highway 12 and Arnold Drive, which are county-designated scenic corridors for a distance of about 3/4-mile on each road. Segment 14 would also cross Adobe Road and be located near Highway 116, another county scenic corridor. Highway 12 is also considered "eligible" for the State Scenic Highway program, but it has not officially been designated. However, since there are existing distribution poles and lines in place along Highway 12 and Arnold Drive that would be used to co-locate the new line with the existing distribution lines on shared poles (albeit taller than the existing poles), this would be a less-than-significant impact. Additionally, since Segment 14 would parallel an existing 230 kV lattice tower transmission line, this would be a less-than-significant impact.

Segments 5 and 6 would conflict with the City of Sonoma's General Plan policy to "enhance" the appearance of its designated Four Corners "gateway" at the Broadway/Highway 12 & Napa Road intersection. However, as the new transmission line would be co-located with existing transmission and distribution lines on shared poles (albeit taller), there would not be a significant change from the existing visual character of the intersection and thus would not represent a significant visual impact.

Installation of Segment 4 would conflict with Sonoma County General Plan policies to retain the largely open, scenic character of important scenic landscape units (Sonoma County 1998) and could therefore create a significant visual impact, as it would be placed in open space/agricultural lands where there currently are no electrical lines. Additionally, Segment 4 conflicts with the County policy to preserve scenic values along designated scenic highway corridors, as it would be visible from Arnold Road. Visual impact on the eastern end of Segment 4 would not be significant as there are exiting distribution lines within that area.

Therefore, due to the potential of significant visual impacts to open space/agricultural lands and the direct conflict with the Sonoma County General Plan policies, this route would have slightly greater impacts than the Proposed Project.

Agricultural Resources: Impacts would be similar to the Proposed Project.

Air Quality: Impacts would be similar to the Proposed Project.

Biological Resources: Route C construction related impacts to biological resources would be similar to the Proposed Project. However, protocol-level surveys for special-status plants and California red-legged frog (CRLF) (Rana aurora draytonii) would be required along Segments 10 and 14 to determine if additional impacts could occur in these areas. Suitable habitat for 18 species of special-status plants is found within Segments 10 and 14.

Impacts to protected valley oaks and landmark and heritage trees may be less likely for Route C than for the Proposed Project. Potential impacts from the spread of invasive plants are likely to be similar, although different species of invasive plants from those noted for the proposed route could cause impacts.

Impacts to high-value wetlands could be less than those of the Proposed Project. However, in Segment 4, one vernal pool could be affected and additional vernal pools may exist in Segment 10.

Potential impacts to sensitive aquatic species would be similar to the Proposed Project assuming that major streams such as Rodgers, Carriger and Sonoma creeks would be spanned by the transmission line

and direct impacts to these stream zones would be avoided. The potential risk to nesting birds associated with operation and maintenance may be somewhat greater because the existing Lakeville-Sonoma transmission line would continue to operate along with the proposed new line. This risk would be minimized by implementation of existing avoidance measures for nesting birds.

It is likely that all of these potential impacts could be mitigated to a less-than-significant level although, for special-status plants and CRLF, the results of protocol-level surveys would be needed to determine this with certainty.

Although impacts associated with valley oaks, land mark and heritage trees, high value wetlands appears to be less than the Proposed Project; impacts to vernal pools may be higher; therefore, Route C would have roughly proportional impacts as the Proposed Project.

Cultural Resources: There is one previously identified cultural resource along Route C. This consists of site CA-Nap-260, a prehistoric habitation site which was first identified in 1958 when obsidian and clamshell were noted in midden deposits. This site is extensive, measuring approximately 250' x 135' at the time it was originally recorded. Based on the best available knowledge of this site, Route C is not expected to impact this cultural resource; therefore, this would have slightly less impacts than the Proposed Project. However, if the site extends beyond the known boundary, this will need to be reevaluated.

Geology, Soils, and Seismicity: Impacts would be similar to the Proposed Project.

Hazards and Hazardous Materials: Impacts would be similar to the Proposed Project.

Hydrology and Water Quality: Impacts would be similar to the Proposed Project.

Land Use and Planning: Segments 5 and 6 would conflict with the City of Sonoma's General Plan policy to "enhance" the appearance of its designated Four Corners "gateway" at the Broadway/Highway 12 & Napa Road intersection. Since the new transmission line would be combined with existing transmission and distribution lines on shared poles (albeit taller), this would not result in a significant change from the existing visual character of the intersection and thus would not represent a significant visual impact. However most of Segment 14, which parallels an existing 230 kV lattice tower transmission line, would not conflict with the Sonoma County General Plan as it encourages the use of existing utility corridors.

Route C would also bring the transmission line adjacent to a greater number of residences and businesses than the Proposed Project; adjacent to homes where no transmission line exist (Segments 4, 5, 10, and 11), adjacent to businesses (Segment 5), as well as adjacent to a school on the west side of Highway 12 in the middle of Segment 5, where no transmission line currently exists. Note, no residences or businesses along Segments 5 would need to be relocated.

Acquisition of a new right-of-way and placement of a transmission line across active agricultural lands where no lines currently exist along most of Segments 4 and 14 could cause a significant impact as farmers would have to operate around the transmission poles in their fields. However, generally this can be mitigated to a less-than-significant level with the strategic placement of the transmission line poles or monetary compensation.

Due to the proximity of Route C to a greater number of residences and businesses than the Proposed Project as well as the need to acquire new right-of-way, Route C would have slightly greater impacts than the Proposed Project.

Mineral Resources: Impacts would be similar to the Proposed Project.

Noise: The primary difference between the Proposed Project and Route C relative to noise is the proximity of sensitive receptors (schools, residences, churches, etc.). Route C would locate the transmission line adjacent to a greater number of residents (e.g., Segments 10, 11, 5 and 6) constituting a temporary impact to nearby residents. Therefore, Route C would have slightly greater impacts than the Proposed Project.

Population and Housing: Impacts would be similar to the Proposed Project.

Public Services: Impacts would be similar to the Proposed Project.

Recreation: Impacts would be similar to the Proposed Project.

Transportation and Traffic: Impacts would be similar to the Proposed Project. However as with Route A and B, this route would parallel California State Highway 12. Therefore, construction efforts would need to be coordinated with Caltrans; and long-term plans for widening Highway 12 may be needed in this area.

Utilities and Services Systems: Impacts would be similar to the Proposed Project.

Conclusion: While Route C would reduce visual impacts at the Sonoma Creek Gateway and the scenic vista located at Leveroni Road at Harrington Drive, it would be located near a greater number of residences and businesses than the Proposed Project. Additionally, potential impact to protected valley oaks, landmark and heritage trees, wetlands and vernal pools may be slightly less than the Proposed Project. However, Route C was not selected as the preferred route because of the additional potential impacts related to Aesthetics, Land Use and Noise.

Route D (Segment 14-15-16-8-7-5-6)

Route D proposes a new single-circuit 115 kV transmission line on tubular steel poles that would run parallel to an existing 230 kV lattice tower transmission line near Adobe Road and Highway 116 (Segment 14 and 15). Approximately ¾ of a mile southeast of where the line crosses over Arnold Drive, a wood pole would be installed, turning north for a short distance before joining up with an existing distribution line that continue to run north and meets up with Watmaugh Road (Segment 16). The line would turn east at Watmaugh Road (Segment 8), then north along Highway 12 (Segment 7 and 5) and proceed west on Napa Road to the Sonoma Substation (Segment 6). Construction methods and equipment usage for Route D would be the same as those described for the Proposed Project in the MND/IS. Portion of Segment 16 would involve installing a new single-circuit transmission line where no distribution or transmission line currently exist. Route D is one and a half miles longer than the Proposed Project.

Evaluation of Environmental Factors

While certain construction related impacts would be the same as the Proposed Project, certain resource impacts would be different as Route D does not have any segments in common with the Proposed Project.

Aesthetics: Route D would reduce visual impacts of the Proposed Project at the Sonoma Creek Gateway and the scenic vista located at Leveroni Road at Harrington Drive, however other visual impacts would occur. Segments 5 and 7 would involve installing a new transmission line along Highway 12 and Segment 15 would cross Arnold Drive, which are all county-designated scenic corridors. Segment 14 would also cross Adobe Road and be located near Highway 116, another county scenic corridor. Highway 12 is also considered "eligible" for the State Scenic Highway program, but it has not officially been designated. However, since there are existing distribution poles and lines in place along Highway 12 and Arnold Drive that would be used to co-locate the new line with the existing distribution lines on shared poles (albeit taller than the existing poles), this would be a less-than-significant impact. Additionally, since Segment 14 would parallel an existing 230 kV lattice tower transmission line, this would be a less-than-significant impact.

Segments 5 and 6 would conflict with the City of Sonoma's General Plan policy to "enhance" the appearance of its designated Four Corners "gateway" at the Broadway/Highway 12 & Napa Road

intersection. However, as the new transmission line would be co-located with existing transmission and distribution lines on shared poles (albeit taller), there would not be a significant change from the existing visual character of the intersection and thus would not represent a significant visual impact.

Installation portion of Segment 16 would conflict with Sonoma County General Plan policies to retain the largely open, scenic character of important scenic landscape units (Sonoma County 1998) and could therefore create a significant visual impact, as it would be placed in open space/agricultural lands where there currently are no electrical lines. Additionally, Segment 15 and potentially 16 conflicts with the County policy to preserve scenic values along designated scenic highway corridors, as it would be visible from Arnold Drive.

Due to the type and size of the cypress trees along Watmaugh Road of Segment 8, extensive tree removal and cutting would be necessary for safety reasons; therefore, adversely affecting the existing visual character of Watmaugh Road, as well as the view of the trees from Highway 12.

Therefore, due to the potential of significant visual impacts to open space/agricultural lands, Watmaugh Road, and the direct conflict with the Sonoma County General Plan policies, this route would have slightly greater impacts than the Proposed Project.

Agricultural Resources: Impacts would be similar to the Proposed Project.

Air Quality: Impacts would be similar to the Proposed Project.

Biological Resources: Construction related impacts to biological resources associated with Route D would be similar to the Proposed Project. However, protocol-level surveys for special-status plants and California red-legged frog (CRLF) (*Rana aurora draytonii*) would be required along Segments 14, 15 and 16 to determine if additional impacts could occur in these areas. Suitable habitat for 18 species of special-status plants is found within these segments.

Impacts to protected valley oaks and landmark and heritage trees may be less likely for Route D than for the Proposed Project. Potential impacts from the spread of invasive plants are likely to be similar, although different species of invasive plants from those noted for the proposed route could cause impacts.

Potential impacts to sensitive aquatic species would be similar to the Proposed Project assuming that major streams such as Rodgers, Fowler and Sonoma creeks would be spanned by the transmission line and direct impacts to these stream zones would be avoided. The potential risk to nesting birds associated with operation and maintenance may be somewhat greater because the existing Lakeville-Sonoma transmission line would continue to operate along with the proposed new line.

Although impacts associated with valley oaks, land mark and heritage trees appears to be less than the Proposed Project; impacts to nesting birds may be more; therefore, Route D would have roughly proportional impacts as the Proposed Project.

Cultural Resources: There is one previously identified cultural resource along Route D. This consists of site CA-Nap-266, a lithic scatter site which may be impacted should the site extend into the area where Route D poles would be installed. Based on the best available knowledge of this site, Route D is not expected to impact this cultural resource; therefore, this would have slightly less impacts than the Proposed Project. However, if the site extends beyond the known boundary, this will need to be reevaluated.

Geology, Soils, and Seismicity: Impacts would be similar to the Proposed Project.

Hazards and Hazardous Materials: Impacts would be similar to the Proposed Project.

Hydrology and Water Quality: Impacts would be similar to the Proposed Project.

Land Use and Planning: Segments 5 and 6 would conflict with the City of Sonoma's General Plan policy to "enhance" the appearance of its designated Four Corners "gateway" at the Broadway/Highway 12 & Napa Road intersection. Since the new transmission line would be combined

with existing transmission and distribution lines on shared poles (albeit taller), this would not result in a significant change from the existing visual character of the intersection and thus would not represent a significant visual impact. However, most of Segment 14, which parallels an existing 230 kV lattice tower transmission line, would not conflict with the Sonoma County General Plan as it encourages the use of existing utility corridors.

Route D would also bring the transmission line adjacent to a greater number of residences and businesses than the Proposed Project; adjacent to homes where no transmission line exist (Segments 5, 7, 8, and 16), adjacent to businesses (Segment 5), as well as adjacent to a school on the west side of Highway 12 in the middle of Segment 5, where no transmission line currently exists. Note, no residences or businesses along Segments 5 or 7 would need to be relocated.

Acquisition of a new right-of-way and placement of a transmission line across active agricultural lands where no lines currently exist along most of Segments 14, 15 and 16 could cause a significant impact as farmers would have to operate around the transmission poles in their fields. However, generally this can be mitigated to a less-than-significant level with the strategic placement of the transmission line poles or monetary compensation.

Due to the proximity of Route D to a greater number of residences and businesses than the Proposed Project as well as the need to acquire new right-of-way, Route D would have slightly greater impacts than the Proposed Project.

Mineral Resources: Impacts would be similar to the Proposed Project.

Noise: The primary difference between the Proposed Project and Route D relative to noise is the proximity of sensitive receptors (schools, residences, churches, etc.). Route D would bring the transmission line adjacent to a greater number of residents (e.g., Segments 5, 7, 8, and 16) constituting a temporary impact to nearby residents. Therefore, Route D would have slightly greater impacts than the Proposed Project.

Population and Housing: Impacts would be similar to the Proposed Project.

Public Services: Impacts would be similar to the Proposed Project.

Recreation: Impacts would be similar to the Proposed Project.

Transportation and Traffic: Impacts would be similar to the Proposed Project. However as with Route A through C, this route would parallel California State Highway 12. Therefore, construction efforts would need to be coordinated with Caltrans; and potential long-term plans for widening Highway 12 in this area.

Utilities and Services Systems: Impacts would be similar to the Proposed Project.

Conclusion: While Route D would reduce visual impacts at the Sonoma Creek Gateway and the scenic vista located at Leveroni Road at Harrington Drive, it was not selected as the preferred route because of the additional potential impacts related to Aesthetics, Land Use and Noise.

Route E (Segments 14-15-16-4-5-6 plus new alignment 16a)

Route E proposes a new single-circuit 115 kV transmission line on tubular steel poles that would run parallel to an existing 230 kV lattice tower transmission line near Adobe Road and Highway 116 (Segment 14 and 15). Approximately ¾ of a mile southeast of where the line crosses over Arnold Drive, a wood pole would be installed, turning north for a short distance before joining up with an existing distribution line that continue to run north (Segment 16) until it intersects with the proposed Segment 4 of Route B and C. This line would turn east at Segment 4, then north along Highway 12 (Segment 5) and proceed west on Napa Road to the Sonoma Substation (Segment 6). Portion of Segment 16 would involve installing a new single-circuit transmission line where no distribution or transmission line currently exist. To avoid the impacts associated with the stand of cypress trees on

Watmaugh Road (Segment 8) under Route A and D, the Sonoma County Department of Public Works suggested extending Segment 16 (See Figure A-1 referred to as Segment 16a) until it reaches Segment 4. Construction methods and equipment usage for Route E would be the same as those described for the Proposed Project in the MND/IS.

Evaluation of Environmental Factors

While certain construction related impacts would be the same as the Proposed Project, certain resource impacts would be different as Route E does not have any segments in common with the Proposed Project.

Aesthetics: Route E would reduce visual impacts of the Proposed Project at the Sonoma Creek Gateway and the scenic vista located at Leveroni Road at Harrington Drive, however other visual impacts would occur. Segments 5 and 7 would involve installing a new transmission line along Highway 12 and Segment 15 would cross Arnold Drive, which are all county-designated scenic corridors. Segment 14 would also cross Adobe Road and be located near Highway 116, another county scenic corridor. Highway 12 is also considered "eligible" for the State Scenic Highway program, but it has not officially been designated. However, since there are existing distribution poles and lines in place along Highway 12 and Arnold Drive that would be used to co-locate the new line with the existing distribution lines on shared poles (albeit taller than the existing poles), this would be a less-than-significant impact. Additionally, since Segment 14 would parallel an existing 230kV lattice tower transmission line, this would be a less-than-significant impact.

Segments 5 and 6 would conflict with the City of Sonoma's General Plan policy to "enhance" the appearance of its designated Four Corners "gateway" at the Broadway/Highway 12 & Napa Road intersection. However, as the new transmission line would be co-located with existing transmission and distribution lines on shared poles (albeit taller), there would not be a significant change from the existing visual character of the intersection and thus would not represent a significant visual impact.

Installation portion of Segment 16 and the proposed extension to connect with Segment 4 of Route B and C would conflict with Sonoma County General Plan policies to retain the largely open, scenic character of important scenic landscape units (Sonoma County 1998).Therefore, this could create a significant visual impact, as it would be placed in open space/agricultural lands where there currently are no electrical lines. Segment 15, potentially Segment 16 and the proposed extension to connect with Segment 4 of Route B and C would conflicts with the County policy to preserve scenic values along designated scenic highway corridors, as it would be visible from Arnold Drive.

Therefore, due to the potential of significant visual impacts to open space/agricultural lands, and the direct conflict with the Sonoma County General Plan policies, Route E would have slightly greater impacts than the Proposed Project.

Agricultural Resources: Impacts would be similar to the Proposed Project.

Air Quality: Impacts would be similar to the Proposed Project.

Biological Resources: Route E construction related impacts to biological resources would be similar to the Proposed Project. However, protocol-level surveys for special-status plants and California red-legged frog (CRLF) (Rana aurora draytonii) would be required along Segments 14, 15, 16 and the proposed extension to connect with Segment 4 of Route B and C to determine if additional impacts could occur in these areas. Suitable habitat for 18 species of special-status plants is found within these segments.

Impacts to protected valley oaks and landmark and heritage trees may be less likely for Route E than for the Proposed Project. Potential impacts from the spread of invasive plants are likely to be similar, although different species of invasive plants from those noted for the proposed route could cause impacts.

Potential impacts to sensitive aquatic species would be similar to the Proposed Project assuming that major streams such as Rodgers, Fowler and Sonoma creeks would be spanned by the transmission line and direct impacts to these stream zones would be avoided. The potential risk to nesting birds associated with operation and maintenance may be somewhat greater because the existing Lakeville-Sonoma transmission line would continue to operate along with the proposed new line.

Although impacts associated with valley oaks, land mark and heritage trees appears to be less than the Proposed Project; impacts to nesting birds may be more; therefore, Route E would have roughly proportional impacts as the Proposed Project.

Cultural Resources: There is one previously identified cultural resource along Route E. This consists of site CA-Nap-266, a lithic scatter site which may be impacted should the site extend into the area where Route E poles would be installed. Based on the best available knowledge of this site, Route E is not expected to impact this cultural resource; therefore, this would have slightly less impacts than the Proposed Project. However, if the site extends beyond the known boundary, this will need to be reevaluated.

Geology, Soils, and Seismicity: Impacts would be similar to the Proposed Project.

Hazards and Hazardous Materials: Impacts would be similar to the Proposed Project.

Hydrology and Water Quality: Impacts would be similar to the Proposed Project.

Land Use and Planning: Segments 5 and 6 would conflict with the City of Sonoma's General Plan policy to "enhance" the appearance of its designated Four Corners "gateway" at the Broadway/Highway 12 & Napa Road intersection. Since the new transmission line would be combined with existing transmission and distribution lines on shared poles (albeit taller), this would not result in a significant change from the existing visual character of the intersection and thus would not represent a significant visual impact. However, most of Segment 14, which parallels an existing 230 kV lattice tower transmission line, would not conflict with the Sonoma County General Plan as it encourages the use of existing utility corridors.

Route E would also bring the transmission line adjacent to a greater number of residences and businesses than the Proposed Project; adjacent to homes where no transmission line exist (Segments 5, and 16), adjacent to businesses (Segment 5), as well as adjacent to a school on the west side of Highway 12 in the middle of Segment 5, where no transmission line currently exists. Note, no residences or businesses along Segment 5 would need to be relocated.

Acquisition of a new right-of-way and placement of a transmission line across active agricultural lands where no lines currently exist along most of Segments 4, 14, 15, 16 and the proposed extension to connect with Segment 4 of Route B could cause a significant impact as farmers would have to operate around the transmission poles in their fields. However, generally this can be mitigated to a less-than-significant level with the strategic placement of the transmission line poles or monetary compensation.

Due to the proximity of Route E to a greater number of residences and businesses than the Proposed Project as well as the need to acquire new right-of-way, Route E would have slightly greater impacts than the Proposed Project.

Mineral Resources: Impacts would be similar to the Proposed Project.

Noise: The primary difference between the Proposed Project and Route E relative to noise is the proximity of sensitive receptors (schools, residences, churches, etc.). Route E would bring the transmission line adjacent to a greater number of residents (e.g., Segments 5 and 16) constituting a temporary impact to nearby residents. Therefore, Route E would have slightly greater impacts than the Proposed Project.

Population and Housing: Impacts would be similar to the Proposed Project.

Public Services: Impacts would be similar to the Proposed Project.

Recreation: Impacts would be similar to the Proposed Project.

Transportation and Traffic: Impacts would be similar to the Proposed Project. However as with Route A through D, this route would parallel California State Highway 12. Therefore, construction efforts would need to be coordinated with Caltrans; and potential long-term plans for widening Highway 12 in this area.

Utilities and Services Systems: Impacts would be similar to the Proposed Project.

Conclusion: While Route E would reduce visual impacts at the Sonoma Creek Gateway and the scenic vista located at Leveroni Road at Harrington Drive, as well as concerns raised by the County of Sonoma associated visual and biological impact associated with the cypress trees along Watmaugh Road, it was not selected as the preferred route because of the additional potential impacts related to Aesthetics, Land Use and Noise.

Preferred Route (Segments 1-2- 17 including underground)

The Preferred Route follows the same alignment as the Proposed Project except that the City of Sonoma has suggested under-grounding the portion of Segment 17 located on Leveroni Road from 5th Street (Pole 108) to the Sonoma Substation. This route assumes that the construction method employed for the modified portion of the Proposed Project would be open trenching. Please see the MND/IS for a detailed evaluation of this route as well as a detailed discussion of the impacts associated with the implementation of Mitigation Measure 2.1-1, which calls for the under-grounding of the portion of the Proposed Project located on Leveroni Road from 5th Street (Pole 108) to the Sonoma Substation.

This Preferred Route poses fewer overall environmental impacts as well as alleviates the concerns raised by the City of Sonoma by avoiding the potential visual impact and conflict with local land use designation that the Proposed Project would have on the Sonoma Creek and Four Corners “gateways” area.

Conclusion

This Preferred Route was chosen over the Proposed Project because it poses fewer overall environmental impacts as well as alleviates the concerns raised by the City of Sonoma. The Preferred Route avoids potential visual impact and land use designation conflict that the Proposed Project would have on the Sonoma Creek and Four Corners “gateways” area. Therefore, the CPUC staff concluded that the Proposed Project, including a mitigation measure in the Land Use Section and referenced in the Aesthetics Section of the Lakeville-Sonoma 115kV Transmission Line Project CEQA documentation, is the environmentally superior route.

Table A-1. Summary Comparison of Routes to the Proposed Project

Evaluation Factor	Route A	Route B	Route C	Route D	Route E	Preferred Route
			ENVIRONMENTAL FACTORS			
Environmental Impacts	Better than Proposed Project: • None Worse than Proposed Project: • Aesthetics • Agricultural Resources • Land Use • Cultural Resources	Better than Proposed Project: • None Worse than Proposed Project: • Aesthetics • Biological Resources • Noise • Land Use	Better than Proposed Project: • Cultural Resources Worse than Proposed Project: • Aesthetics • Noise • Land Use	Better than Proposed Project: • Cultural Resources Worse than Proposed Project: • Aesthetics • Noise • Land Use	Better than Proposed Project: • Cultural Resources Worse than Proposed Project: • Aesthetics • Noise • Land Use	Better than Proposed Project: • Aesthetics • Land Use Worse than Proposed Project: • None
Creation of Utility Corridors	Creates new electrical transmission corridor in a portion of Segment 3	Creates an entirely new electrical transmission corridor in most of Segment 4	Creates an entirely new electrical transmission corridor in most of Segment 4	Creates an entirely new electrical transmission corridor in most of Segment 16	Creates an entirely new electrical transmission corridor in most of Segment 16 and proposed extension (16a) to meet Segment 4	None
			TECHNICAL AND ECONOMIC FACTORS			
System Reliability	Feasible	Feasible	Feasible	Feasible	Feasible	Feasible
Engineering and Design	Feasible	Feasible	Feasible	Feasible	Feasible	Feasible
Length of Line	8.4 miles	7.85 miles	8.30 miles	8.78 miles	7.43 miles	7.23 miles
Construction and Operation Access	Feasible	Feasible	Feasible	Feasible	Feasible	Feasible
Construction and Maintenance Cost	Greater than Proposed Project	Greater than Proposed Project	Greater than Proposed Project	Greater than Proposed Project	Greater than Proposed Project	Greater than Proposed Project

APPENDIX B

Electric and Magnetic Fields (EMF) and Other Field Related Concerns

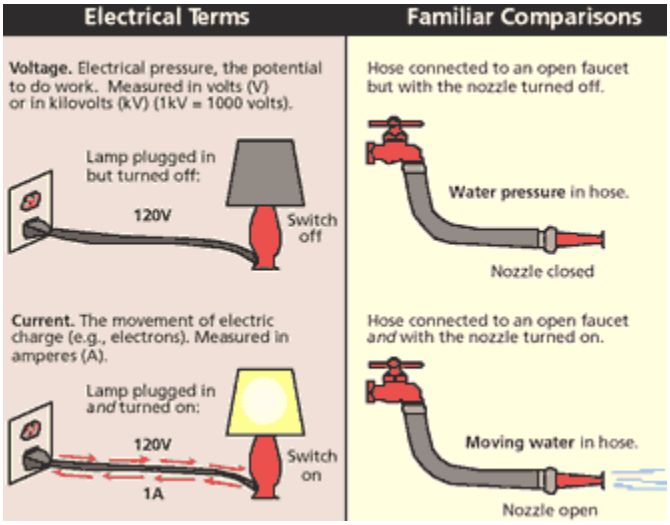
Appendix B

Electric and Magnetic Fields (EMF) and Other Field Related Concerns

EMF is an acronym for "electric and magnetic fields." As explained by the National Institutes of Health, electric and magnetic fields (EMF) are "…invisible lines of force that surround any electrical device. Power lines, electrical wiring, and electrical equipment all produce EMF." [1] EMF has two distinct components: **electric fields** (created by **electric voltage,** measured in *volts [V] or kilovolts [Kv]*), and **magnetic fields** (created by **electric current,** *measured in amperes [A]*).

Figure B-1 below illustrates the electrical *voltage* and *current* concepts:

FIGURE B-1
VOLTAGE VS. CURRENT



SOURCE: National Institutes of Health EMF RAPID Website

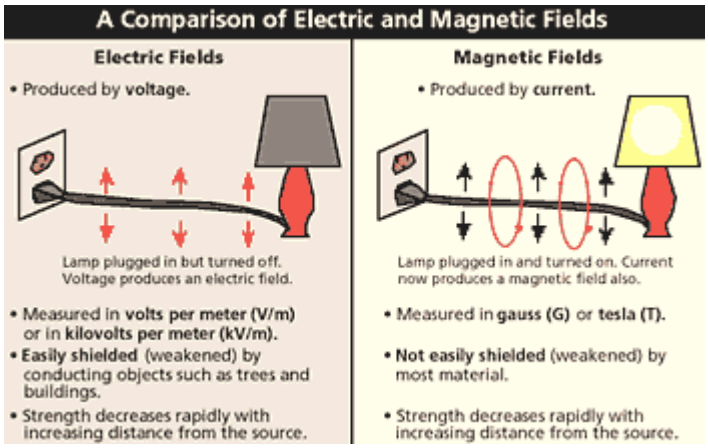
As explained by the National Institutes of Health, "…electric fields are produced by voltage and increase in strength as the voltage increases. The electric field strength is measured in units of volts per meter (V/m). Magnetic fields result from the flow of current through wires or electrical devices and increase in strength as the current increases. Magnetic fields are measured in units of gauss (G) or tesla (T)."[2]

Figure B-2 below illustrates the difference between *electric* and *magnetic* fields:

1 From the National Institute of Environmental Health Web Site on EMF, the EMF RAPID (Research and Public Information Dissemination) project, http://www.niehs.nih.gov/emfrapid/booklet/basics.htm

2 *Ibid*.

FIGURE B-2
ELECTRIC VS. MAGNETIC FIELDS



SOURCE: National Institutes of Health EMF RAPID Website

At low frequencies (such as those associated with EMF from transmission lines), the electric and magnetic fields are separable. By contrast, at high and super high frequencies, the fields are inseparable.[3]

EMF can occur naturally and/or result from human activities. Examples of **naturally-occurring EMF** are found in lightning and in the Earth's magnetic field, which causes a compass needle to point north.[4] Naturally-occurring electromagnetic fields also exist in the human body and allow messages to flow through the nervous system.[5] EMF can also be generated as a result of **human activities** such as communications, appliances, and the generation, transmission, and local distribution of electricity.

Electromagnetic fields are divided into several different categories, driven by their **frequencies.** Electromagnetic fields regularly change direction. The rate of change in direction is referred to as **frequency**, and represents the number of times the field changes direction each second. In the United States, the frequency of change in common household current is 60 times per second, commonly known as 60 Hertz (Hz) power. In Europe, the frequency is 50 Hz. By comparison, radio and communication waves operate at much higher frequencies (500,000-1,000,000,000 Hz.) **Table B-1** outlines the basic categories of electromagnetic fields:

3 "Are Electromagnetic Fields Dangerous to Your Health?", Ohio State University Extension Fact Sheet, http://ohioline.osu.edu/cd-fact/0185.html

4 The geomagnetic field of the earth ranges from 500-700 mG. (Carstensen, 1987).

5 *Ibid.*

TABLE B-1
CATEGORIES OF ELECTROMAGNETIC FIELDS

Description	Acronym	Examples
Extremely Low Frequencies	ELF	Appliances and power lines
High and Low Frequencies	HF and LF	AM radio transmission
Very Low Frequencies	VLF	TVs and video display terminals
Very High Frequencies	VHF	TV and FM radio transmissions
Super High Frequencies	SHF	Microwaves

SOURCE: "Are Electromagnetic Fields Dangerous to Your Health?", Ohio State University Extension Fact Sheet

This document focuses mainly on EMF associated with electricity transmission. The information presented in this analysis is limited to EMF from power lines operating at frequencies of 50 or 60 Hz.

Electric power flows across transmission systems from generating sources to serve electrical loads in a community. A transmission lines' *voltage* and *current* determine the **apparent power** flowing over the transmission line. In general terms, the higher the voltage level of a transmission line, the lower the current needed to deliver the power. For example, a 115 kV transmission line with 200 amps of current will transmit approximately 40,000 kilowatts (kW) of *apparent power* (enough to power approximately 40,000 homes), while a 230 kV line requires only 100 amps of current to deliver the same 40,000 kW. By contrast, a 500 kV transmission line would only require 46 amps of current to deliver the same amount. Since there continue to be public health concerns associated with exposure to EMF from electrical transmission lines, it is the primary focus of this analysis.

B.1 – Components of EMF

B.1.1 – Electric Fields

As mentioned above, the National Institute of Environmental Health Science has noted that, "…electric fields are produced by voltage and increase in strength as the voltage increases. The electric field strength is measured in units of volts per meter (V/m). Electric fields are often present even when the equipment is switched off, as long as it remains connected to the source of electric power".[6] **Table B-2** outlines the strength of typical electrical fields for common household appliances, at a distance of 12 inches.

6 National Institute of Environmental Health Website at http://www.niehs.nih.gov/emfrapid/booklet/basics.htm.

TABLE B-2
TYPICAL ELECTRIC FIELD VALUES FOR APPLIANCES, AT 12 INCHES

Appliance	Electric Field Strength (kV/m)
Electric blanket	0.25 *
Broiler	0.13
Stereo	0.09
Refrigerator	0.06
Iron	0.06
Hand mixer	0.05
Phonograph	0.04
Coffee Pot	0.03

* 1 to 10kV/m nest to blanket wires (Enertech, 1985)

Electric fields are created when an electrical line is energized with voltage. The strength of the field is directly dependant upon the voltage of the line and decreases with distance from the source of the EMF. The strength is likewise affected by surrounding objects: electric fields are shielded or weakened by materials that conduct electricity, even if they are materials that are traditionally known as poor conductors, such as trees, buildings, and human skin."[7]

At close distances, electric fields near power lines can result in phenomena similar to static electricity from clothes removed from a dryer or shuffling feet on a carpet, and may result in electric discharge (or "nuisance shock") when metal objects are touched.[8] Electric shock from transmission lines is acknowledged as a potential impact to public health, and is generally the result of accidental contact with energized wires.

B.1.2 – Magnetic Fields

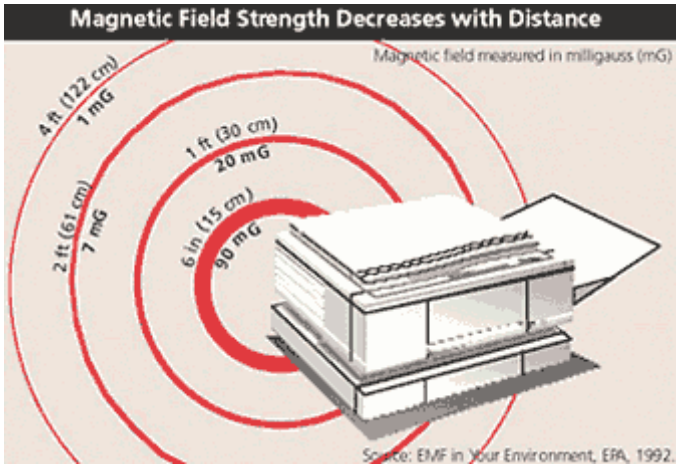
A current flowing through power lines at any voltage creates a magnetic field. The strength of the field is directly dependant on the current in the line. As mentioned earlier, the strength of this field is typically measured in gauss (G) or milligauss (mG). As with electric fields, magnetic field strength decreases rapidly with distance from the source, however unlike electric fields, magnetic fields are not easily shielded by objects or materials.

Figure B-3 illustrates the rapid decrease in magnetic field strength as one moves farther away from a common household photocopy machine.

7 *Ibid.*

8 An interesting demonstration of "ambient" EMF in the immediate vicinity of high-power transmission lines occurred in 2004 in the UK by Richard Box, the Artist in Resident of the Dept. of Physics at the University of Bristol, which is famous for its pioneering work on the effects of magnetic and electrical fields on human health. Box created an artistic display of 1301 fluorescent light bulbs that lit up, powered solely by the transmission line's ambient power. See http://www.pureenergysystems.com/news/exclusive/2004/pylon_ambience.

FIGURE B-3
DECREASING MAGNETIC FIELD LEVELS OVER VARIOUS DISTANCES



SOURCE: National Institute of Environmental Health EMF RAPID Website

Household appliances provide an illustrative example of magnetic fields. **Table B-3** outlines the typical magnetic field strengths for common appliances at distances of 1 and 3 feet.

TABLE B-3
MAGNETIC FIELD FROM HOUSEHOLD APPLIANCES

Appliance	Magnetic Field (mG)	
	At 1 foot distance	At 3 feet
Can opener	0.35 - 18.21	1.30 – 6.44
Clothes iron	1.66 - 2.93	0.25 – 0.37
Coffee machine	0.09 - 7.30	0 – 0.61
Computer monitor	0.20 – 134.7	0.01 – 9.37
Copier	0.05 – 18.38	0 – 2.30
Desktop light	32.81	1.21
Dishwasher	4.98 – 8.91	0.84 – 1.63
Fax machine	0.16	0.03
Food processor	6.19	0.35
Microwave oven	0.59 – 54.33	0.11 – 4.66
Mixer	0.49 – 41.21	0.09 – 3.93
Printer	0.74 – 43.11	0.18 – 2.45
Portable fan	0.04 – 85.64	0.03 – 3.12
Radio	0.34 – 4.07	0.03 – 0.98
Scanner	2.18 – 26.91	0.09 – 3.48
Television	1.80 – 12.99	0.07 – 1.11
Vacuum Cleaner	7.06 – 22.62	0.51 – 1.28

SOURCE: L. Zaffanella, School Exposure Assessment Survey, California EMF Program, interim results, November 1977.

If an appliance is plugged in to an outlet but not turned on, no current is flowing and only an electric field is generated around the appliance. No magnetic field would be present. However, when the appliance is switched on, both an electric field *and* a magnetic field will be created. The strength of the magnetic field is directly related to the extent of the *current* flowing in the appliance and the cord.

For areas where no major transmission lines exist, EMF is still present due to neighborhood electrical distribution lines, household wiring, and other electrical equipment and wiring. Generally speaking, the magnetic field returns to "background" level (i.e., a level no greater than normally occurs in nature) at distances of approximately 3–4 feet from an typical household appliance. The distance required to return to "background" level is much higher with respect to electrical power lines: approximately 60–200 feet from a distribution line and 300–1,000 feet from a transmission line. Fields and currents that occur in the same place can interact to strengthen or weaken the total overall effect. Therefore, the strength of the fields depends not only on the distance to the source but also the distance to and location of other nearby sources.

It can sometimes be difficult to determine the cause of elevated magnetic fields in or around a residence. Currents in grounding paths and common wiring errors can make locating source of magnetic fields only possible by a trained technician. However, these errors can be repaired easily by an electrician. In some cases, simple measurements can identify internal and external sources of elevated magnetic fields. Turning the power off at a residence can rule out indoor power sources. Measurements taken from varying distances at power lines can also help to pinpoint the cause of elevated sources.

It is estimated that the average individual encounters about 1mG during a 24 hour period. Forty percent of this exposure comes from nearby power lines, while 60 percent come from other sources, such as those in the home described above and/or exposure to appliances and electrical tools.

Considerable recent research has focused on the potential adverse health effects of magnetic field exposure. The primary reason for the focus on *magnetic* fields is because some scientific studies have reported an increased cancer risk associated with estimates of magnetic field exposure. No similar associations have been reported for electric fields. In fact, many of the studies examining the biological effects of electric fields were essentially negative.[9] The results of many major studies as they relate to EMF health effects are discussed later in this appendix section.

B.2 – Other Field Related Public Concerns

There are several other public concerns related to electric power facility projects. These concerns are both safety and nuisance issues and include: radio/television/electronic equipment interference; induced currents (i.e., power-line-related electric and magnetic fields that create

9 National Institute of Environmental Health Web Site, at http://www.niehs.nih.gov/emfrapid/booklet/basics.htm

weak electric currents in humans[10]) and shock hazards; and potential effects on cardiac pacemakers. Each of these is described below.

B.2.1 – Radio, Television, and Electronic Equipment Interference

Overhead transmission lines do not, as a general rule, interfere with normal radio or TV reception. However, there are two potential sources for interference: corona and gap discharges.

Corona Discharge

Whenever high voltages are present in electrical systems, there is the possibility that the high electric fields that exist close to the conductors may cause an electrical breakdown of the surrounding air. This effect is known as "corona discharge".[11] Corona discharges can sometimes generate unwanted radio frequency electrical noise. Several factors, including conductor voltage, shape and diameter, and surface irregularities such as scratches, nicks, dust, or water drops can affect a conductor's corona performance.

A working group of the Radio Noise Subcommittee of the Institute of Electrical and Electronics Engineers (IEEE) has developed a Radio Noise Design Guide for High-Voltage Transmission Lines (IEEE Section 1971). This guide is useful for evaluating the performance of a high-voltage transmission line before it is built. The design guide is applicable to overhead A/C transmission lines in the voltage range of 115 kV to 800 kV. This guide is a valuable tool for the design of overhead high-voltage transmission lines because it provides electrical guidelines that engineers can use to evaluate design alternatives. The IEEE guide is based on many years of research and practical experience. The concept is to design high-voltage transmission lines efficiently to help reduce corona activity and its associated "noise."

Gap Discharges

Gap discharges are different from corona discharges. Gap discharges can develop on power lines at any voltage and are more frequently found on smaller low voltage distribution lines. Gap discharges can take place at locations where tiny electrical separations (or "gaps") develop between mechanically-connected metal parts (for example, on broken or poorly-fitting line hardware, such as insulators, clamps, or brackets). A small electric spark discharge across the gap can create unwanted electrical noise. In addition, tiny electrical arcs can develop on the surface of dirty or contaminated insulators, but this interference source is less significant than gap discharge. Hardware is designed to be problem-free, but corrosion, wind motion, gunshot damage and insufficient maintenance contribute to gap formation.

Radio and Television Interference

The potential for radio and television interference is associated with transmission and distribution line electrical conductors of any voltage, configuration, or location. However, there has been a significant amount of work done to quantify radio and TV noise and provide design methods for electrical transmission lines to mitigate this phenomenon (e.g., EPRI §1982, IEEE §§1971, 1972,

10 *Ibid.*

11 "Electric and Magnetic Fields", National Grid EMF, http://www.emfs.info/sci_elecNRPB_keypoints.asp

and 1976). Corona-generated electrical noise decreases with distance from a transmission line and also decreases with higher frequencies. When a problem exists, it is usually for AM radio, and not the higher frequencies associated with TV signals. Corona interference to radio and television reception is usually not a design problem for transmission lines rated at 230 kV and lower. In addition, radio and TV interference levels are typically extremely low at the right-of-way edge for 230 kV and lower transmission lines both in fair weather and in rain, and will usually meet or exceed established guidelines of the Federal Communications Commission (FCC).

With respect to gap discharge, the severity of potential interference depends on external factors such as the strength and quality of the transmitted radio or TV signal, the quality of the receiving radio or TV set and antenna system, and the distance between the receiver and power line. The vast majority of interference complaints are found to stem from causes other than power lines, such as poor signal quality, poor antennae, and interference from household items including door bells and appliances. (Interference from household items has been noted from such diverse sources as heating pads, sewing machines, freezers, ignition systems, aquarium thermostats, fluorescent lights, etc.) (IEEE § 1976).

In contrast to corona-generated interference, interference due to gap discharges is generally *less* frequent for high voltage transmission lines than for lower voltage distribution lines. Some of the reasons that these transmission lines have fewer gap-related problems include: predominate use of steel structures, fewer structures, greater mechanical load on hardware, and different design and maintenance standards. Gap discharge interference can be avoided or minimized by proper design of the transmission line hardware parts, use of electrical bonding where necessary, and by careful tightening of fastenings during construction. Individual sources of gap discharge noise can also be located and corrected using documented repair and maintenance procedures.

Personal Computer (PC) Monitor Interference

Personal computer monitors using cathode ray tubes (CRTs) can be susceptible to magnetic field interference. Magnetic field interference results in disturbances to the image displayed on the CRT monitor, often described as screen distortion, “jitter,” or other visual defects (Banfi, 2000). In most cases it can be annoying, and at its worst, it can prevent use of the monitor. The extent of interference depends on magnetic field intensity, monitor orientation, monitor design, and the monitor’s vertical refresh rate.

The potential for computer monitor interference is associated with transmission and distribution lines of any voltage, configuration, or location. Heavily loaded transmission lines and lower conductor ground clearances generally produce higher magnetic fields, which, in turn, can potentially result in computer monitor interference.

CRT monitors can potentially experience image jitter due to magnetic fields at about 10 mG or less, depending upon such factors as the size and type of monitor. However, this image distortion does not occur on liquid crystal display (LCD) monitors, commonly used on most portable/notebook computers (ESAA, 1996).

Computer monitor interference is a recognized problem in the video monitor industry. As a result, there are manufacturers who specialize in monitor interference solutions and shielding enclosures. Possible solutions to computer monitor interference issues include: relocation of the monitor, use of magnetic shield enclosures, use of software programs to adjust the monitor's vertical refresh rate, and replacement of cathode ray tube monitors with liquid crystal displays. It is important to note that use of flat screen LCD computer displays (immune to standard household current-created magnetic fields) has grown significantly in the past couple of years as unit prices have declined and image quality has improved.

B.2.2 – Induced Current and Shock Effects

Electric currents can be induced by electric and magnetic fields in conductive objects near to transmission lines. For magnetic fields, the concern is for very long objects parallel and close to the line. However, the majority of concern is related to the potential for small electric currents to be induced by electric fields in metallic objects close to transmission lines. Metallic roofs, vehicles, vineyard trellises, and fences are examples of objects that can develop a small electric charge in proximity to high voltage transmission lines.

Object characteristics, degree of grounding, and electric field strength affect the amount of induced charge. An electric current can flow when an object has an induced charge and a path to ground is presented. The amount of induced current that can flow is important to evaluate because of the potential for nuisance shocks to people and the possibility of other effects such as accidental ignition of fuel.

The amount of induced current can be used to evaluate the potential for harmful or other effects. Previous work on appliance leakage current can provide some insight into this issue. Leakage (and induced) current is commonly measured in units of milliamperes, or *mA* (One mA is 0.001 amperes of electric current). Most appliances have a leakage current that flows through to the body of the user. Usually the amount of current is very small and is below the threshold of perception. Many factors affect the leakage current levels. In addition to appliance design and age, contact resistance and insulation from the ground affect the magnitude of current that flows through to the user. Appliance leakage currents have been measured for a variety of appliances and levels ranged from 0.002 mA to tens of mA (Kahn, 1966; Stevenson, 1973).

There is a U.S. standard for leakage current from appliances that was developed to minimize the potential for electric shock hazards and sudden involuntary movements that might result in an accident (ANSI, 1992). The standard limits appliance leakage current to 0.5 mA for portable appliances and 0.75 mA for stationary or fixed appliances. The standard was developed with consideration of the variable threshold of human perception of electric current.

Different people and different situations produce a range of current perception values. As an example, when an average person grips an energized conductor, the median (50th percentile) threshold for perception of an A/C electric current is 0.7 mA for women and 1.1 mA for men (Dalziel, 1972; EPRI, 1982). If the current is gradually increased beyond a person's perception threshold, it becomes bothersome, and possibly startling. With sufficiently large currents, the

muscles of the hand and arm involuntarily contract and a person cannot release the gripped object.

The reasonably safe value at which 99.5 percent of people can let go of a gripped energized object is 9 mA for men and 6 mA for women (Bridges, 1985). An equivalent let-go value of 5 mA has been estimated for children (EPRI, 1982). However, before the current flows in a shock situation, contact must be made, and in the process of *establishing* contact, a small arc occurs. This causes a withdrawal reaction that, in some cases, may be a hazard if the involuntary nature of the reaction causes a fall or other accident. Consideration of let-go currents was the basis for the National Electric Safety Code (NESC) to set an induced current limit of 5 mA for objects under transmission lines (ANSI, 2002).

B.2.3 – Cardiac Pacemakers

Another area of concern related to the electric and magnetic fields of transmission lines has been the possibility of interference with cardiac pacemakers. There are two general types of pacemakers: asynchronous and synchronous. The asynchronous pacemaker pulses at a predetermined rate and is practically immune to interference because it has no sensing circuitry and is not exceptionally complex. The synchronous pacemaker, on the other hand, pulses only when its sensing circuitry determines that pacing is necessary.

The concern is that interference could result from transmission line electric or magnetic fields, and cause a spurious signal in the pacemaker's sensing circuitry (Sastre, 1997). However, when these pacemakers detect a spurious signal, such as an induced 60 Hz current, they are programmed to revert to an asynchronous or fixed pacing mode of operation and return to synchronous operation within a specified time after the signal is no longer detected. The issue for pacemakers is if power line fields could adversely affect their operation.

The potential for cardiac pacemaker interference is associated with high voltage transmission lines along any section or location. Higher voltage transmission lines and lower conductor ground clearances generally produce higher electric fields, which can have the potential for pacemaker interference.

The potential for pacemaker interference from power line fields depends on the pacemaker's manufacturer, model, and implantation method, among other factors. Studies have determined that the thresholds for interference of the most sensitive units are about 2,000 to 12,000 mG for magnetic fields and about 1.5 to 2.0 kV/m for electric fields (University of Rochester 1985). Electric and magnetic fields at the edge of power line rights-of-way are generally below these values, but on the right-of-way the electric field threshold can be exceeded in some cases. The American Conference of Governmental Industrial Hygienists recommends not exceeding an electric field of 1 kV/m or magnetic field level of 1,000 mG for occupational exposure on workers wearing cardiac pacemakers (ACGIH, 2001).

It is unclear that reversion to a fixed pacing mode is harmful since pacemakers are routinely put into reversion with a magnet to test operation and battery life. Some new pacemaker models are dual chamber devices that can be more sensitive to external interference. Some of these dual

chamber units may experience inappropriate pacing behavior (prior to reversion to fixed pacing mode) in electric fields as low as 1.5-2 kV/m, while other models appear unaffected in fields up to 20 kV/m. The biological consequences of brief, reversible pacemaker malfunction are mostly benign. An exception would be an individual who has a sensitive pacer and is completely dependent on it for maintaining all cardiac rhythms. For such an individual, a malfunction that compromised pacemaker output or prevented the unit from reverting to the fixed pacing mode, even for brief periods, could be life-threatening (Sastre, 1997). However, this precise collection of events (i.e., susceptible pacer model, favorable field characteristics, and biological need for full-function pacing) appearing simultaneously would appear to be a rare event.

B.3 – Miscellaneous, Non-Field-Related Public Concerns

B.3.1 – Lightning

Contrary to popular belief, transmission lines do not "attract" lightning. However, lightning does tend to strike taller objects more frequently. For objects less than 600 feet tall, the strike probability is directly related to height (i.e., an object twice as tall as another object will generally have twice as many strikes) although object shape can be a factor too. For objects over about 600 feet tall, the likelihood of lightning strikes increases exponentially (Veimeister, 1972).

A transmission line passing above the earth can be said to cast an "electrical shadow" on the land beneath it (EPRI, 1982). Lightning strokes that would generally terminate on the land inside the shadow will strike the transmission line instead and strokes outside this shadow will miss the line entirely. Therefore, a transmission line actually protects the land near it from lightning strikes.

B.4 – EMF Research

B.4.1 – Scientific Panel Reviews

Hundreds of EMF studies have been conducted over the last 20 years in the areas of epidemiology, animal research, cellular studies, and exposure assessment. A number of nationally-recognized, multi-disciplinary panels have performed comprehensive reviews of the body of scientific knowledge on EMF. These panels' ability to bring experts from a variety of disciplines together to review the research gives their reports recognized credibility. It is standard practice in risk assessment and policymaking to rely on the findings and consensus opinions of these distinguished panels.

Reports by the National Research Council/National Academy of Sciences, American Medical Association, American Cancer Society, National Institute of Environmental Health Sciences, World Health Organization – International Agency for Research on Cancer, and California Department of Health Services have all concluded that insufficient scientific evidence exists to warrant the adoption of specific health-based EMF mitigation measures. The potential for adverse health effects associated with EMF exposure is too speculative to allow the evaluation of impacts or the preparation of mitigation measures. The substantive conclusions reached by these various multi-disciplinary panels have been summarized below.

World Health Organization - International Agency for Research on Cancer

In June of 2001, the International Agency for Research on Cancer (IARC), a branch of the World Health Organization (WHO), evaluated the carcinogenic risk to humans of static and extremely low-frequency EMF. In October of 2001, the WHO published a Fact Sheet that summarized the IARC findings.

In June 2001, an expert scientific working group of IARC reviewed studies related to the carcinogenicity of static and ELF electric and magnetic fields. Using the standard IARC classification that weighs human, animal and laboratory evidence, ELF magnetic fields were classified as "possibly carcinogenic to humans," largely based on epidemiological studies of childhood leukemia. Evidence for all other cancers in children and adults, as well as other types of exposures (i.e., static fields and ELF electric fields) was considered not classifiable either due to insufficient or inconsistent scientific information.

The table below outlines the classification conclusions reached by the IARC:

Static magnetic fields	Inadequate	Inadequate	3 (not classifiable)
Static electric fields	Inadequate	Inadequate	3 (not classifiable)
ELF magnetic fields	Childhood leukemia: limited All other cancers: inadequate	Inadequate	2B (possibly carcinogenic)
ELF electric fields	Inadequate	Inadequate	3 (not classifiable)

SOURCE: National Grid EMF, citing the IARC 2001 Report Results

"Possibly carcinogenic to humans" is a classification used to denote an agent for which there is limited evidence of carcinogenicity in humans and less than sufficient evidence for carcinogenicity in experimental animals. This classification is the weakest of three categories ("is carcinogenic to humans", "probably carcinogenic to humans" and "possibly carcinogenic to humans") used by IARC to classify potential carcinogens based on published scientific evidence. For comparison, some examples of well-known agents that have been classified by IARC are listed below:

Classification	Examples of Agents
Carcinogenic to Humans (usually based on strong evidence of carcinogenicity in humans)	Asbestos Mustard gas Tobacco (smoked and smokeless) Gamma radiation
Probably Carcinogenic to Humans (usually based on strong evidence of carcinogenicity in animals)	Diesel engine exhaust Sun lamps UV radiation Formaldehyde
Possibly Carcinogenic to Humans (usually based on evidence in humans which is considered credible, but for which other explanations could not be ruled out)	Coffee Styrene Gasoline engine exhaust Welding fumes ELF magnetic fields

British National Radiological Protection Board (NRPB)

In 1995, the NRPB joined the British Health Protection Agency to become the "Radiation Protection Division." In 2004, the NRPB released its most recent report addressing EMF-related health issues, *Advice on Limiting Exposure to Magnetic Fields (0-300 GHz)*, and its accompanying document, *Review of the Scientific Evidence for Limiting Exposure to Electromagnetic Fields (0–300 GHz)*.

The Board acknowledged that there are concerns that prolonged, low-level exposure to EMFs may be linked to long-term health effects, in particular, cancer. However, the *Review of the Scientific Evidence* document concluded that there was "…no firm evidence of such adverse health effects at the levels of EMF's to which people are normally exposed."[12]

Specifically, in the *Review of the Scientific Evidence* document, the panel found that, "…having considered the totality of the scientific evidence in the light of uncertainty and the need for a cautious approach, [the] NRPB recommends that restrictions on exposure to EMFs in the UK should be based on the guidelines issued by the International Commission on Non-Ionizing Radiation Protection (ICNIRP) in 1998.[13] This provides for basic restrictions on exposures of members of the public that are a factor of five lower than for those who are occupationally exposed". The report further noted that an association between prolonged exposure to intense power frequency magnetic fields and a small raised risk of childhood leukemia has been found, the scientific reasons for which were uncertain. Because of those findings and the requirement for additional research, the Board noted that "…further precautionary measures should be considered by the government".[14]

In reaching its conclusions, the NRPB sought input from numerous divergent sources, such as individual UK and international scientific experts, published comprehensive reviews by expert groups, and from an *ad hoc* expert group on weak electric field effects in the body.

National Institute of Environmental Health Sciences/RAPID Program

The National Institute of Environmental Health Sciences (NIEHS) and the Department of Energy (DOE) coordinated the implementation of the Electric and Magnetic Fields (EMF) Research and Public Information Dissemination (RAPID) Program, established by the 1992 Energy Policy Act. This was a six-year, federally-coordinated effort designed to evaluate developing technologies and research the potential adverse health effects on biological systems from exposure to 60 Hz electric and magnetic fields.[15], and to communicate these results to the public sector.

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12 From the *Statement by the National Radiological Protection Board ,Advice on Limiting Exposure to Electromagnetic Fields (0-300 GHz)* Abstract, at phttp://www.hpa.org.uk/radiation/publications/documents_of_nrpb/abstracts/absd15-2.htm

13 For a full discussion of the ICNIRP guidelines, see the section below entitled, "International Guidelines".

14 From the *Statement by the National Radiological Protection Board*, cite above.

15 As mentioned previously, 60Hz fields are those produced by the generation, transmission and use of electric energy

Overall, following the 6-year, $60-million study, the NIEHS concluded that the evidence for a risk of cancer and other human disease from EMF around electric power lines was "weak.[16]" The report applied to the extremely low frequency electric and magnetic fields associated with both the larger transmission lines (that distribute power regionally) and the smaller distribution lines that provide power directly to homes.

While sections of the report did say that EMF exposure "cannot be recognized as entirely safe," the report concluded that the"…probability that EMF exposure is truly a health hazard is currently small. The weak epidemiological associations and lack of any laboratory support for these associations provide only marginal scientific support that exposure to this agent is causing any degree of harm."[17] Nonetheless, research has continued on some "lingering concerns" cited in the report, and the NIEHS noted that "…efforts to reduce exposures [to EMF] should continue…"[18]

The NIEHS said that the "strongest evidence" for health effects comes from statistical associations observed in human populations with childhood leukemia and chronic lymphocytic leukemia[19] in "occupationally-exposed" adults (such as electric utility workers, machinists and welders). "While the support from individual studies is weak," according to the report, "these epidemiological studies demonstrate, for some methods of measuring exposure, a fairly consistent pattern of a small, increased risk with increasing exposure that is somewhat weaker for chronic lymphocytic leukemia than for childhood leukemia."[20] However, laboratory studies and investigations of basic biological function do not support these epidemiological associations, according to the report. It says, "Virtually all of the laboratory evidence in animals and humans and most of the mechanistic studies in cells fail to support a causal [cause and effect] relationship."[21]

NIEHS Director Kenneth Olden, Ph.D., said, "The lack of consistent, positive findings in animal or mechanistic studies weakens the belief that this association is actually due to EMF, but it cannot completely discount the epidemiological findings. For that reason, and because virtually everyone in the United States uses electricity and therefore is routinely exposed to EMF, efforts to encourage reductions in exposure should continue. For example, industry should continue efforts to alter large transmission lines to reduce their fields and localities should enforce electrical codes to avoid wiring errors that can produce higher fields."[22]

The studies reviewed and conducted by NIEHS and its grantees focused on the possibility of an EMF-related link to cancer, largely in response to a leukemia study in Denver, Colorado in 1979,

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[16] From NIEHS press release entitled *Environmental Health Institute Report Concludes Evidence is 'Weak' that EMF's Cause Cance*r, dated June 15, 1999, electronically at http://www.niehs.nih.gov/oc/news/emffin.htm
[17] *Ibid.*
[18] *Ibd.*
[19] *Chronic Lymphocytic Leukemia* (or "CLL") is a rare condition characterized by an accumulation of abnormal lymphocytes in the blood and the bone marrow. CLL results from an acquired (not inherited) injury to the DNA of a single cell in the bone marrow. Scientists do not yet understand what produces this change in the DNA of CLL patients.
[20] *Ibid.*
[21] *Ibid.*
[22] *Ibid.*

and to subsequent attempts to duplicate or refute it. But the NIEHS report also found inadequate evidence of any link to non-cancer diseases such as Alzheimer's, depression and birth defects. Christopher Portier, Ph.D., the associate director of the Environmental Toxicology Program at NIEHS who coordinated the evaluation effort, said, "This risk assessment gains strength and reliability from the conduct of extensive new research focused to support the evaluation and through obtaining the opinion of hundreds of scientists who participated in the evaluation. The novel methods used in this risk assessment can serve as a blueprint for resolving other difficult issues."[23]

To assist the NIEHS in reaching its conclusions, several panels of scientists reviewed the data in open, public hearings. One such panel assembled to advise the NIEHS rejected EMF as a "known" or proven, or even "probable" carcinogen, but a majority of the panel said a role in cancer could not be ruled out and should therefore be regarded as a "possible" carcinogen. The NIEHS report also recommended that the fields continue to be recognized as a "possible" cancer hazard, but emphasized the weakness of the data and the low risk that may be involved. The report went on to say that the evidence does not seem to meet the standard for listing as a known or even "anticipated" human carcinogen in the National Toxicology Program's Report on Carcinogens.[24]

In 2002, as a follow-up to the report referenced above, the NIEHS released its "Questions and Answers About EMF' booklet to the public. Available on-line at http://www.niehs.nih.gov/emfrapid/, the booklet was designed to help inform the public about the basics of EMF, the potential adverse health effects, the research conducted to date, typical levels of appliance-related EMF exposure in the household, and standards and guidelines that have been developed both nationally and internationally to help regulate EMF exposure.[25]

U.S. National Research Council/ National Academy of Sciences

In 1997, the National Academy of Sciences/National Research council released a report entitled, "Possible Health Effects of Exposure to Residential Electric and Magnetic Fields". In essence, the report concluded that EMF exposure at normal residential levels did not constitute a public health hazard. Specifically, the report stated, "Based on a comprehensive evaluation of published studies relating to the effects of power-frequency electric and magnetic fields on cells, tissues, and organisms (including humans), the conclusion of the committee is that the current body of evidence does not show that exposure to these fields presents a human-health hazard. Specifically, no conclusive and consistent evidence shows that exposures to residential electric and magnetic fields produce cancer, adverse neurobehavioral effects, or reproductive and developmental effects… An association between residential wiring configuration (called wire codes…) and childhood leukemia persists in multiple studies, although the causative factor responsible for that statistical association has not been identified. No evidence links contemporary measurements of magnetic-field levels to childhood leukemia.[26]"

[23] *Ibid.*
[24] *Ibid.* This finding is consistent with the WHO's classifications discussed above.
[25] Many of these topics are also discussed and summarized throughout this document.
[26] "National Grid EMF", citing the National Academy of Sciences, http://www.emfs.info/expert_NAS.asp

American Cancer Society

The most recent reference by the American Cancer Society to EMF-related health issues was in an article dated in January of 2000. In the article, the ACS cited a reputable *British Lancet* article authored by Nick Day, PhD, professor of epidemiology at Cambridge University which found, in essence, that there was "no link between electromagnetic fields and childhood cancer"[27]. The study followed 2,226 children in the UK "with a confirmed cancer" beginning in infancy and continuing through age 14. The children were compared to a cancer-free control group of children with comparable birth dates and genders.

According to the article, "The researchers took measurements of EMF exposures at the children's homes – including the proximity and type of overhead power lines nearby and electrical appliances in the homes. They also measured exposures at schools or other institutions attended by the children."[28] The researchers found "no evidence that magnetic fields associated with the electricity supply increase risk of childhood leukemia, malignant brain tumors, or any other childhood cancer."[29]

The American Cancer Society gave particular credence to Day's study, since it was a "very nice, large population-based study." The conclusions were clear that there was "…no evidence of an association of EMF and acute lymphoclastic leukemia, all leukemias, central nervous system tumors, and all other malignant disease."[30] The conclusions reached in the Day study paralleled those cited in an earlier, 1997 ACS article on the same topic entitled, *New Study Finds Electrical Lines Cause No Increase in Childhood Leukemia*.[31]

Michael Thun, MD, vice president of epidemiology and surveillance research for the American Cancer Society (ACS), noted the difficulties associated with studying potential links between EMF and cancer, since measuring exposure levels is complicated. However, according to Thun, "... [the Day] study went to great lengths to capture the major sources of exposure."[32]

Since the study was unable to capture a significant sample of children with "high category exposures," a follow-up study currently underway in Japan is expected to be able to address that issue upon its completion.

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27 American Cancer Society Website, *Study Finds No Link Between Power Lines and Childhood Cancer,* http://www.cancer.org/docroot/NWS/content/NWS_1_1x_Study_Finds_No_Link_Between_Power_Lines_and_Childhood_Cancer.asp

28 *Ibid.*

29 *Ibid.*

30 *Ibid.*

31 For a full review of the 1997 article, see http://www.cancer.org/docroot/MED/content/MED_2_1X_New_Study_Finds_Electrical_Lines_Cause_No_Increase_in_Childhood_Leukemia.asp The 1997 study was conducted by the National Cancer Institute and the Children's Cancer Group, and was published in the New England Journal of Medicine.

32 American Cancer Society Website, *Study Finds No Link Between Power Lines and Childhood Cancer.*

National Cancer Institute

According to the National Cancer Institute, overall, "…there is limited evidence that magnetic fields cause childhood leukemia, and there is inadequate evidence that these magnetic fields cause other cancers in children. Studies of magnetic field exposure from power lines and electric blankets in adults show little evidence of an association with leukemia, brain tumors, or breast cancer. Past studies of occupational magnetic field exposure in adults showed very small increases in leukemia and brain tumors. However, more recent, well-conducted studies have shown inconsistent associations with leukemia, brain tumors, and breast cancer."[33]

The Institute itself conducted a comprehensive study to assess the potential relationship between EMF and the childhood risk of acute lymphoblastic leukemia, a rare but quickly-progressing disease in which too many immature white blood cells (called lymphoblasts) are found in the blood and bone marrow. The study found that children living in homes with high magnetic field levels did not have an increased risk of developing the disease. According to the article, "…the one exception may have been children living in homes that had fields greater than 0.4 microtesla (μT), a very high [magnetic field] level that occurs in few residences."[34] A second study conducted by NCI researchers reported that children living close to overhead power lines based on distance measurements were not at greater risk of leukemia.[35]

A third major study also cited by the Institute addressed the potential relationship between EMF and breast cancer in adult women living in Nassau and Suffolk counties in New York State. Released in 2003, the study followed 576 women who had been diagnosed with breast cancer during the period from August 1, 1996, and June 20, 1997, along with 585 "controls" (women who did not have the disease). The study, entitled, *Electromagnetic Fields and Breast Cancer on Long Island: A Case-Control Study*, did not find "…an association between exposure to EMFs and increased risk for breast cancer."[36]

American Medical Association

Resolution 511, amended and adopted at the 1993 American Medical Association Annual Meeting, asked that a review be conducted to describe the potential adverse health effects of exposure to extremely-low frequency electric and magnetic fields. In response to that request, the Council on Scientific Affairs (CSA) prepared an extensive report reviewing some of the prominent scientific and medical literature available on the topic of EMF as of December, 1994.[37]

The report considered basic principles relating to electromagnetic fields (EMF), summarized known effects, reviewed some studies related to EMF, and made recommendations about preventing possible adverse effects from EMF-related exposure. According to the report, "…Some studies of the past 15 years have associated exposures to 50 or 60 Hz electric and

[33] National Cancer Institute, "Magnetic Field Exposure and Cancer: Questions and Answers – Cancer Facts 3.46", http://cis.nci.nih.gov/fact/3_46.htm

[34] *Ibid.*

[35] *Ibid.*

[36] *Ibid,* at http://www.cancer.gov/cancertopics/factsheet/long-island-electromagnetic-qa

[37] The full text of the article is available on the AMA web site at http://www.ama-assn.org/ama/pub/category/13682.html.

magnetic fields with slightly elevated risks of developing cancer or leukemia in children or adults. However, the inconsistency of the results and the shortcomings of most of the studies, in terms of selecting test and control groups, estimating exposures, and accounting for key variables that might affect outcomes, detract from the studies' conclusions… It is not certain that electromagnetic fields pose health risks, or if they do, which attribute or mechanism of action is responsible."[38]

Because of the minimal and inconclusive evidence connecting EMF with adverse health affects, the AMA agreed with other public entities in concluding that although it was premature to dismiss EMF as a health issue entirely, it was likewise unnecessary to take drastic public health protection measures such as outlawing all EMF exposures. Also, since the federal government lacked specific EMF guidelines, the Council suggested that convening a multi-disciplinary national committee to investigate whether such standards were warranted would be helpful. Finally, the Council stated in its Recommendations that it encouraged on-going research efforts, including examinations of exposures to electromagnetic fields and their effects, average public exposures, occupational exposures, and the effects of field surges and harmonics.[39]

California Department of Health

In the State of California, a joint program between the California Department of Health and the Public Health Institute has been developed to address the public's EMF-related concerns. The program, dubbed the "California Electric and Magnetic Fields Program" was undertaken to help provide research, education, and technical assistance related to the possible health effects of electric and magnetic fields from power lines, appliances, and other uses of electricity.[40]

As part of the DOH's research effort, a comprehensive report entitled, *An Evaluation of the Possible Risks from Electric and Magnetic Fields (EMFs) From Power Lines, Internal Wiring, Electrical Occupations and Appliances*, was prepared and finalized in June, 2002. The report was intended to provide an evaluation of the animal, laboratory and human evidence that shows how exposure to 50/60 Hz magnetic fields may or may not increase human health risks. The Risk Evaluation was based on the results of published research studies, with emphasis on new studies, the National Institute of Environmental Health Sciences (NIEHS) Working Group Report (referenced earlier in this paper), and the results of the California EMF Program Studies. Three epidemiological scientists with the DHS were asked to review this data and attempt to formulate reasonable inferences based on the weight of the available evidence. The following information summarizes the pertinent results discussed in that study.

In contrast to the results seen in the majority of the prior studies conducted (such as the National Academy of Sciences RAPID EMF program referenced earlier), the DHS report did find some correlations between EMF and potential adverse health effects. Notably, all 3 scientists said they

38 Excerpted from the AMA's Report 7 of the Council on Scientific Affairs (I-94) Full Text, at http://www.ama-assn.org/ama/pub/category/13682.html .

39 *Ibid.*

40 California EMF Program, http://www.dhs.ca.gov/ehib/emf/

were, "…inclined to believe that EMF's can cause some degree of increased risk of childhood leukemia, adult brain cancer, Lou Gehrig's Disease, and miscarriage… ."[41] The report went on to state that all 3 scientists had "…judgments that were 'close to the dividing line between believing and not believing' that EMF's cause some degree of increased risk of suicide."[42] Furthermore, with respect to adult leukemia, 2 of the 3 scientists were "close to the dividing line between believing or not believing" that EMF's cause some degree of increased risk, with the third being "prone to believe" that such a link exists.[43]

Conversely, with respect to birth defects, low birth weight, breast cancer, heart disease, Alzheimer's Disease, and depression, the 3 scientists did *not* believe (to varying degrees) that the research supported a connection between EMF and an increased risk for these maladies. Furthermore, the panel noted that they "strongly believe[d]" that EMF's are *not* "universal carcinogens"[44], largely due to the fact that there are so many other cancer types [beyond those already mentioned] that were not shown to be connected in any way with EMF exposure.[45]

In addressing the apparent inconsistencies between the conclusions reached by the prior reports and the DHS study, the DHS report did acknowledge that the "…DHS scientists [were] more inclined to believe that EMF exposure increased the risk of…health problems than the majority of the members of the scientific committees convened to evaluate the scientific literature… ."[46] Several reasons for the differences were cited, including that the DHS scientists placed *less* emphasis on the negative findings in animal and test tube experiments than the majority of other scientists, and that the DHS scientists placed *more* emphasis on the epidemiological evidence that the others found less than compelling.

The DHS report stopped short of making any specific public policy related recommendations but, instead, deferred to the California Public Utilities Commission (CPUC) to decide what action, if any, to take based on the report's findings.[47]

41 Executive Summary, *California EMF Risk Evaluation for Policymakers and the Public*, California Department of Health, June 2002 Report, pg. 3.

42 *Ibid.*

43 *Ibid.* All of these findings are discussed in much further detail, with accompanying epidemiological data, in the full text of the report.

44 "Universal Carcinogen" can be defined as a substance that will "induce cancer in most tissues of most species at all ages…" See http://carcin.oupjournals.org/cgi/content/full/21/3/397 wherein the example of radiation exposure is cited as a "universal carcinogen".

45 From the CA Dept of Health 2002 EMF Study cited above, at pg. 3.

46 *Ibid.* Specifically, reference was made to the NIH RAPID Report from 1998, the International Agency for the Research on Cancer (IARC) report from 2001, and the British National Radiological Protection Board (NRPB) report from 2001.

47 See the latter section of this report for more details on the CPUC policies and approach to handling potential EMF-related health issues.

B.5 – Policies Standards and Guidelines

B.5.1 – International Guidelines

The International Commission on Non-Ionizing Radiation Protection (ICNIRP) is an organization of 15,000 scientists from 40 nations who specialize in radiation protection. In 1998, the ICNIRP adopted guidelines recommending limits to EMF exposure in both occupational and household settings. **Table B-4** summarizes the ICNIRP recommendations.

TABLE B-4
ICNIRP GUIDELINES FOR EMF EXPOSURE

Exposure (60 Hz)	Electric field	Magnetic field
Occupational	8.3 kV/m	4.2 G (4,200 mG)
General Public	4.2 kV/m	0.833 G (833 mG)

SOURCE: ICNIRP, 1998
Graphic Source: EMF Exposure Standards, EMF Questions and Answers Booklet[48]

The ICNIRP concluded that available data regarding potential long-term effects of EMF exposure, such as increased risk of cancer, are insufficient to provide a basis for setting exposure restrictions.

B.5.2 – National Guidelines

As outlined earlier in this paper, many prominent national organizations have conducted research into EMF from power lines and potential health risks associated with exposure although, to date, no specific national standards have been established.

However, one national organization, the American Conference of Governmental Industrial Hygienists (ACGIH), a non-governmental, professional organization that facilitates the exchange of technical information about worker health protection, has published recommended "threshold limit values" (or TLV) for magnetic field exposures in an occupational setting. **Table B-5** summarizes the ACGIH recommendations.

According to the National Institute of Environmental Health Sciences, the TLVs for 60-Hz EMF shown in the table above were outlined as a guide to control EMF exposure, but were not intended to define safe versus dangerous EMF levels.[49]

48 EMF Exposure Standards - EMF Questions & Answers Booklet - June 2002, National Environmental Health Institute, http://www.niehs.nih.gov/emfrapid/booklet/standard.htm
49 *Ibid.*

TABLE B-5
ACGIH OCCUPATIONAL THRESHOLD LIMITS VALUES FOR 60-HZ EMF

	Electric Field	Magnetic Field
Occupational exposure should not exceed	25 kV/m	10 G (10,000 mG)
Prudence dictates the use of protective clothing above	15 kV/m	-
Exposure of workers with cardiac pacemakers should not exceed	1 kV/m	1 G (1,000 mG)

SOURCE: ACGIH, 2001.

Graphic Source: EMF Exposure Standards, EMF Questions and Answers Booklet[50]

B.5.3 – State Guidelines

Several states have adopted limits of electric field strength within transmission line rights-of-way[51] (ROW). Florida and New York are the only states that currently limit the intensity of magnetic fields from transmission lines. These regulations include limits within the ROW as well as the edge of the ROW and cover a broad range of values. **Table B-6** lists states that currently regulate EMF and their respective limits. Taken as a precautionary measure to prevent magnetic fields from increasing beyond "baseline" (i.e. beyond levels currently experienced by the public), the magnetic field limits were not actually based upon any link between scientific data and health risks (Morgan, 1991).

TABLE B-6
EMF REGULATED LIMITS (BY STATE) STATE TRANSMISSION LINE STANDARDS AND GUIDELINES

	Electric Field		Magnetic Field	
Florida	8 kV/m[a] 10 kV/m[b]	2 kV/m	-	150 mG[a] (max. load) 200 mG[b] (max. load) 250 mG[c] (max. load)
Minnesota	8 kV/m	-	-	-
Montana	7 kV/m	1 kV/m[e]	-	-
New Jersey	-	3 kV/m	-	-
New York	11.8 kV/m 11.0 kV/m[f] 7.0 kV/m[d]	1.6 kV/m	-	200 mG (max. load)
Oregon	9 kV/m	-	-	-

*R.O.W. = right-of-way (or in the Florida standard, certain additional areas adjoining the right-of-way).
kV/m = kilovolt per meter. One kilovolt = 1,000 volts.
[a] For lines of 69-230 kV.
[b] For 500 kV lines.
[c] For 500 kV lines on certain existing R.O.W.
[d] Maximum for highway crossings.
[e] May be waived by the landowner.
[f] Maximum for private road crossings.

Graphic Source: EMF Exposure Standards, EMF Questions and Answers Booklet[52]

50 EMF Exposure Standards - EMF Questions & Answers Booklet - June 2002, National Environmental Health Institute, http://www.niehs.nih.gov/emfrapid/booklet/standard.htm

51 See Footnote 12 above for definition of "right of way".

In other states, several agencies and municipalities have enacted specific EMF policies[53]. These actions have been varied and sometimes include requirements that the fields be considered in the siting of new facilities. The manner in which EMF is considered has taken several forms. In a few instances, a concept referred to as "prudent avoidance" has been adopted. "Prudent Avoidance", a concept proposed by Dr. Granger Morgan of Carnegie-Mellon University, is defined as "limiting exposures which can be avoided with small investments of money and effort" (Morgan, 1991). Some municipalities or regulating agencies have proposed limitations on field strength, requirements for siting of lines away from residences and schools, and in some cases, prohibitions on the construction of new transmission lines. The origin of these individual actions has been varied, with some initiated by the regulators at the time of new transmission line proposals within their communities or through grassroots efforts.

B.5.4 – CPUC Guidelines

The California Public Utilities Commission (CPUC) regulates privately owned telecommunications, electric, natural gas and water utilities, as well as railroad, rail transit, and passenger transportation companies within the state of California. The CPUC is responsible for assuring safe services to consumers for reasonable rates.[54] With respect to electricity, the CPUC is charged with enacting public policies governing transmission and distribution lines (new and existing), electricity substations, etc. for the largest, investor-owned utilities (including Pacific Gas & Electric, Southern California Edison, San Diego Gas & Electric, Sierra Pacific Power, and Pacific Power & Light).

In 1991, the CPUC began an investigation to consider its potential role in mitigating health effects, if any, of EMFs created by electric utility power lines and by cellular radiotelephone facilities. All interested parties were notified that the CPUC would take appropriate action on EMFs in response to a conclusion, based on scientific evidence, which indicated that a health hazard actually exists, and that a clear cause and effect relationship between utility property or operations and public health was established.[55]

As discussed earlier, significant controversy exists as to whether EMF does or does not constitute a public health hazard. As such, the CPUC was reticent to enact restrictive regulatory requirements. Instead, they adopted seven "Interim Measures" aimed at concurrently protecting the public while avoiding overreaching and unduly expensive limitations on the investor-owned utilities.

As indicated on the CPUC website, the seven interim measures enumerated in the CPUC's November 1993 decision include:

52 EMF Exposure Standards - EMF Questions & Answers Booklet - June 2002, National Environmental Health Institute, http://www.niehs.nih.gov/emfrapid/booklet/standard.htm

53 Although the State of California has not specifically codified restrictions with respect to EMF limits, the CPUC has examined the issue. Please see the CPUC section of this document for more information.

54 California Public Utilities Commission Website, at http://www.cpuc.ca.gov/static/consumers/overview.htm

55 California Public Utilities Commission Website, at http://www.cpuc.ca.gov/static/industry/environment/electromagnetic+fields/action.htm

- **No-Cost and Low-Cost Steps to Reduce EMF Levels:** For new and upgraded utility facilities, "no-cost" and "low-cost" measures should be implemented where feasible to reduce potential EMF exposure, with the goal of pursuing the "prudent avoidance"[56] strategy while simultaneously controlling costs. Whereas the "no-cost" mitigation measures should be undertaken immediately, the "low-cost" options should be pursued throughout the project certification process. The CPUC established a benchmark of up to four percent (4%) of the total budgeted project cost to be applied towards developing EMF mitigation measures, including both design and siting considerations.

- **New Designs to Reduce EMF Levels:** The CPUC's Advisory and Compliance Division and Safety Division held workshops for utilities to develop EMF design guidelines for their new and rebuilt facilities. The guidelines incorporate alternative site selections, increasing the size of rights-of-way, placing facilities underground, and using other suggested methods for reducing EMF levels at transmission, distribution and substation facilities.

- **Measurement of EMFs:** Uniform residential and workplace EMF measurement programs were also designed in the workshops mentioned above. The guidelines are available to both utilities and their customers. The measurement considerations include sources of EMF beyond the control of utilities, such as appliances, house wiring, and grounding systems. Non-investor-owned utilities are also encouraged to use the measurement guidelines.

- **Education and Research:** The CPUC wants to encourage the public and groups having a financial or basic interest in EMFs to become involved in developing education and research programs. Established and managed by the DHS, the CPUC-regulated utilities and municipal utilities use ratepayer funds to pay for their share of development costs for education and research on EMF-related health issues.

- **EMF Education:** This $1.49 million program will provide credible, meaningful, consistent, and timely EMF information to electric utility customers, employees, and the public. DHS will coordinate a uniform EMF education program to supplement, but not duplicate, those that most electric utilities already have. Utilities without programs should implement one as soon as possible.

- **EMF Research:** A $5.6 million four-year non-experimental research program will be directed by DHS. This program will provide utility participation in state, national, and international research to be pursued to the extent that it benefits ratepayers.

- **Other Research**: Utilities are authorized to contribute to federal experimental research conducted under the National Energy Policy Act of 1992.

Recent Reexamination of "Prudent Avoidance" and Low-Cost/No-Cost Policies

56 As an example, Southern California Edison has approached the "prudent avoidance" strategy by setting a policy to "Implement reasonable no cost and low cost steps to build new electric utility lines and substations in ways that reduce magnetic fields". http://www.emraa.org.au/powrlines/ESAA.htm

In August of 2004, the CPUC opened an "Order Instituting Rulemaking" inquiry[57] to determine if modifications needed to be made to the Commission's previous "prudent avoidance" and low-cost/no-cost policies with respect to EMF. The inquiry was opened for several reasons, including the fact that the Commission had not revisited the issue since its 1993 ruling coupled with the recent resurgence in public interest in the topic in the wake of the 2002 Department of Health Services EMF report.

In its inquiry, the CPUC thoroughly reviewed the updated EMF scientific analyses presented by the National Institutes of Environmental Health Services Working Group (NIEHS), the British National Radiological Protection Board (NRPB), the International Agency for Research on Cancer (IARC), and the California Department of Health Services 2002 report.[58] In its analysis, the CPUC noted that all the reports examined (including the DHS report, although to a lesser degree) failed to find a definitive causational relationship between EMF exposure and adverse health effects.[59]

As a result, the Commission decided, that it was "…not in a position [to] develop a specific numerical standard or threshold".[60] The CPUC cited the 2002 DHS report's lack of substantive recommendations regarding policy implications as further evidence that more definitive action was not warranted.[61] Nonetheless, the Commission did leave open the possibility of revisiting the EMF health issue in the future as new scientific evidence was produced. In the meantime, the CPUC decided to focus its efforts on improving its "prudent avoidance" and no-cost/low-cost policies which, as of May, 2005, is still an on-going effort.

B.6 – Pacific Gas & Electric: Implementation of the CPUC's "Prudent Avoidance" and "No-Cost/Low-Cost" Strategies

As one of the largest investor-owned California utilities, Pacific Gas and Electric (PG&E) has adopted a detailed written strategy to implement the "prudent avoidance" guidelines outlined by the CPUC. [62] As part of the Proposed Project, PG&E "…will incorporate "no cost" and "low cost" magnetic field reduction steps [for] proposed transmission and substation facilities..." Potential measures to reduce magnetic field exposure "…will be consistent with PG&E's

57 *Order Instituting Rulemaking to Update the Commission's Policies and Procedures Related to Electromagnetic Fields Emanating from Regulated Utility Facilities,* Filed August 19, 2004 with the California Public Utilities Commission, Rulemaking 04-08-020.

58 *Ibid*, at pg. 3. Please see earlier in this analysis for a synopsis of the CPUC-reviewed sources.

59 The CPUC Order also reviewed the 2002 DHS Report in detail and addressed the apparent inconsistencies between the DSH report and the other primary sources, noting that "…an independent review of the DHS study suggests that other reviewers might have reached different conclusions." From the *Order Instituting Rulemaking* cited above, at pg. 6.

60 *Ibid* at pg 7.

61 *Ibid.*

62 Specifically, PG&E has adopted a formal "Transmission and Substation EMF Design Guidelines" protocol.

Transmission and Substation EMF Design Guidelines."[63] The design guidelines provide for all of the following potential proactive EMF reduction measures:

- Increase distance from conductors and equipment;
- Reduce conductor spacing;
- Minimize current; and
- Optimize phase configuration

Taking into account the four potential considerations above, the "final field management plan" will be provided to the CPUC for review. It will include the following project information:

- A description of the project (including cost, design, length, location, etc.);
- A description of the surrounding land uses using priority criteria classifications;
- No-cost options to be implemented;
- Priority areas where low-cost measures are to be applied;
- Measures considered for magnetic field reduction, percent reduction and cost; and
- Conclusion – (including a discussion of which options were selected and how areas were treated equivalently or why low-cost measures cannot be applied to this project due to cost, percent reduction, equivalence, environmental concerns or some other reason.)[64]

B.7 – PG&E's Proposed EMF Management Plan

Pursuant to the CPUC requirements, PG&E has submitted two EMF Management Plans for the proposed and amended project applications.[65] Calculated field strengths for the Proposed Project were provided by PG&E based on the following parameters:

- *Computer Program:* Southern California Edison Fields 3.0.A
- *Base Case Load Flow:* The projected 2009 normal summer peak load current (system peak, all lines in service) used for the base case calculation of the magnetic field is 335 Amps, flowing from the Lakeville Substation to the Sonoma Substation in both 115 kV circuits.

63 *Ibid.*

64 Both the "potential measures" list and the list of details to be included in the "Final Field Management Plan" were taken directly from the *Proponent's Environmental Assessment* document cited above, at pg. H-5.

65 Pacific Gas and Electric Company. 2004. Preliminary Transmission EMF Management Plan Lakeville-Sonoma 115 kV Transmission Line Project. November 16, 2004. *and* Pacific Gas and Electric Company. 2005. Draft Preliminary Transmission EMF Management Plan Lakeville-Sonoma 115kV Transmission Line Project (Assuming Project Approved with CPUC-Proposed Mitigation Measure Requiring Undergrounding in and near Sonoma. June 2005.

Load currents are assumed to be balanced at 120 electrical degrees separation between the three phases. Conductor type is assumed to be 477 SSAC.

- *Base Case Phasing:* Both circuits are aligned ABC (Top, Middle, Bottom)
- *Base Case Height of Conductors:* Thirty feet
- *Location of Magnetic Field Calculation:* Three feet above ground adjacent to the minimum conductor clearance point, which is normally at midspan.

It was assumed that the projected peak summer loads for 2009 were used in order to provide a more conservative estimate of future line loadings and EMF levels by projecting 5 years ahead of currently available data (2004).[66] The area load levels represent summer peak loading conditions expected for a one-in-ten year heat wave, which occurs for a limited time each year.

Based on the calculations provided by PG&E, the maximum magnetic field strength varies from approximately 30.5 mG directly beneath the conductors, to 26.3 mG at the edge of the 40 foot wide right of way. This distribution appears reasonable for an overhead transmission line, with a high concentration of field strength directly below the conductors, and with a reduction of strength with distance due to the close spacing of the cables. The calculated field strength at the edge of the right of way also appears reasonable, since typical magnetic fields from power transmission lines range from 10 to 90 mG.[67]

The majority of the Proposed Project passes through open space, grazing lands, and vineyards. However, there are some residential areas along the alignment, particularly along Leveroni and Felder Roads in Sonoma. Residences on Leveroni Road are as close as 29 feet of the transmission line between Poles 117 and 119. The corresponding Base Case maximum magnetic field level at these locations is calculated to be approximately 22.9 mG. Residences on Felder Road are as close as 46 feet of the transmission line near Poles 83. At this location, the Base Case maximum magnetic field level is calculated to be approximately 16.6 mG.

At each existing substation, EMF levels at the property line are predominately the result of transmission and distribution lines that enter or exit the property. Changes to EMF levels would occur as a result of the proposed modifications to the transmission lines.

B.8 – Project EMF Levels with Implementation of Mitigation Measure 2.1-1

Implementation of Mitigation Measure 2.1-1 requires PG&E to underground a portion of the transmission line within Leveroni Road from approximately Fifth Street West to the Sonoma

[66] ATI Architects and Engineers Technical Memorandum. Draft Electric and Magnetic Field Hazard Technical Memorandum. PG&E Lakeville-Sonoma 115kV project. Document Number E2106-MEM-002-RV1 June 3, 2005.

[67] *Ibid.*

Substation. Under this Mitigation Measure, PG&E would construct a portion of the new transmission line underground along the Leveroni Road leading into the Sonoma Substation. The overhead line would be transitioned into a 115KV underground cable at Pole 108, approximately 150 feet west of the Fifth Street West intersection. A 3,060 foot long single-circuit 115 kV line would be installed underground along Leveroni Road between Fifth Street West and the Sonoma Substation. The 115 kV cables would be installed in a concrete encased duct bank in a 2 foot wide by 5 foot deep trench. The existing overhead 115 kV single-circuit transmission line, distribution lines, and communication wires on the existing poles along Leveroni Road would not be modified.

Calculated field strengths for the underground segment of the Amended Project were provided by PG&E based on the following parameters (PG&E, 2005):

- *Computer Program:* Southern California Edison Fields 3.0.A
- *Base Case Load Flow:* The projected 2009 normal summer peak load current (system peak, all lines in service) used for the base case calculation of the magnetic field is 335 Amps, flowing from the Lakeville Substation to the Sonoma Substation in both 115 kV circuits. Load currents are assumed to be balanced at 120 electrical degrees separation between the three phases. Conductor type is assumed to be 2500 kcmil Cu type XLPE cables.
- *Base Case Depth to Bottom of Trench:* Five feet
- *Location of Magnetic Field Calculation:* Three feet above ground

Based on the calculations provided, the maximum magnetic field strength varies from approximately 40.6 mG directly above the conductors, to 4.5 mG at the edge of the 40 foot wide right of way. This distribution appears reasonable for an underground transmission line, with a high concentration of field strength directly above the cable since it is only a few feet from the ground surface, and with a rapid reduction of strength with distance due to the close spacing of the cables.[68] This results in a greatly reduced width of exposure compared to an overhead line.

The transition from overhead to underground occurs at Pole 108 and at the Sonoma Substation. The local EMF levels near Pole 108 may be higher than the Base Case calculations provided.

At the Sonoma Substation, EMF levels at the property line are predominately the result of transmission and distribution lines that enter or exit the property. Changes to EMF levels will occur as a result of the proposed modifications to the transmission lines.

Residences on Leveroni Road are as close as 29 feet to the existing transmission line between Poles 117 and 119. The maximum magnetic field level at these locations from the new underground transmission line are calculated to be approximately 2.3 mG, though depending on the placement of the duct bank Leveroni Road, it is likely that the distance to residences will be increased, and the corresponding field levels reduced.

[68] *Ibid.*

The existing EMF levels induced by other utilities in the project vicinity are not known, and the cumulative effect of the underground and overhead circuits operating in parallel have not been provided. Further assessment of these effects may be warranted.

B.9 – EMF MITIGATION MEASURES

In accordance with CPUC Decision 93-11-013 (CPUC, 1993), PG&E is required to consider no-cost and low cost measures, where feasible, to reduce EMF exposure from new or upgraded utility facilities. The magnetic field reduction techniques that are typically considered in electric power transmission facilities include the following:

- Optimize phase configuration
- Increase distance from conductors
- Reduce conductor spacing
- Minimize current

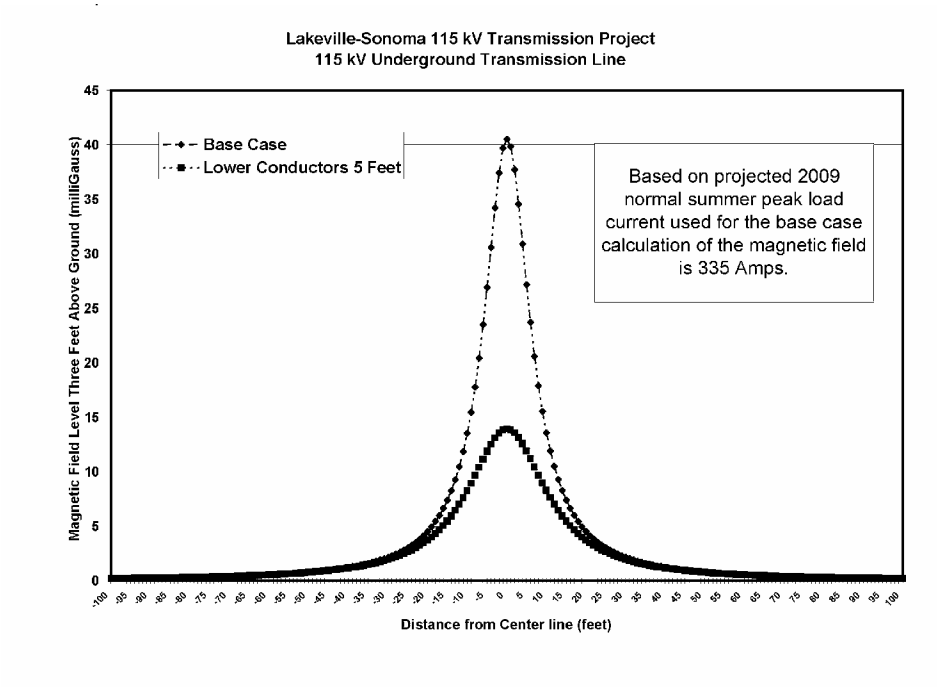
As previously mentioned, PG&E has presented two Preliminary Transmission EMF Management Plans, and has evaluated various EMF reduction measures, as described below.

Proposed Project - Optimized Phase Configuration

Cross phasing circuits in a double circuit transmission line can be used as a field cancellation technique, where the phases from one circuit in a multi-circuit line are used to reduce the fields from another circuit, thereby reducing the total magnetic field strength. Relative to the Base Case described above, the revised analysis of EMF levels for the Proposed Project using this reduction measure incorporates the following modifications:

Phasing Modifications:
- Lakeville-Sonoma Circuit #1 is arranged ABC (Top, Middle, Bottom)
- Lakeville-Sonoma Circuit #2 is arranged CBA (Bottom, Middle, Top)

Based on the calculations provided, the revised maximum magnetic field strength using the cross phasing reduction measure varies from approximately 7.7 mG directly beneath the conductors, to 6.0 mG at the edge of the 40 foot wide right of way. This represents a 77.2 percent reduction in EMF levels at the edge of the right of way relative to the Base Case condition described above. This is considered a "no-cost" field reduction measure that PG&E has indicated will be incorporated into the Proposed Project. PG&E's graphic representation of EMF levels for both overhead and underground portions of the line with and without EMF reduction measures are

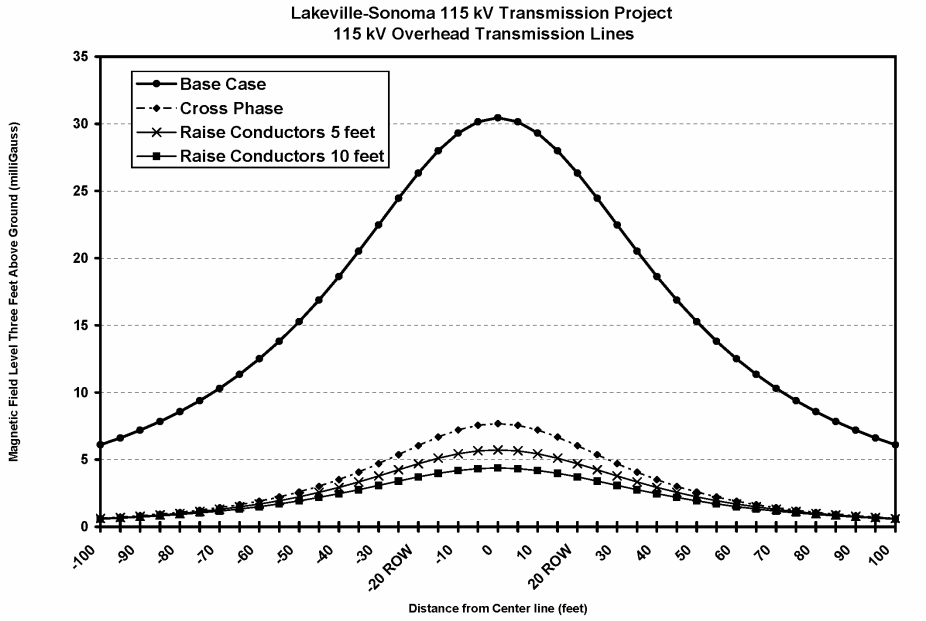


shown on **Figure B-4**.

FIGURE B-4

PG&E ESTIMATED EMF LEVELS WITH AND WITHOUT REDUCTION MEASURES

SOURCE: PG&E (2004) and PG&E (2005)



Increasing Distance from Conductors

EMF levels decrease as the distance from the conductors increases. For overhead lines, this may be accomplished by raising the height of the poles and by reducing the sag of the conductors between poles. For the Proposed Project, PG&E has evaluated the effect on EMF levels considering increasing the height of the conductors first by 5 feet, then by 10 feet. The calculations that were performed also incorporated the cross phasing technique for reducing EMF levels as described above.

Based on the calculations provided, the revised maximum magnetic field strength using both the cross phasing reduction measure and the conductor height increase is shown in **Table B-7**:

TABLE B-7

REVISED MAXIMUM MAGNETIC FIELD STRENGTH

Conductor Height Increase	Magnetic Field		
	Beneath Conductors	Edge of Right of Way	% Reduction at Edge of Right of Way
Base Case	7.7 mG	6.0 mG	-
5 foot height increase	5.7 mG	4.7 mG	21.7%
10 foot height increase	4.4 mG	3.7 mG	38.3%

PG&E has indicated that the height of the conductors will be raised by ten feet adjacent to residential areas along Felder and Leveroni Roads as a “low-cost” field reduction measure for the Proposed Project.

Proposed Project with Underground Segment (Mitigation Measure 2.1-1)

In the second EMF management plan, PG&E has evaluated various EMF reduction measures for the underground duct bank along Leveroni Road, as described below.

Triangular Configuration

The proposed duct bank will include three solid dielectric cables, with each cable installed in separate conduits and carrying different phases of the three-phase circuit. In lieu of arranging the three cables in the same horizontal or vertical plane, PG&E intends to place the three cables in a triangular distribution within the duct bank, where one cable is located above or below the other two cables. This no-cost measure can reduce field levels by as much as 35 percent.

Strategic Line Placement

EMF levels decrease as the distance from the conductors increases. One method of achieving this for the underground duct bank is to strategically place the conductors in the right of way to maximize the distance to residences. While consideration must be given to existing underground

APPENDIX C
Special Status Plant Surveys

SPECIAL-STATUS PLANT SURVEYS

for the

PG&E Lakeville – Sonoma 115 kV Transmission Line

Proposed Route and Alternatives

Sonoma County, California

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J-359

October 2004

Executive Summary

Pacific Gas and Electric (PG&E) is proposing to add a transmission line between its existing Lakeville and Sonoma substations. The proposed route and the alternative routes are located in southeastern Sonoma County (Figure 1).

Reconnaissance- and protocol-level special-status plant surveys were conducted in August and September, 2002, March, April, May, June and September, 2003, and June 2004. The purpose of the reconnaissance-level surveys was to identify vegetation and land cover types, to identify areas with the potential to support special-status plants, and to locate wetlands within and near the survey corridor. The purpose of the protocol-level surveys was to locate all populations of special-status plants within the project area, to precisely record and map their locations using GPS technology, and to estimate the size, number of individuals, phenology and microhabitat characteristics of each rare plant population. Protocol-level surveys were floristic in nature and were conducted according to the rare plant survey guidelines approved by the California Native Plant Society (CNPS) (Tibor 2001) and the California Department of Fish and Game (CDFG 2000). In addition, existing populations of non-native invasive plants were described for each segment as they were noted during reconnaissance- and protocol-level surveys.

Using the Holland (1986) system of vegetation classification, ten vegetation and cover types were identified within the project area. The upland types include: Coast Live Oak Forest and Woodland, Mixed Evergreen Forest, Non-native Grassland, Oregon Oak Woodland, Upland Redwood Forest, and Vineyards and other Agricultural Lands. The wetland types include: Coastal and Valley Freshwater Marsh, North Coast Riparian Forest, Northern Vernal Pool, and Vernal Marsh.

Three special-status plant species were found within the project area: three populations of Northern California black walnut (*Juglans hindsii*) (CNPS 1B), one population of cotula navarretia (*Navarretia cotulifolia*) (CNPS 4), and one population of Lobb's aquatic buttercup (*Ranunculus lobbii*) (CNPS 4). Figure 1 shows the locations of special-status plant populations observed during surveys conducted for this project. With implementation of the proposed avoidance and minimization measures, all impacts to these species will be less than significant.

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Tables and Figures

Appendices

1.0 Introduction

1.1 Proposed Project

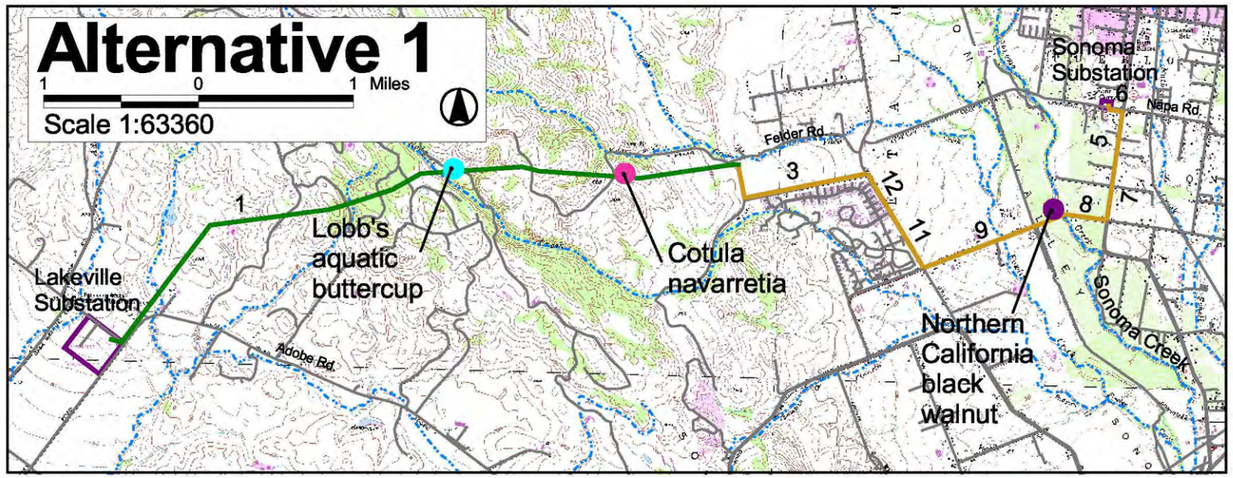
Project activities associated with PG&E's Lakeville – Sonoma 115 kV Transmission Line Project include: upgrades to the Lakeville and Sonoma substations, removal and replacement of poles along an existing transmission line, construction of some new temporary and permanent access roads, improvement of some existing access roads for temporary and permanent use, and temporary use of landing zone/staging areas, helicopter landing zones, pull sites, and crane pads during construction. Operations-phase activities will consist of maintenance activities along the transmission line.

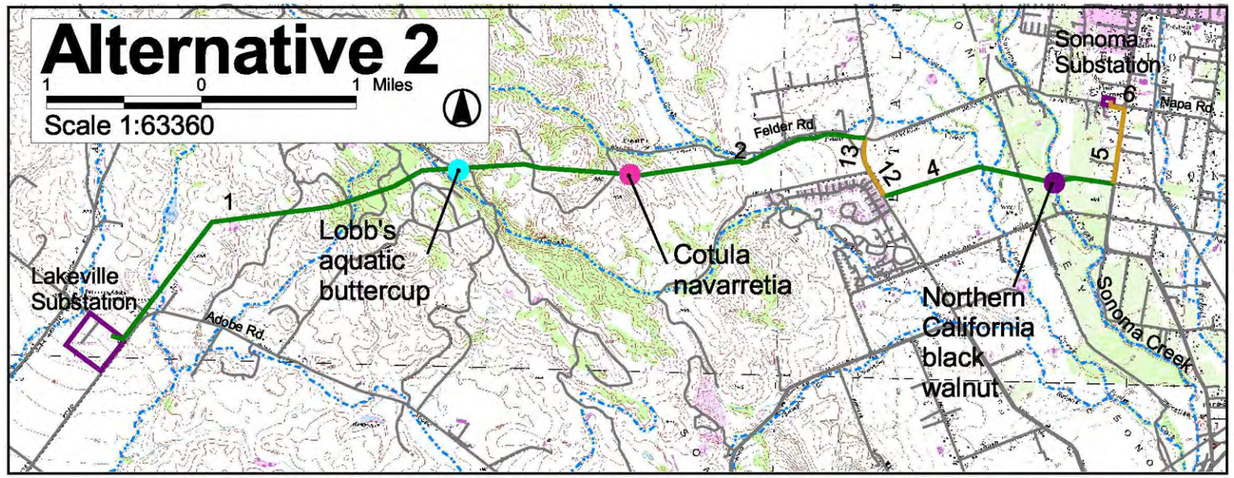
1.2 Project Site Location

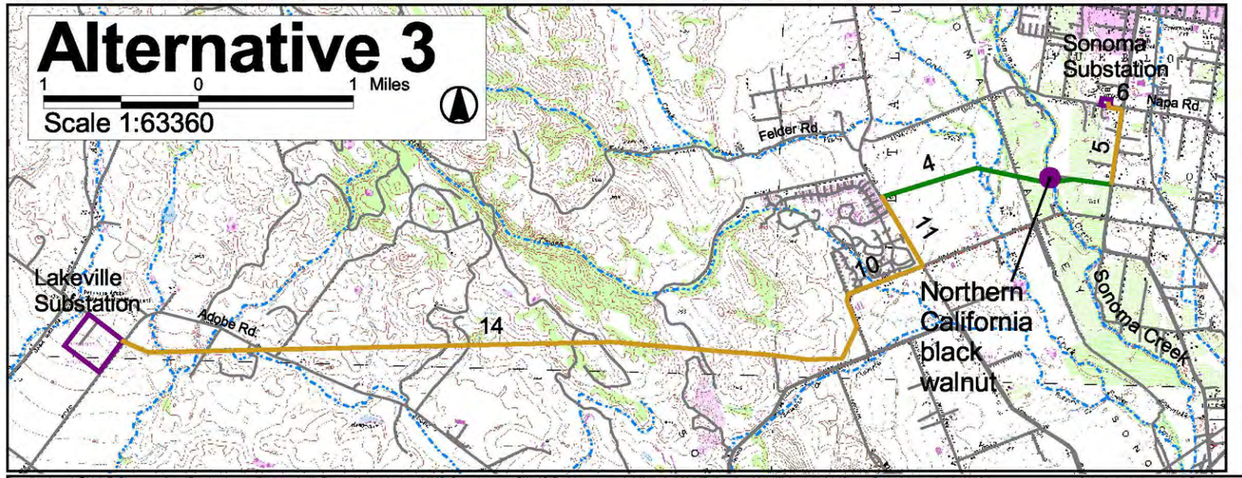
The PG&E Lakeville – Sonoma 115 kV Transmission Line Project and alternative routes considered are located in southern Sonoma County, California. (See Figure 1.) The proposed project area includes the survey corridors for route segments 1, 2 and 17, the area proposed for modification of PG&E's Lakeville substation, and sites for landing zones/staging areas, helicopter landing zones, pull sites, crane pads, and access roads. Four additional alternative routes were considered before selecting the proposed project. The project areas for the alternative routes include the survey corridors for segments 1 through 16 (see Figure 1). The proposed project area and the alternative routes are located within a geographic area that includes: part of the southeastern Petaluma Valley, the southern section of the Sonoma Mountains, and the southwestern part of the Sonoma Valley. The term "study area" will be used below to denote the total area encompassed by the proposed project area and alternative routes.

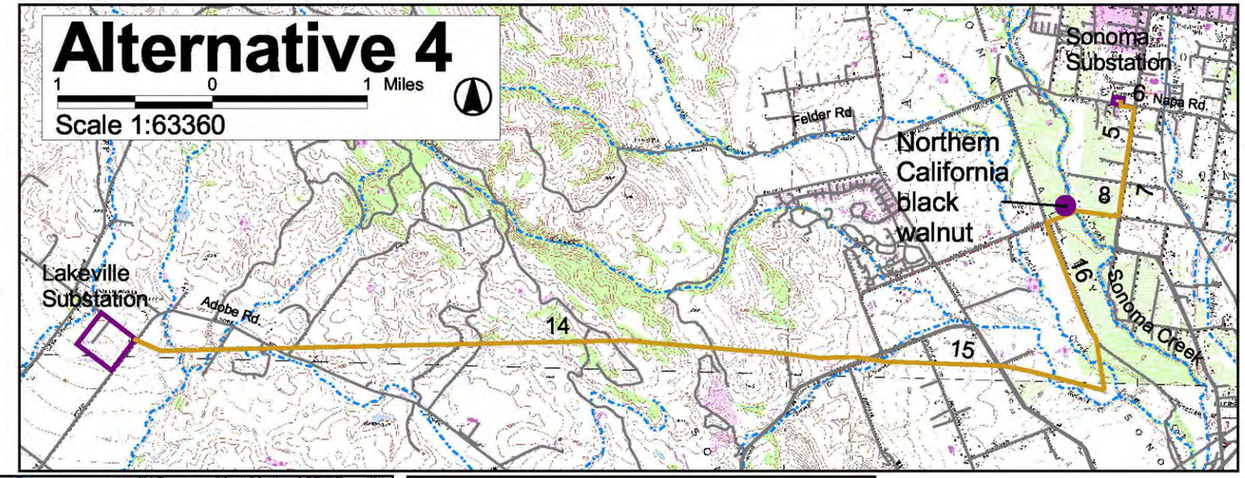
1.2.1 Proposed Project Route

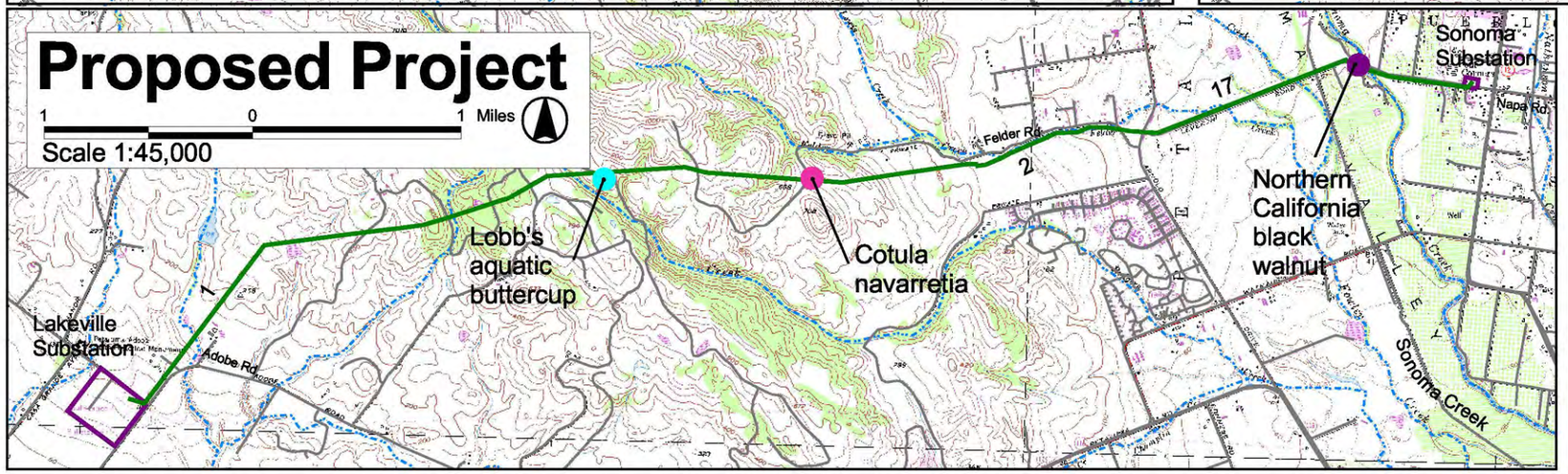
The proposed project route is approximately seven miles long and includes segments 1, 2 and 17. (See Figure 1) From PG&E's Lakeville substation at the northwest corner of Adobe and Frates roads, segment 1 crosses Adobe Road and extends east across the southern part of Sonoma Mountain, terminating at the eastern base of Sonoma Mountain, near the upstream crossing of Felder Creek by Felder Road. Segment 2 continues east, running parallel to and just south of Felder Creek, and terminating at the intersection of Arnold Drive and Leveroni Road. Segment 17 follows Leveroni Road east to the Sonoma substation, near the intersection of Leveroni Road and State Highway 12, in the City of Sonoma. The terrain crossed by the proposed route includes level ground in the valley bottoms, shallow depressions containing seasonal wetlands, gradual to steep slopes on Sonoma Mountain, and several steep-sided, deeply incised stream canyons (Rodgers

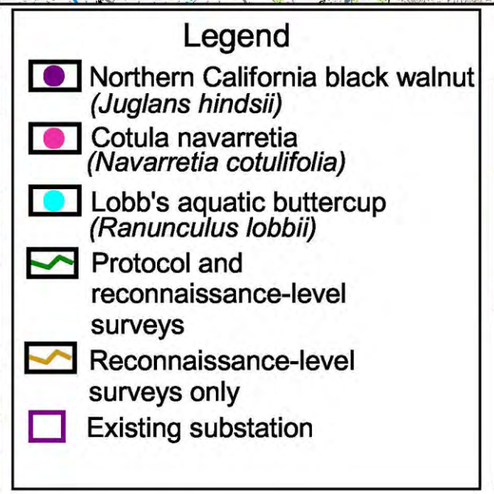












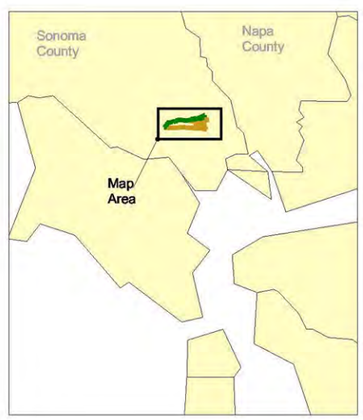


Figure 1.
Study area and results of special-status plant surveys.
Lakeville-Sonoma 115kV Transmission Line Project
October 2004

GANDA

Creek, Felder Creek and Sonoma Creek). Elevations range from approximately 50 to 800 feet. Annual grassland, mixed evergreen forest, oak woodland, riparian woodland, seasonal wetlands, vineyards, rural residential and urban residential are the main cover types crossed by the proposed route.

1.2.2 Alternative Segments

In addition to including segments 1 and 2 of the proposed project, the alternative segments include segments 3 through 16, as shown in Figure 1. The total length of these segments is approximately 13.5 miles. Segments 14 and 15 extend east from the PG&E Lakeville substation, cross the southern slopes of Sonoma Mountain and end in the southwestern Sonoma Valley, west of Sonoma Creek. Segments 10, 9 and 8 follow Watmaugh Road east from near its intersection with Stage Gulch Road (State Highway 116) to its intersection with State Highway 12. Segment 16 extends south from Watmaugh Road to its intersection with the eastern end of Segment 15. Segments 13, 12 and 11 follow Arnold Drive south from its intersection with Leveroni Road to its intersection with Watmaugh Road. Segment 3 extends overland from its intersection with segments 1 and 2 east to Arnold Drive. Segment 4 extends overland from Arnold Drive to Highway 12. Segments 6, 5 and 7 extend south along Highway 12 from Leveroni Road to Watmaugh Road. Elevations along these segments range from approximately 40 to 675 feet. The terrain crossed by the alternative segments includes level ground in the valley bottoms, shallow depressions containing seasonal wetlands, gradual to steep slopes on Sonoma Mountain, and several steep-sided, deeply incised stream canyons (Felder Creek and three crossings of Sonoma Creek). Annual grassland, oak woodland, riparian woodland, seasonal wetlands, vineyards, rural residential, urban residential and urban commercial are the main cover types crossed by the route segments which make up alternatives 1 through 4.

1.3 Overview of Rare Plant Surveys

Surveys for special-status plants were conducted at two levels: reconnaissance-level and protocol-level. Surveys of the proposed project (segments 1, 2 and 17) were conducted at both the reconnaissance and protocol levels. Surveys of the segments that comprise the alternatives (segments 3 through 16) were conducted only at the reconnaissance level, with the exception of segment 4, which was also surveyed at the protocol level. The purpose of the reconnaissance-level surveys was to identify vegetation and land cover types, to identify areas with the potential to support special-status plants, and to locate wetlands within and near the survey corridor. The purpose of the protocol-level surveys was to locate and record all populations of special-status plants. Protocol-level surveys were conducted according to the rare plant survey guidelines approved by the California Native Plant Society (Tibor 2001) and the California Department of Fish and Game (CDFG 2000).

2.0 Methods

Surveys for special-status plants were conducted at two levels: reconnaissance-level and protocol-level. Surveys of the proposed route (segments 1, 2 and 17) and segment 4 were conducted at both the reconnaissance and protocol levels. Surveys of the other segments comprising the alternatives (segments 3 and 5 through 16) were conducted only at the reconnaissance level.

2.1 Reconnaissance-level Surveys

The purpose of the reconnaissance-level surveys was to identify vegetation and land cover types, to identify areas with the potential to support special-status plants, and to locate wetlands within and near the survey corridor. In addition, existing populations of non-native invasive plants were described for each segment. Reconnaissance-level surveys were conducted by one or two surveyors who visually observed the survey corridor, either on foot or from a vehicle, using binoculars as needed. For segments containing an existing transmission line (poles or towers), the survey corridor was 200 feet wide and was centered on the existing transmission line. For segments lacking an existing transmission line, a 1000-foot wide corridor was surveyed, centered on the proposed transmission line location. Surveys of segments 1, 2, 3, 4 (part), 5 (part), 6 and 17 were completed in August 2002. Segments 4 (part), 5 (part), and 7 through 16 were completed in September 2003.

Vegetation and land cover types were recorded by labeling color aerial photographs in the field. Noxious weed infestations were recorded by segment in field notes. Weed species noted included those listed by the California Department of Food and Agriculture (CDFA 2003) and those designated as harmful to wildlands by the California Invasive Plant Council[1] (Cal-EPPC 1999).

2.2 Protocol-level Surveys

The purpose of the protocol-level surveys was to locate all populations of special-status plants within the project area, to precisely record and map their locations using GPS units with 2-3 meter accuracy, and to estimate the size, number of individuals, phenology and microhabitat characteristics of each rare plant population. Protocol-level surveys were floristic in nature and were conducted according to the rare plant survey guidelines approved by the California Native Plant Society (Tibor 2001) and the California Department of Fish and Game (CDFG 2000).

[1] Formerly the California Exotic Pest Plant Council, Cal-EPPC.

Preparation for the protocol-level rare plant surveys included compiling a list of special-status plants potentially occurring within the project area. A plant was considered to be of special-status if it met one or more of the following criteria:

- Federally or state-listed, or proposed for listing, as rare, threatened or endangered (USFWS 1996, CDFG 2002a, 2002b, 2003a, 2003b);
- Federal species of concern or candidate for listing (USFWS 2002, 2003);
- Special Plant as defined by the California Natural Diversity Database (CDFG 2002a, 2003a); or
- Listed by the California Native Plant Society in their *Inventory of Rare and Endangered Plants of California* (Tibor 2001).

A species was determined to have potential to occur in the project area if its known or expected geographic range includes the project area or the vicinity of the project area, and if its known or expected habitat is represented within or near the project area.

A list of potentially occurring special-status plants was compiled by searching the CNDDB RareFind2 database (CDFG 2002b) and the CNPS Inventory (Tibor 2001), and by reviewing unpublished species lists from sites near the project area with habitats similar to that of the project area (Howald 2000, 2002). Table 1 is a tabular summary of information about 24 special-status plants with potential to occur within the project area. Information on flowering time, status, habitat preferences, geographic distribution, elevational range, and known locations in the vicinity of the project area was gathered prior to the initiation of the protocol-level (floristic) field surveys conducted in 2003. This information was compiled from the sources listed above, and other sources, including *The Jepson Manual* (Hickman 1993), *A Flora of Sonoma County* (Best et al. 1996), and the CalFlora database (2003).

The large number of potentially occurring special-status plants, the differences in their flowering times, and the lack of access to local populations on private property made it impractical to observe local populations of all of the potentially occurring special-status plant species prior to or during the field surveys. Local populations of Napa false indigo (*Amorpha californica* ssp. *napensis*), Brewer's milkvetch (*Astragalus breweri*), Baker's blennosperma (*Blennosperma bakeri*), dwarf downingia (*Downingia pusilla*), fragrant fritillary (*Fritillaria liliacea*), broad-lobed linanthus (*Linanthus latisectus*) and Lobb's aquatic buttercup (*Ranunculus lobbii*) were observed prior to and during the survey period to check flowering condition. Drawings, photographs and written descriptions of all potentially occurring special-status plants were reviewed prior to and during the survey period.

Table 1. List of Special-status Plant Species Expected to Occur within the PG&E Lakeville – Sonoma 115 kV Transmission Line Project and Alternatives Areas.

Common name **Scientific name**[1]	**Listing Status** **Federal**	**State**	**CNPS**[2]	**Flowering Period**	**Habitat Preferences**	**Potential for Occurrence**[3]
Napa false indigo *Amorpha californica var. napensis*	SLC	-	1B	Apr-Jul	Shaded, moist, mixed evergreen forest and oak woodlands. 150-2000m	Moderate. Known occurrences within 10 miles of project area.
Bent-flowered fiddleneck *Amsinckia lunaris*	SLC	-	1B	Mar-June	Coastal bluff scrub, cismontane woodland, valley and foothill grassland. 3-500m	Low. Few known occurrences are widely scattered; one is within 15 mi of project area.
Brewer's milk-vetch *Astragalus breweri*	-	-	4	Apr-Jun	Grassland, oak woodland, soil often serpentine-influenced. 90-730m	Moderate. Known occurrences > 10 mi from project area.
Clara Hunt's milk-vetch *Astragalus clarianus*	FE	CT	1B	Mar-Apr	Dry, open, blue oak woodlands; thin, rocky serpentine or volcanic soil. 75-275m	Low. Only 4 occurrences known, closest is > 10 mi from project area.
Baker's blennosperma *Blennosperma bakeri*	FE	CE	1B	Mar-Apr	Vernal pools within grassland, clay soil. 10-110m	High. Known occurrences within 1 mile of project area.
Narrow-anthered California brodiaea *Brodiaea californica var. leptalea*	SLC	-	1B	May-Jul	Broad-leaved upland forest, chaparral, lower montane conifer forest. 110-915m	Medium. One occurrence is approx. 10 mi from project area.
Dwarf downingia *Downingia pusilla*	-	-	2	Mar-May	Vernal pools within grassland, clay soil. 1-445m	High. Known occurrence within 2 miles of project area.
Marsh horsetail *Equisetum palustre*	-	-	3	None	Marshes and swamps. 45-1000m	Very low. Nearest occurrence > 10 mi from project area; Napa Co occurrence only second confirmed in CA.
Fragrant fritillary *Fritillaria liliacea*	SC	-	1B	Feb-Mar	Vernally wet coastal and valley grassland, oak woodland, clay soil. 3-410m	High. Known occurrence within 2 miles of project area.
Hayfield tarplant *Hemizonia congesta ssp. leucocephala*	-	-	3	Apr-Oct	Annual grassland, coastal scrub. 25-365 m	Moderate. Known from Sonoma County in vicinity of project area.

Common name Scientific name[1]	Listing Status Federal	State	CNPS[2]	Flowering Period	Habitat Preferences	Potential for Occurrence[3]
Northern California black walnut *Juglans hindsii*	SC	-	1B	Apr-May	Riparian woodland and scrub. 0-440m	High. Natural distribution poorly known; widely planted by Native Americans. Found within project area during project surveys; these plants likely not native.
Contra Costa goldfields *Lasthenia conjugens*	FE	-	1B	Mar-Jun	Cismontane woodland, alkaline playas, grasslands, vernal pools, 0-470 m.	Low. New location found in 2003 within 2 miles of project area (CDFG 2004). Vernal pools of the type suitable for this species not observed within project area.
Legenere *Legenere limosa*	SC	-	1B	Apr-Jun	Vernal pools. 1-880m	High. Occurs on east side of Sonoma Mtn, about 5 mi from project area.
Woolly-headed lessingia *Lessingia hololeuca*	-	-	3	Jun-Oct	Broad-leaved forest, coastal scrub, lower montane conifer forest, serpentinite clay soil. 15-305m	Low. Collections from Petaluma area are old.
Redwood lily *Lilium rubescens*	-	-	4	Jun-Aug	Redwood and mixed evergreen forest, shaded, sometimes on serpentine. 30-1715m	Low. Nearest known location > 10 mi from project area. Increasingly rare in southern part of range.
Bristly linanthus *Linanthus acicularis*	-	-	4	Apr-Jul	Chaparral openings, grassland and oak woodland. 55-1500m	Low. Nearest location > 10 mi from project area.
Broad-lobed linanthus *Linanthus latisectus*	-	-	4	Apr-Jun	Mixed evergreen forest, oak woodlands. 170-1500m	Moderate. Nearest locations 5-10 mi from project area.
Mt. Diablo cottonweed *Micropus amphibolus*	-	-	3	Mar-May	Mixed evergreen forest, oak woodland, chaparral, grassland. 45-825m	Moderate. Nearest location in Mayacamas Mtns, < 10 mi from project area.
Cotula navarretia *Navarretia cotulifolia*	-	-	4	Apr-Jun	Grassland, chaparral and woodland, adobe soil. 4-1830m	Low. Known occurrences > 10 mi from project area. Found during protocol surveys for this project.
Baker's navarretia *Navarretia leucocephala ssp. bakeri*	SC	-	1B	May-Jul	Locally in vernal pools of Santa Rosa Plain and adjacent hills. 15-1740m	Moderate. Nearest occurrence in Annadel State Park, > 10 mi from project area.

Common name Scientific name[1]	Listing Status Federal	State	CNPS[2]	Flowering Period	Habitat Preferences	Potential for Occurrence[3]
Gairdner's yampah *Perideridia gairdneri ssp. gairdneri*	SC	-	4	Jun-Oct	Mixed evergreen forest, chaparral, moist grassland, adobe flats. 0-365m	Moderate. Known from within 10 mi of project area.
Lobb's aquatic buttercup *Ranunculus lobbii*	-	-	4	Feb-May	Vernal pools, seasonal wetlands within grasslands and woodlands. 14-470m	High. Nearest known location about 2 mi from project area. Found during protocol surveys for this project.
Victor's gooseberry *Ribes victoris*	-	-	4	Mar-Apr	Mixed evergreen forest, chaparral. 100-750m	High. Nearest location about 2 mi from project area.
Showy indian clover *Trifolium amoenum*	FE	-	1B	Apr-Jun	Coastal bluff scrub, grassland, sometimes serpentinite. 5-415m Presumed extinct in Alameda, Mendocino, Napa, Santa Clara and Solano counties.	Very low. Presumed extinct throughout range until recently rediscovered in Sonoma & Marin counties.
Dark-mouthed triteleia *Triteleia lugens*	-	-	4	Apr-Jun	Mixed evergreen forest, chaparral, lower montane conifer forest. 100-1000m	Low. Nearest location > 10 mi from project area.

1. Scientific names, common names, and habitat notes from Hickman (1993) and Tibor (2001).

2. Plant status definitions are as follows:
   U.S. Fish and Wildlife Service designations:
   - FE Endangered: Any species that is in danger of extinction throughout all or a significant portion of its range.
   - FT Threatened: Any species likely to become endangered within the foreseeable future.
   - SC Species of concern: Other species of concern to the Service.
   - SLC Species of local concern: Species of local or regional concern or conservation significance.

   California Department of Fish and Game designations:
   - CE Endangered: Any species that is in danger of extinction throughout all or a significant portion of its range.
   - CT Threatened: Any species likely to become endangered within the foreseeable future.

   California Native Plant Society designations:
   - 1B Plants rare, threatened or endangered in California and elsewhere.
   - 2 Plants rare, threatened or endangered in California, but more common elsewhere.
   - 3 Plants for which more information is needed – a review list.
   - 4 Plants of limited distribution – a watch list.

3. Project area contains potential habitat for all species included in table. Potential for occurrence derived from evaluation of information from California Natural Diversity Database (2002a and b, 2003a), the California Native Plant Society's Inventory of Rare and Endangered Plants in California (Tibor 2001), A Flora of Sonoma County (Best et al. 1996), the CalFlora database (2003), and other sources.

Protocol-level field surveys were conducted by one or two surveyors walking meandering transects and visually observing a 200-foot wide survey corridor centered on the existing transmission pole alignment in segments 1, 2 and 17. All habitat suitable for rare plants was surveyed within these segments. Features with a high potential for supporting rare plants, such as rock outcrops and seasonal wetlands, were carefully examined, including those within and adjacent to the survey corridor. Rare plant populations found during protocol-level surveys were mapped in the field using a Trimble GeoExplorerIII, which provides 2-3 meter accuracy after post-processing of field-collected data. Population size, flowering condition, and habitat characteristics were recorded in the field. Population size was determined by visual estimates, using standard estimation techniques (Elzinga et al. n.d.).

Protocol-level surveys were conducted on March 19, 21 and 28, April 2, May 15 and June 24, 2003. This range of survey dates was selected to encompass the blooming times of all of the special-status plants potentially occurring within the project area. All areas identified as potential habitat for rare plants during reconnaissance-level surveys were visited two or three times during the blooming season. On June 10 and 11, 2004, focused surveys for cotula navarretia were conducted in the vicinity of poles 58, 59 and 60 (see Section 3.2.2).

Nearly all plant species found in the project area during protocol-level surveys were identified to species; all were identified to the level needed to determine whether they qualify as special-status plants. A list of all vascular plant taxa encountered within the project area was recorded in the field. Collections were made of specimens that could not be readily identified in the field. Final determinations were made by keying specimens using standard references such as *The Jepson Manual* (Hickman 1993), *A California Flora* (Munz and Keck 1968), and *A Flora of Sonoma County* (Best et al. 1996). Voucher specimens were made or photographs were taken to document the presence of the special-status plants found during the surveys. Voucher specimens will be donated to the Jepson Herbarium, Valley Life Sciences Building, University of California, Berkeley. A list of vascular plant taxa found within the proposed project and alternatives area is included in Appendix A.

3.0 Results

Vegetation and other cover types found in the study area are described below, followed by a discussion of special-status plant species found during the protocol-level surveys. Common and scientific names of plant species mentioned in the text and others observed in the study area are listed in Appendix A.

3.1 Vegetation Types

Ten vegetation types are represented within the study area, including six upland types and four wetland and riparian types. Nine of the ten are natural vegetation types. Vineyards and other agricultural lands constitute the tenth type. The natural vegetation types are named and characterized below based primarily on Holland (1986). Sawyer and Keeler-Wolf (1995) equivalents are given, when possible. The ten vegetation types found within the study area include:

Upland Types

- Coast Live Oak Forest and Woodland
- Mixed Evergreen Forest
- Non-native Grassland
- Oregon Oak Woodland
- Upland Redwood Forest
- Vineyards and other Agricultural Lands

Wetland and Riparian Types

- Coastal and Valley Freshwater Marsh
- North Coast Riparian Forest
- Northern Vernal Pool
- Vernal Marsh

3.1.1 Upland Vegetation Types

Coast Live Oak Forest and Woodland

Coast Live Oak Forest is an upland (non-riparian) vegetation type consisting of dense stands of coast live oak (*Quercus agrifolia*) that often form a closed canopy (Holland 1986). Oak woodland is similar, but the trees are more widely spaced and the canopy is open. This type is found on slopes and in valley bottoms of the Coast Ranges, from

Sonoma County to Santa Barbara County. The understory typically consists of a sparse to dense growth of shrubs, often including blue elderberry (*Sambucus mexicana*), toyon (*Heteromeles arbutifolia*) and poison oak (*Toxicodendron diversilobum*), as well as many species of annual and perennial forbs and grasses. Holland (1986) describes Coast Live Oak Forest and Coast Live Oak Woodland as separate, but intergrading, types. The Coast Live Oak series of Sawyer and Keeler-Wolf (1995) encompasses both Holland types.

Coast Live Oak Forest and Woodland is widespread within the study area, where it is found mainly on ridges and slopes with a northern or eastern exposure, and on the upper slopes of some steep-walled canyons with ephemeral drainages. California bay (*Umbellularia californica*) is a frequent associate. The understory can be open in heavily shaded sites, or it can be dominated by introduced weedy annual grasses, or weedy annual forbs such as Italian thistle (*Carduus pycnocephalus*) and milk thistle (*Silybum marianum*). The weedy understory type is observed primarily in areas currently used for livestock grazing. Cattle are observed to use the understory of these forests and woodlands for bedding down and resting during the hotter periods of the day. Coast Live Oak Woodland is found in segments 1 and 14.

No special-status plants were found within Coast Live Oak Forest and Woodland.

Mixed Evergreen Forest

As described by Holland (1986), Mixed Evergreen Forest is dominated by broad-leaved trees up to 100 feet in height that form a closed canopy. Oaks, madrone (*Arbutus menziesii*) and Douglas fir (*Pseudotsuga menziesii*) are characteristic species. Mixed Evergreen Forest occurs on slopes with moist, well-drained, coarse soils, within the zone of summer fog. Holland notes that Mixed Evergreen Forest is a transition type, both geographically and biologically, between dense coastal conifer forests (especially redwood forest) and open interior oak woodlands. It extends more or less continuously from Santa Cruz County to the Oregon border, in the outer Coast Ranges. It occurs sporadically from Santa Cruz County south to Santa Barbara County. There is no equivalent type in the series-based system of Sawyer and Keeler-Wolf (1995).

Within the study area, Mixed Evergreen Forest is found on the upper west-facing slopes of Sonoma Mountain, in segment 1. This area is frequently fog-enshrouded in summer due to the seasonal weather pattern that draws moisture from the coast into the interior on a daily basis. The dominant trees include California black oak (*Quercus kelloggii*), coast live oak, madrone, Douglas fir and Oregon oak (*Quercus garryana*). The understory contains a diverse array of native shrubs, forbs and grasses. Mixed Evergreen Forest within the study area is not currently grazed by livestock and retains a predominance of native plant species.

A non-flowering gooseberry similar in vegetative characters to the special-status plant Victor's gooseberry (*Ribes victoris*) was found during early season protocol-level

surveys. During a later survey, flowers were found, confirming the identity as canyon gooseberry (*Ribes menziesii*), a common species. No special-status plants were found in Mixed Evergreen Forest.

Non-native Grassland

Holland (1986) describes Non-native Grassland as consisting of a dense to sparse cover of introduced annual grasses, mainly less than three feet in height, often including a diverse assemblage of native annual forbs (wildflowers). The comparable type in Sawyer and Keeler-Wolf (1995) is the California Annual Grassland series. Both authors note that the species composition of annual grasses and forbs varies considerably among stands.

Within the study area, Non-native Grassland is characterized by dense stands of introduced annual and native perennial grasses, and a large variety of native and introduced annual and perennial forbs and geophytes (bulb plants). Considerable variation in species composition, vegetation height, soil moisture conditions, and disturbance levels related to land use exists within grasslands of the project area. Non-native Grassland is widespread within segments 1, 4, 14 and 15, and small patches are found within other segments.

Most non-native grasslands in the study area have a long history of livestock grazing, although many areas were not actively grazed during the field surveys conducted for this project. These currently ungrazed grasslands are dominated by introduced annual grasses such as slender wild oat (*Avena barbata*), brome grasses (*Bromus hordeaceus, B. diandrus* and others), Mediterranean barley (*Hordeum marinum* ssp. *gussoneanum*) and other barleys (*Hordeum* spp.), Italian ryegrass (*Lolium multiflorum*), introduced weedy forbs such as Italian thistle, milk thistle and yellow and purple starthistles (*Centaurea solstitialis* and *C. calcitrapa*), and native forbs such as tarweeds (*Hemizonia congesta, H. fitchii*) and summer lupine (*Lupinus formosus*). Coyote brush (*Baccharis pilularis*) is sometimes present in these sites. Small stands of native perennial grasses, especially purple needlegrass (*Nassella pulchra*) are occasionally found in this type of grassland. Native forbs are present in low diversity and numbers.

Sites that appear to have had lower levels of historic grazing and sites that are currently grazed at moderate levels support, in addition to non-native grasses and weedy forbs, native perennial grasses such as purple needlegrass, meadow barley (*Hordeum brachyantherum*), blue wildrye (*Elymus glaucus*), melic grasses (*Melica* spp.), and occasionally, California oat grass (*Danthonia californica*), as well as the introduced annual grasses noted above. These sites, especially areas with higher soil moisture levels, can support a great diversity of native annual and perennial forbs (e.g., *Layia chrysanthemoides, Lupinus* spp., *Linanthus* spp., *Navarretia* spp., *Sanicula* spp. and many others) and geophytes (*Calochortus* spp., *Brodiaea* spp., *Triteleia* spp.). Examples include grasslands on the upper west- and east-facing slopes of Sonoma Mountain in segments 1 and 14.

Non-native Grassland within segment 4 and some of segment 15 appears to be regularly plowed and over-planted with ryegrass and other non-native grasses. This grassland is mowed for hay annually.

Moist swales, vernal pools, vernal marshes and other seasonal wetlands are found within a grassland matrix within the study area. These wetlands are found in segments 1, 4, 10, 15 and 16, and are discussed below as separate vegetation types.

One population of the special-status plant cotula navarretia (*Navarretia cotulifolia*) was found in a site with moist adobe soil in Non-native Grassland within and adjacent to the survey corridor for segment 1. This species is discussed further in Section 3.2.2.

Oregon Oak Woodland

Holland (1986) describes Oregon Oak Woodland as varying from forests composed of pure stands with closed canopies, to mixed stands with other broad-leaved trees and conifers, to open savannah consisting of widely spaced individual trees. The equivalent type in Sawyer and Keeler-Wolf (1995) is the Oregon oak series. This type generally occurs in sites beyond the reach of summer fog. Oregon oak is shade-intolerant (Sawyer and Keeler-Wolf 1995) and may be replaced over time by conifers and hardwood trees on drained sites with moist soils. Oregon Oak Woodland is found within the Coast Ranges from Santa Cruz County north into Oregon.

Within the study area Oregon Oak Woodland consists of open woodlands of pure Oregon oak and mixed woodlands dominated by Oregon oak but also including blue oak (*Quercus douglasii*) and coast live oak. The understory is composed of non-native annual grasses, usually grazed. Oregon oak woodland occurs in segments 1 and 14.

No special-status plants were found within Oregon Oak Woodland.

Upland Redwood Forest

The Holland type (1986) called Redwood Forest is dominated by coast redwood (*Sequoia sempervirens*) and occurs more or less continuously along the coast from the Oregon border south to the southern end of Monterey County, according to Holland (1986). Redwood Forest can occur on all aspects, from alluvial stream terraces to steep slopes subject to erosion (Sawyer and Keeler-Wolf 1995). The Redwood series is the equivalent type in Sawyer and Keeler-Wolf (1995).

Redwood Forest within the study area corresponds to the Holland subtype called upland redwood forest, which is usually found on shallow, well-drained soils, often on slopes subject to erosion. Other tree species are often present and may be co-dominant. In the

study area, upland redwood forest occurs near the inland range limit for the species, and includes Douglas fir and madrone as associates. The understory is heavily shaded, with a sparse growth of sword fern (*Polystichum munitum*) and shade-tolerant native annual and perennial forbs. Upland redwood forest is found immediately adjacent to the survey corridor for segment 1, and elsewhere in the area. Small native groves of redwoods are found south of the proposed project route, near the vernal marsh that is west of the Rodgers Creek crossing on the upper west side of Sonoma Mountain, and on the nearby east-facing slopes of the Rodgers Creek drainage.

No special-status plants were found within Redwood Forest.

Vineyards and other Agricultural Lands

Vineyards and other agricultural lands are not natural vegetation, so they are not included in the systems of Holland (1986) or Sawyer and Keeler-Wolf (1995). Vineyards of wine grapes are common within the study area, occurring within or adjacent to all segments. Native plants sometimes persist within vineyards. In the flatlands of the Santa Rosa Plain in Sonoma County, special-status plants have occasionally been found within vineyards that contain seasonal wetlands and are not extensively tilled. The vineyards within the project area occur mainly on slopes, although some are on flatlands. During reconnaissance and protocol surveys, vineyards were evaluated for their likelihood of supporting special-status plants. None of the vineyards examined was considered likely to support special-status plants.

Segment 9 crosses a large strawberry field at the corner of Watmaugh Road and Arnold Drive. No habitat for special-status plants exists within this field.

3.1.2 Wetland and Riparian Vegetation Types

Coastal and Valley Freshwater Marsh

As described by Holland (1986), this wetland type occurs in areas that are permanently flooded with slow-moving or quiet fresh water (not brackish, alkaline or saline). Dominant plants include tall, rooted aquatic monocots, such as cattails (*Typha* spp.), bulrushes (*Scirpus* spp.), rushes (*Juncus* spp.), and aquatic grasses. Floating and emergent unrooted aquatic plants (e.g., *Polygonum* spp., *Potamogeton* spp.) are common associates. Coastal and Valley Freshwater Marsh has no single equivalent in the system of Sawyer and Keeler-Wolf (1995); this vegetation type would encompass several series, including: bulrush-cattail, cattail, duckweed, mosquito fern, pondweeds with floating leaves, and others.

Within the study area, Coastal and Valley Freshwater Marsh vegetation was found in artificial ponds and small reservoirs used mainly for vineyard irrigation. Several

reservoirs are located in segment 1. Two reservoirs are located in the vicinity of segment 16. The vegetation within these features varies from almost none to moderately developed. No special-status plants are expected to occur, nor were found, in freshwater marsh vegetation of these reservoirs during surveys conducted for this project.

North Coast Riparian Forest

Riparian forest is a streambank habitat consisting of dense stands of tall deciduous and evergreen trees that form a closed canopy, usually with 100 percent cover. This forest typically has a structurally complex understory of smaller trees, shrubs, vines, and annual and perennial forbs and grasses. Riparian forest within the study area fits within Holland's (1986) general type, North Coast Riparian Forest, but does not correspond to any of the described subtypes. The series-based system used by Sawyer and Keeler-Wolf (1995), which relies on one or two dominant species to characterize and name a type, does not accommodate vegetation composed of a mixture of co-dominant species, like that found in most of the riparian forest throughout the study area.

Riparian forest within the study area consists mainly of two subtypes, Mixed Riparian Forest and Oak-Bay Riparian Forest. The Mixed Riparian Forest subtype occurs along lower gradient, usually perennial streams, and consists of a mixture of deciduous and evergreen tree species, none of which dominates by area. Typical species include: coast live oak, valley oak (*Quercus lobata*), California buckeye (*Aesculus californicus*), Fremont cottonwood (*Populus fremontii*), Oregon ash (*Fraxinus latifolia*), California bay, white alder (*Alnus rhombifolia*), red willow (*Salix laevigata*) and walnuts (*Juglans hindsii* and others). The native understory often includes California wild grape (*Vitis californica*) and poison oak. This subtype occurs along perennial and intermittent streams with well-developed beds and banks. Examples of this subtype are found at the Rodgers Creek crossing in segment 1 and the Sonoma Creek crossings in segments 4, 9 and 17. This subtype occurs in a less robust form, with fewer species, smaller trees and a less complete canopy, along several intermittent streams within the study area, for example, the Felder and Carriger creek crossings in segments 4 and 17, and the Fowler Creek crossing in segment 16.

The Oak-Bay Riparian Forest subtype has a closed to broken canopy dominated by coast live oak and California bay, with a fairly open understory that includes poison oak. This subtype is found along smaller perennial streams and intermittent streams, for example, at the Felder Creek crossing in segment 2.

The special-status plant, Northern California black walnut (*Juglans hindsii*) was found in riparian forest, as discussed in more detail in Section 3.2.1.

Northern Vernal Pool

Vernal pools within the study area are a northern California type that do not fit within any of the subcategories of Northern Vernal Pools described by Holland (1986) or Sawyer and Keeler-Wolf (1995). As with all vernal pools, they occupy shallow depressions that hold water during the rainy season due to a clay or hardpan substrate that impedes water percolation.

Vernal pools in the study area are found in sites with a volcanic bedrock overlain by clay soil. Many of the characteristic plants are endemic annual forbs that germinate under water, then grow to maturity, flower and set seed as the pool dries. Examples include: goldfields (*Lasthenia* spp.), downingias (*Downingia* spp.), popcorn flowers (*Plagiobothrys* spp.), meadowfoams (*Limnanthes* spp.) and button-celeries (*Eryngium* spp.). Vernal pools were found within segments 1 and 16. Potential habitat for vernal pools exists within segment 10. The large vernal pool in segment 1, just east of the Rodgers Creek crossing, contains a population of the special-status plant Lobb's aquatic buttercup (*Ranunculus lobbii*), discussed further in Section 3.3.3. Vernal pools within segment 16 were observed only during a reconnaissance survey in September 2003, when vernal pool plants are dormant and cannot be identified, so their species composition is unknown.

Vernal Marsh

Vernal marshes are described by Holland (1986) as wetlands somewhat similar to vernal pools in species composition. They differ in hydrology, with vernal marshes retaining some standing water well into the summer, and often throughout the year. Often, the central area, with deeper water, supports plants characteristic of freshwater marshes, while the gradually sloping shoreline, which dries completely during the summer, supports vernal pool species. Vernal marshes are not included in the Sawyer and Keeler-Wolf (1995) system.

One vernal marsh was found adjacent to the segment 1 survey corridor, on the upper west-facing slope of Sonoma Mountain, just west of the Rodgers Creek crossing site. This wetland appears to have been formed from a natural vernal pool whose size was enhanced by the construction of a low berm along the eastern edge of the wetland. The well-developed appearance of the vegetation suggests that this enhancement occurred many years ago, probably at a time when the area was used for livestock grazing. This area was not grazed during surveys in 2002 and 2003. Common species identified on the shores of this vernal marsh during field surveys include: Jepson's button-celery (*Eryngium aristulatum*), flowering quillwort, (*Lilaea scilloides*), bracted popcorn flower (*Plagiobothrys bracteatus*) and pygmy-weed (*Crassula aquatica*). Common tule (*Scirpus acutus*), lance-leaved water plantain (*Alisma lanceolatum*) and floating pondweed (*Potamogeton* sp.) were common in the permanent standing water of this vernal marsh. No special-status plants were found in this vernal marsh.

3.2 Special-status Plant Species

Special-status plants found within the project area are discussed below. Field survey forms submitted to the California Natural Diversity Database are found in Appendix B.

3.2.1 *Juglans hindsii* (Northern California black walnut)

Juglans hindsii is a tall, deciduous tree in the Walnut Family (Juglandaceae) with the male flowers in greenish-yellow catkins and the small green female flowers borne singly or in small clusters near the ends of the new twigs. Its habitat is riparian woodland. According to Tibor (2001), only two native stands are still extant, one of which occurs in southeastern Napa County. Northern California black walnut trees were found at the Sonoma Creek crossings within segments 4, 8, and 17 (see Figure 1). At the segment 4 crossing, large trees of Northern California black walnut are a dominant feature of the North Coast Riparian Forest. At the segment 8 crossing, medium-sized trees occur with oaks and California bay in a mixed assemblage. At the segment 17 crossing, one large tree is found within the survey corridor near the stream crossing site, and several small to medium-sized trees and saplings are found within the riparian zone, in the vicinity of poles 107 and 108. Northern California black walnut is designated 1B, rare and endangered in California and elsewhere, in the California Native Plant Society's inventory (Tibor 2001).

Juglans hindsii can be distinguished readily from two introduced walnuts found occasionally within Sonoma County. Black walnut (*Juglans nigra*) leaves are more pubescent on their lower surfaces and the nuts are irregularly ridged, whereas those of *Juglans hindsii* are almost smooth. The English walnut (*Juglans regia*) has fewer (7-9), larger, leaflets, which are smooth along the margins (entire); Northern California black walnut has more leaflets (11-19), which are toothed along the margins (serrate).

Northern California black walnut is a fairly common tree within the riparian vegetation of the middle reaches of Sonoma Creek. It is not possible to determine with certainty whether any of these trees, including those found within the study area, are naturally occurring trees. Best and others (1996) note that it is debatable whether this species is native to Sonoma County, although they note that extensive stands of large trees are found along the Russian River in the vicinity of Guerneville. The edible nuts were widely traded by Native Americans, and, therefore, large trees appearing to be native and growing in natural habitat may be the result of early trade in nuts between local tribes and those of Napa, eastern Contra Costa or Sacramento counties, where the species is known to be native. However, walnuts are also transported by birds and other wildlife, leaving open the possibility that trees within the study area could have resulted from natural dispersal from native groves in eastern Napa County. In the absence of studies beyond

the scope of this project, it cannot be determined with certainty whether the trees within the study area are naturally occurring or the result of human activities.

Potential impacts to Northern California black walnut are discussed in Section 4.1.1.

3.2.2 *Navarretia cotulifolia* (cotula or broad-leaved navarretia)

Cotula navarretia is an annual forb with cream-colored flowers in the Polemoniaceae (Phlox Family) that is found in chaparral, cismontane woodlands, and especially in moist grasslands, sometimes with serpentine influence, from San Benito County to Mendocino, Colusa and Butte counties (Tibor 2001). One population was found within the proposed project area, in segment 1, on the lower east-facing slope of Sonoma Mountain, in grazed Non-native Grassland with adobe soil (see Figure 1), between and in the vicinity of poles 58, 59 and 60. The California Native Plant Society's Inventory (Tibor 2001) places cotula navarretia on List 4, a "watch" list of plants that may become endangered if additional habitat is lost. The project area population was estimated to consist of about 30,000 individuals during a focused survey conducted in June 2004. The population within the project area is significant because it is the only known location for this species in the Sonoma Valley area and in all of southern Sonoma County. In Sonoma County, only one other location for this species is currently known (Best et al. 1996).

Navarretia cotulifolia is one of 13 or possibly 14 taxa of navarretias that occur in Sonoma County, including three with special-status (Best et al. 1996). *Navarretia cotulifolia* is the only navarretia with the combination of four cream-colored corolla lobes, two stigma lobes and large leaves with lobes broader than 1 mm.

The CalFlora database (2003) lists 87 citations for *Navarretia cotulifolia*, statewide, including several specimen-based records from Sonoma County. *A Flora of Sonoma County* (Best et al. 1996) lists several locations in the Santa Rosa and Laguna de Santa Rosa areas, although most of these are 25 or more years old and are from areas that have since been developed. The Jepson Herbarium has one relatively recent specimen from Sonoma County, collected in 1986 at the California Department of Fish and Game's Todd Road Ecological Reserve, near the Laguna de Santa Rosa. No locations in the Sonoma Valley (Sonoma Creek watershed) or anywhere in southern Sonoma County are noted by any of these sources. The CNDDB does not include information on specific locations for plants ranked as CNPS 4.

The population of *Navarretia cotulifolia* in the project area is located in non-native annual grassland that was grazed by cattle in 2002 to 2004, during surveys conducted for this project. In June 2004 the population consisted of approximately 30,000 plants, in dense, interconnected colonies. A voucher specimen was collected. The area where the plants are found has dark gray "shrink-swell" clay soil and is dominated by annual grasses and forbs indicative of good habitat quality, including California oatgrass, blue

larkspur (*Delphinium variegatum*), short-leaved hesperevax (*Hesperevax sparsiflora*) and goldfields (*Lasthenia californica*).

Potential impacts and mitigations for cotula navarretia are discussed in Section 4.1.2.

3.2.3 *Ranunculus lobbii* (Lobb's aquatic buttercup)

Lobb's aquatic buttercup is an aquatic annual herb in the Buttercup Family (Ranunculaceae) with floating and submerged leaves, and small white flowers that float on the water surface when in bloom. Lobb's aquatic buttercup is endemic to vernal pools and other seasonal wetlands in coastal areas from Santa Clara County to Mendocino County and in Oregon. It is included on List 4, a "watch" list, in the CNPS Inventory (Tibor 2001). One population of *Ranunculus lobbii* was found within the proposed project area, in a large vernal pool in segment 1, about 0.1 mile east of the Rodgers Creek crossing.

Lobb's aquatic buttercup can be distinguished from a very similar white-flowered species, *Ranunculus aquatilis* var. *capillaceus*, which also occurs in the project area, by several features. *R. lobbii* is an annual, whereas *R. aquatilis* is a perennial. *R. lobbii* has floating, 3-lobed leaves with truncate lobes, whereas most of the leaves of *R. aquatilis* are finely divided and submerged, and the floating leaves have more pointed lobes. In the flower at anthesis (when stamens are releasing pollen), the stigmas of *R. lobbii* are significantly longer and thinner than those of *R. aquatilis*. In the fruit, *R. lobbii* produces 2-6 follicles per flower and *R. aquatilis* produces 15 or more. In addition, the stems of *R. aquatilis* are thicker and coarser, while those of *R. lobbii* are thinner and more delicate. In the field, the shape of the floating leaves and the length and thickness of the stigmas are the most reliable features for separating these two. In addition to morphological features, Lobb's aquatic buttercup is found only in vernal pools and other seasonal wetlands, whereas the more common aquatic buttercup (*R. aquatilis*) can be found in seasonal wetlands, but is more common in shallow ponds and slowly moving freshwater streams. Lobb's aquatic buttercup flowers earlier in the season, February to April, than the common aquatic buttercup, which flowers April to June.

Several additional locations for Lobb's aquatic buttercup are known in Sonoma County, where it is a fairly common component of the vernal pools of the Santa Rosa Plain. *A Flora of Sonoma County* (Best et al. 1996) lists 17 locations for this species, including the Todd Road Ecological Reserve, the Laguna de Santa Rosa, Fairfield Osborn Preserve (approximately 2 miles from the project area), and Sonoma County Regional Park. The species has not been seen at the Sonoma County Regional Park in the last five years, however, and many other populations on the Santa Rosa Plain have been extirpated by development within the last 15 years. The CalFlora database (2003) lists 10 specimen-based records for Lobb's aquatic buttercup in Sonoma County. The Jepson Herbarium has 11 specimens from Sonoma County.

The population of Lobb's aquatic buttercup in segment 1 was found in a large vernal pool in grazed annual grassland just east of the Rodgers Creek crossing. The growth form of this species makes it difficult to estimate numbers of individuals. The plants covered a crescent-shaped portion of the vernal pool approximately 80 feet by 20 feet in size, about one-fourth of the total area covered by the vernal pool. The pool showed substantial trampling impacts by cattle that were grazing in the area at the time of the protocol-level surveys.

Potential impacts and mitigations for Lobb's aquatic buttercup are discussed in Section 4.1.3.

4.0 Conclusions and Recommendations

4.1 Special-status Plant Recommendations

Three occurrences of special-status plants could be adversely affected by construction of the proposed project, including: one occurrence each of Northern California black walnut, cotula navarretia and Lobb's aquatic buttercup. Discussion of potential impacts of the proposed project and recommendations for reducing potential impacts to a level of insignificance are given below. With implementation of the recommended avoidance and minimization measures, all impacts would be less than significant.

All of the alternative routes (1 through 4) include a crossing of Sonoma Creek in an area where Northern California black walnut trees are located. Potential impacts to these trees are possible from construction and maintenance activities, however, these impacts would be minimal and would not be considered significant in any event because the native status of the trees has not been confirmed.

Alternatives 1 and 2 also utilize segment 1, so potential impacts to cotula navarretia and Lobb's aquatic buttercup in segment 1 would likely be identical to those discussed below. Alternatives 3 and 4 do not utilize segment 1, so these alternatives would not affect the cotula navarretia and Lobb's aquatic buttercup populations found in that segment. Protocol-level surveys have not been completed for some of the segments utilized in Alternatives 1 and 2, or for any of the segments utilized in Alternatives 3 and 4, with the exception of segment 4. Since some of these unsurveyed segments contain potential habitat for special-status plants, further surveys would need to be completed to provide a comprehensive description of the potential impacts to special-status plants from use of the alternatives.

The following discussion covers potential impacts and proposed mitigations for the proposed project only.

4.1.1 *Juglans hindsii* (Northern California black walnut)

Northern California black walnut is found in North Coast Riparian Forest where segment 17 crosses Sonoma Creek. This population would not be significantly affected by the proposed project. A few small saplings of Northern California black walnut on the banks of Sonoma Creek will likely be removed during activities associated with the replacement of pole 107, such as construction of an access road. Loss of these trees is considered to be a less-than-significant impact because their native status is unconfirmed and, at most, only a few saplings would be removed. Tree trimming of large walnut trees outside the riparian zone during construction or maintenance would not be a significant impact

because tree loss would be unlikely, Northern California black walnut trees are a dominant species within the riparian forest along Sonoma Creek, their native status is unconfirmed, and local ordinances permit such trimming.

4.1.2 *Navarretia cotulifolia* (cotula or broad-leaved navarretia)

One large population of cotula navarretia is found in grazed Non-native Grassland between and in the vicinity of poles 58, 59 and 60 in segment 1. This population was found within the 200-foot-wide survey corridor in June 2003. Construction details at that time indicated all potential impacts to the population would be avoided. Subsequent changes in construction details, especially the proposed location of a new access road, necessitated additional surveys in 2004 to determine the total extent of the population, beyond the originally authorized 200-foot-wide survey corridor. Expanded focused surveys in June 2004 found that this population of cotula navarretia extends beyond the 200-foot-wide corridor that was surveyed during protocol-level surveys in 2003. A new route for the proposed new permanent access road was located that minimizes the possibility of direct impacts to the entire population.

Direct and indirect impacts from the proposed project to cotula navarretia and its habitat are unlikely but possible from activities associated with the removal of poles 58 and 59, and construction of a new permanent access road in the vicinity of poles 58, 59 and 60. Surveys in June 2003 and June 2004 located a large population of cotula navarretia in the small valley in which poles 58 and 59 are located. All of the plants are north of an ephemeral drainage that flows through the bottom of the valley. Construction of the proposed temporary access road to pole 59 will likely not directly affect any of the plants, but erosion on the steep hillside on which the temporary access road will be constructed could cause erosion in the plant's habitat downslope. The proposed route of the new permanent access road from the vicinity of pole 60 to the vicinity of pole 57 has been rerouted to the ridgetop north of the small valley to avoid direct impacts to cotula navarretia. At the west end of the ridge, a cut will be required on the steep slope below the ridge to connect the new road segment to the existing ranch road. Erosion from the cut could affect potential habitat for cotula navarretia on the lower slope, although this is unlikely. No direct impacts from road construction are expected based on the plant's distribution in June 2004.

To reduce impacts to cotula navarretia from the proposed project to a level of insignificance, the following mitigation measures are recommended:

- Develop and utilize access routes to poles 58, 59 and 60 that, to the extent feasible, avoid direct impacts to special-status plants and their habitats.
- Habitat occupied by cotula navarretia will be protected by establishing an exclusion zone around the perimeter of the habitat where feasible. The

exclusion zone will be staked and flagged in the field prior to construction by a trained professional botanist. All new poles and temporary use areas (i.e., staging areas, cable pulls, access roads, etc.) will be located outside of this exclusion zone.

- During all phases of construction, the outer edge of the exclusion zone will be marked in the field with temporary fencing.

- Restrict construction personnel and equipment from entering the fenced protected area (exclusion zone and plant habitat) for any purpose.

- Restrict construction activities to the dry season (June to October), or, if this is not feasible, use appropriate erosion control measures.

- Monitor the protected areas, using a trained professional botanist, during construction and for one year following construction to assess the effectiveness of protection measures.

- Mitigate any direct or indirect impacts (e.g., weed invasion, erosion impacts) through appropriate weed control and erosion control measures.

4.1.3 *Ranunculus lobbii* (Lobb's aquatic buttercup)

The vernal pool in segment 1 containing Lobb's aquatic buttercup is located within the 200-foot-wide survey corridor of the proposed project route. The vernal pool is located within a shallow depression surrounded by low hills that is approximately 0.1 mile north of the segment 1 Rodgers Creek crossing site. Existing pole 43 would be replaced 130 feet to the east by a new pole and existing pole 44 would be removed if the proposed route is utilized. The proposed access roads to these poles include existing ranch roads and short sections of newly constructed temporary roads. All of these roads avoid direct impacts to the vernal pool. Potential impacts to Lobb's aquatic buttercup plants and their vernal pool habitat could result from construction-related activities that cause disturbances to topography, soils, hydrology or vegetation within or adjacent to vernal pool habitat occupied by the plants. Impacts to the vernal pool and Lobb's aquatic buttercup can be minimized or avoided if the following mitigations are implemented:

- Develop and utilize access routes to poles 43 and 44 that, to the extent feasible, avoid direct impacts to special-status plants and their habitats.

- Habitat occupied by Lobb's aquatic buttercup will be protected by establishing an exclusion zone around the perimeter of the habitat where feasible. The exclusion zone will be staked and flagged in the field prior to construction by a trained professional botanist. All new poles and temporary

use areas (i.e., staging areas, cable pulls, access roads, etc.) will be located outside of this exclusion zone.

- During all phases of construction, the outer edge of the exclusion zone will be marked in the field with temporary fencing.
- Restrict construction personnel and equipment from entering the fenced protected area (exclusion zone and plant habitat) for any purpose.
- Restrict construction activities to the dry season (June to October), or, if this is not feasible, use appropriate erosion control measures.
- Monitor the protected areas, using a trained professional botanist, during construction and for one year following construction to assess the effectiveness of protection measures.
- Mitigate any direct or indirect impacts (e.g., weed invasion, erosion impacts) through appropriate weed control and erosion control measures.

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Appendix A

List of Vascular Plants Found within the Study Area

PG&E Lakeville – Sonoma 115 kV Transmission Line Project and Alternatives Areas

PG&E Lakeville – Sonoma 115 kV Transmission Line Project and Alternatives Area	
Scientific Name[1]	**Common Name**
FERNS AND FERN ALLIES	
AZOLLACEAE	
Azolla filiculoides	mosquito fern
DENNSTAEDTIACEAE	
Pteridium aquilinum	bracken fern
DRYOPTERIDACEAE	
Dryopteris arguta	coastal wood fern
Polystichum munitum	sword fern
EQUISETACEAE	
Equisetum telmateia ssp. braunii	giant horsetail
POLYPODIACEAE	
Polypodium californicum	California polypody
PTERIDACEAE	
Adiantum jordanii	California maiden hair fern
Pentagramma triangularis	goldenback fern
SELAGINELLACEAE	
Selaginella bigelovii	Bigelow's spike-moss
CONIFERS	
PINACEAE	
Pseudotsuga menziesii	Douglas fir
TAXODIACEAE	
Sequoia sempervirens	coast redwood
FLOWERING PLANTS - DICOTS	
ACERACEAE	
Acer macrophyllum	big-leaf maple

PG&E Lakeville – Sonoma 115 kV Transmission Line Project and Alternatives Area	
Scientific Name[1]	**Common Name**
ANACARDIACEAE	
Toxicodendron diversilobum	poison oak
APIACEAE	
*Conium maculatum**	poison hemlock
Eryngium aristulatum	Jepson's button-celery
*Foeniculum vulgare*NW*	fennel
Lomatium utriculatum	bladder parsnip
Osmorhiza chilensis	sweet cicely
Sanicula bipinnatifida	purple sanicle
Sanicula crassicaulis	gamble weed
*Scandix pectin-veneris**	Venus's needle
*Torilis arvensis**	hedge-parsley
*Torilis nodosus**	hedge-parsley
APOCYNACEAE	
*Vinca major*NW*	periwinkle
ARISTOLOCHIACEAE	
Aristolochia californica	California pipevine
ASCLEPIADACEAE	
Asclepias fascicularis	narrow-leaf milkweed
ASTERACEAE	
Achillea millefolium	white yarrow
Achyrachaena mollis	blow-wives
Agoseris grandiflora	mountain dandelion
Agoseris heterophylla var. *heterophylla*	annual mountain dandelion
Artemisia douglasiana	mugwort
Aster radulinus	broad-leaved aster
Baccharis pilularis	coyote brush
Blennosperma nanum	common blennosperma
*Carduus pycnocephalus*NW*	Italian thistle
*Centaurea calcitrapa**	purple starthistle
*Centaurea solstitialis**	yellow starthistle
*Chamomilla suaveolens**	pineapple weed
*Cichorium intybus**	chicory
*Cirsium vulgare*NW*	bull thistle
*Conyza canadensis**	horseweed
*Cotula coronopifolia**	brass buttons

PG&E Lakeville – Sonoma 115 kV Transmission Line Project and Alternatives Area	
Scientific Name[1]	**Common Name**
Filago californica	California fluffweed
Helianthella californica	California helianthella
Hemizonia congesta ssp. *congesta*	hayfield tarplant
Hemizonia congesta ssp. *luzulifolia*	hayfield tarplant
Hemizonia fitchii	Fitch's spikeweed
Hesperevax sparsiflora var. *sparsiflora*	short-leaved evax
*Hypochaeris glabra**	smooth cat's ear
*Hypochaeris radicata**	hairy cat's ear
*Lactuca serriola**	prickly lettuce
Lasthenia californica	California goldfields
Lasthenia glaberrima	vernal pool goldfields
Layia chrysanthemoides ssp. *chrysanthemoides*	smooth tidy-tips
Gnaphalium palustre	lowland cudweed
Madia sativa	coast tarweed
Micropus californicus	California cottonweed
Microseris douglasii	douglas' microseris
*Picris echioides**	bristly ox-tongue
Psilocarphus oregonus	Oregon woolly marbles
*Rhagadiolus stellatus**	rhagadiolus
*Senecio vulgaris**	common groundsel
*Silybum marianum**	milk thistle
*Soliva sessilis**	soliva
*Sonchus asper**	prickly sow thistle
*Tragopogon porrifolius**	salsify
Wyethia angustifolia	narrow-leaved mule ears
Xanthium strumarium	cocklebur
BETULACEAE	
Alnus rhombifolia	white alder
Corylus cornuta var. *californica*	California hazelnut
BORAGINACEAE	
Amsinckia eastwoodiae	Eastwood's fiddleneck
Amsinckia menziesii var. *intermedia*	common fiddleneck
Amsinckia menziesii var. *menziesii*	Menzies's fiddleneck
Plagiobothrys bracteatus	bracted popcorn flower
Plagiobothrys fulvus	fulvous popcorn flower
Plagiobothrys nothofulvus	rusty popcorn flower

PG&E Lakeville – Sonoma 115 kV Transmission Line Project and Alternatives Area	
Scientific Name[1]	**Common Name**
BRASSICACEAE	
Barbarea orthoceras	American wintercress
*Brassica nigra**	black mustard
*Brassica rapa**	field mustard
*Capsella bursa-pastoris**	shepherd's purse
Cardamine californica	milk maids
Cardamine oligosperma	bittercress
*Hirshfeldia incana**	summer mustard
Lepidium nitidum	shining peppergrass
*Lepidium strictum**	wayside peppergrass
*Rorippa nasturtium-aquaticum**	watercress
*Raphanus raphanistrum**	jointed charlock
*Raphanus sativus**	wild radish
CALLITRICHACEAE	
Callitriche heterophylla var. bolanderi	Bolander's water-starwort
CAMPANULACEAE	
Downingia concolor	common downingia
CAPRIFOLIACEAE	
Lonicera hispidula var. vacillans	honeysuckle
Sambucus mexicana	blue elderberry
Symphoricarpos albus var. laevigatus	snowberry
Symphoricarpos mollis	creeping snowberry
CARYOPHYLLACEAE	
*Cerastium glomeratum**	mouse-ear chickweed
*Spergula arvensis**	starwort
Spergularia rubra	purple sand spurry
*Stellaria media**	common chickweed
CHENOPODIACEAE	
Atriplex triangularis	spearscale
CONVOLVULACEAE	
*Convolvulus arvensis**	bindweed
CRASSULACEAE	
Crassula aquatica	pygmy-weed
Crassula connata	sand pygmy-weed

PG&E Lakeville – Sonoma 115 kV Transmission Line Project and Alternatives Area	
Scientific Name[1]	**Common Name**
Crassula tillaea	Mediterranean pygmy-weed
Dudleya cymosa	rock lettuce
ERICACEAE	
Arctostaphylos manzanita ssp. m*anzanita*	common manzanita
Arbutus menziesii	Pacific madrone
EUPHORBIACEAE	
Chamaesyce serpyllifolia ssp. *hirtula*	
*Euphoria oblongata*NW*	oblong spurge
FABACEAE	
Lathyrus vestitus	hillside pea
*Lotus corniculatus**	bird's foot trefoil
Lotus humistratus	colchita
Lotus micranthus	hill lotus
Lotus purshianus	Spanish clover
Lotus wrangelianus	California lotus
Lupinus bicolor	miniature lupine
Lupinus formosus var. *robustus*	summer lupine
Lupinus nanus	valley sky lupine
*Medicago polymorpha**	California burclover
*Melilotus indicus**	yellow sweet clover
Trifolium bifidum	Pinole clover
*Trifolium campestre**	hop clover
Trifolium depauperatum	sac clover
*Trifolium dubium**	shamrock clover
*Trifolium fragiferum**	strawberry clover
Trifolium glomeratum	clustered clover
Trifolium gracilentum	pinpoint clover
*Trifolium hirtum**	rose clover
*Trifolium incarnatum**	crimson clover
Trifolium microdon	cupcake clover
Trifolium oliganthum	few-flowered clover
*Trifolium striatum**	striped clover
*Trifolium subterraneum**	subterranean clover
Trifolium variegatum	white tip clover
Trifolium willdenovii	tomcat clover
Vicia sativa var. *nigra**	spring vetch
Vicia sativa var. *sativa**	spring vetch
Vicia villosa var. *varia**	winter vetch

PG&E Lakeville – Sonoma 115 kV Transmission Line Project and Alternatives Area	
Scientific Name[1]	**Common Name**
FAGACEAE	
Quercus agrifolia var. *agrifolia*	coast live oak
Quercus douglasii	blue oak
Quercus garryana var. *garryana*	Oregon oak
Quercus lobata	valley oak
Quercus kelloggii	California black oak
GERANIACEAE	
*Erodium botrys**	broadleaf filaree
*Erodium cicutarium**	red-stemmed filaree
*Geranium dissectum**	cranesbill
*Geranium molle**	woodland geranium
*Geranium robertianum**	red robin, herb Robert
GROSSULARIACEAE	
Ribes menziesii	canyon gooseberry
HIPPOCASTANACEAE	
Aesculus californica	California buckeye
HYDROPHYLLACEAE	
Nemophila heterophylla	canyon nemophila
Nemophila menziesii ssp. menziesii	baby blue-eyes
Phacelia distans	wild-heliotrope
JUGLANDACEAE	
Juglans hindsii	Northern California black walnut
LAMIACEAE	
*Marrubium vulgare**	horehound
*Mentha pulegium**NW	pennyroyal
Stachys ajugoides	hedge-nettle
LAURACEAE	
Umbellularia californica	California bay
LIMNANTHACEAE	
Limnanthes douglasii ssp. *douglasii*	common meadowfoam

PG&E Lakeville – Sonoma 115 kV Transmission Line Project and Alternatives Area	
Scientific Name[1]	**Common Name**
LINACEAE	
*Linum bienne**	blue flax
LYTHRACEAE	
*Lythrum hyssopifolium**	loosetrife
MALVACEAE	
*Malva nicaeensis**	bull mallow
Malvella leprosa	alkali mallow
MORACEAE	
*Maclura pomifera**	osage orange
MYRTACEAE	
*Eucalyptus camaldulensis**	red gum
OLEACEAE	
Fraxinus latifolia	Oregon ash
*Olea europea**	olive
ONAGRACEAE	
Camissonia ovata	sun cup
Clarkia sp.	farewell-to-spring
Epilobium brachycarpum	annual fireweed
Epilobium ciliatum	common willow-herb
Ludwigia peploides ssp. *peploides*	water primrose
OXALIDACEAE	
*Oxalis pes-caprae**	bermuda buttercup
PAPAVERACEAE	
Eschscholzia californica	California poppy
PLANTAGINACEAE	
Plantago erecta	California plantain
*Plantago lanceolata**	English plantain
*Plantago major**	common plantain
POLEMONIACEAE	
Gilia tricolor	bird's eye gilia
Linanthus androsaceus	shower gilia

PG&E Lakeville – Sonoma 115 kV Transmission Line Project and Alternatives Area	
Scientific Name[1]	**Common Name**
Navarretia cotulifolia	cotula navarretia
Navarretia intertexta	needle-leaved navarretia
Phlox gracilis	slender phlox
POLYGONACEAE	
Polygonum lapathifolium	willow weed
Polygonum punctatum	water smartweed
*Rumex acetosella**	sheep sorrel
*Rumex conglomeratus**	clustered dock
*Rumex crispus**	curly dock
*Rumex pulcher**	fiddle dock
PORTULACACEAE	
Claytonia perfoliata	miner's lettuce
Lewisia rediviva	bitterroot
Montia fontana	water chickweed
PRIMULACEAE	
*Anagallis arvensis**	scarlet pimpernel
Dodecatheon hendersonii	Henderson's shooting star
Trientalis latifolia	starflower
RANUNCULACEAE	
Delphinium variegatum	blue larkspur
Ranunculus aquatilis	water buttercup
Ranunculus californicus	California buttercup
Ranunculus lobbii	Lobb's aquatic buttercup
*Ranunculus muricatus**	prickle-fruited buttercup
Ranunculus orthorhynchus var. *bloomeri*	bloomer's buttercup
RHAMNACEAE	
Rhamnus californica	California coffeeberry
ROSACEAE	
Adenostoma fasciculatum	chamise
Aphanes occidentalis	western ladies' mantle
Fragaria vesca	wood strawberry
Heteromeles arbutifolia	toyon
Holodiscus discolor	oceanspray
Potentilla glandulosa	sticky cinquefoil
Prunus sp.	

PG&E Lakeville – Sonoma 115 kV Transmission Line Project and Alternatives Area	
Scientific Name[1]	**Common Name**
Rosa sp.	wild rose
*Rubus discolor*NW*	Himalayan blackberry
Rubus ursinus	California blackberry
RUBIACEAE	
Galium aparine	goose-grass
*Galium parisiense**	wall bedstraw
Galium porrigens	climbing bedstraw
*Sherardia arvensis**	field madder
SALICACEAE	
Populus fremontii	Fremont cottonwood
Salix exigua	sandbar willow
Salix laevigata	red willow
Salix lucida ssp. *lasiandra*	shining willow
SAXIFRAGACEAE	
Lithofragma affine	woodland star
SCROPHULARIACEAE	
*Bellardia trixago**	Mediterranean lineseed
Castilleja attenuata	valley tassels
Castilleja densiflora	owl's clover
Collinsia heterophylla	Chinese houses
Collinsia sparsiflora var. arvensis	giant blue-eyed Mary
*Kickxia spuria**	
Mimulus aurantiacus	bush monkeyflower
Mimulus guttatus	common monkeyflower
*Parentucellia viscosa**	yellow glandweed
Pedicularis densiflora	Indian warrior
Scrophularia californica	California figwort
Triphysaria eriantha ssp. *eriantha*	butter-and-eggs
Triphysaria pusilla	dwarf owl's clover
Triphysaria versicolor ssp. f*aucibarbata*	yellow owl's clover
Triphysaria versicolor ssp. v*ersicolor*	yellow owl's clover
*Veronica anagallis-aquatica**	water speedwell
Veronica peregrina ssp. xalapensis	purslane speedwell
SIMAROUBACEAE	
*Ailanthus altissimus*NW*	tree of heaven

PG&E Lakeville – Sonoma 115 kV Transmission Line Project and Alternatives Area	
Scientific Name[1]	**Common Name**
SOLANCEAE	
Solanumsp.	nightshade
TRAPAEOLACEAE	
*Tropaeolum majus**	garden nasturtium
URTICACEAE	
Urtica dioica	nettle
VALERIANACEAE	
Plectritis macrocera	long-spurred plectritis
VIOLACEAE	
Viola pedunculata	johnny-jump-up
VISCACEAE	
Phoradendron villosum	oak mistletoe
ZYGOPHYLLACEAE	
*Tribulus terrestris*NW*	puncture vine
FLOWERING PLANTS – MONOCOTS	
ALISMATACEAE	
*Alisma lanceolatum**	lance-leaved water-plantain
CYPERACEAE	
Carex nudata	torrent sedge
Carex sp.	sedge
Cyperus eragrostis	umbrella sedge
Eleocharis acicularis	small spikerush
Eleocharis macrostachya	pale spikerush
Scirpus acutus var. occidentalis	common tule
IRIDACEAE	
Iris macrosiphon	ground iris
*Romulea rosea var. australis**	satin flower
Sisyrinchium bellum	blue-eyed grass

PG&E Lakeville – Sonoma 115 kV Transmission Line Project and Alternatives Area	
Scientific Name[1]	**Common Name**
JUNCACEAE	
Juncus bufonius	toad rush
Juncus effusus	Pacific bog rush
Junus occidentalis	western rush
Juncus tenuis	slender rush
Juncus xiphioides	iris-leaved rush
Luzula comosa	coastal wood rush
JUNCAGINACEAE	
Lilaea scillioides	flowering quillwort
LEMNACEAE	
Lemna sp.	duckweed
LILIACEAE	
Brodiaea elegans	elegant brodiaea
Calochortus luteus	yellow mariposa
Chlorogalum pomeridianum	soap plant
Dichelostemma capitatum ssp. capitatum	blue dicks
Dichelostemma congestum	ookow
Fritillaria affinis	checker lily
Smilacina racemosa	false Solomon's seal
Trillium sp.	wake robin
Triteleia hyacinthina	white brodiaea
Triteleia laxa	Ithuriel's spear
Zigadenus fremontii	star lily
POACEAE	
*Aira caryophyllea**	shiver grass
Alopecurus saccatus	saccate foxtail
*Avena barbata**	slender wild oat
*Brachypodium distachyon**	false brome
*Briza maxima**	quaking grass
*Briza minor**	little quaking grass
Bromus carinatus	California brome
*Bromus diandrus**	ripgut brome
*Bromus hordeaceus**	soft chess
Bromus laevipes	chinook brome
Bromus madritensis ssp. *rubens**	foxtail chess
*Cynodon dactylon**	bermuda grass
*Cynosurus echinatus**	hedgehog dogtail

PG&E Lakeville – Sonoma 115 kV Transmission Line Project and Alternatives Area	
Scientific Name[1]	**Common Name**
*Dactylis glomerata**	orchard grass
Danthonia californica var. *californica*	California oatgrass
Elymus glaucus ssp. glaucus	blue wildrye
Festuca californica	California fescue
Glyceria occidentalis	western mannagrass
Hordeum brachyantherum ssp. *brachyantherum*	meadow barley
Hordeum marinum ssp. *gussoneanum**	Mediterranean barley
Hordeum murinum ssp. *leporinum**	foxtail barley
*Hordeum vulgare**	barley
*Lamarckia aurea**	goldentop
*Leersia oryzoides**	rice cutgrass
*Lolium multiflorum**	italian ryegrass
*Lolium perrine**	perennial ryegrass
Melica californica	california melic
Nassella pulchra	purple needlegrass
*Paspalum dilatatum**	dallis grass
*Phalaris aquatica**	Harding grass
*Phleum pratense**	cultivated timothy
Pleuropogon californicus	semaphore grass
*Poa annua**	annual bluegrass
*Polypogon monspeliensis**	rabbitfoot grass
*Taeniatherum caput-medusae**	medusahead
Vulpia myuros	fescue
*Vulpia octoflora**	six-weeks fescue
POTAMOGETONACEAE	
Potamogeton sp.	floating pondweed
TYPHACEAE	
Typha sp.	cat-tail

Notes:
1. Scientific names mainly from Hickman 1993.
   * = not native to California
   NW = noxious weed listed by Caifornia Invasive Plant Council and/or California Dept. of Food and Agriculture.

Appendix B

California Natural Diversity Database
Field Survey Forms

PG&E Lakeville – Sonoma 115 kV Transmission Line Project and Alternatives Areas

California Native Species Field Survey Form

Mail to:
Natural Diversity Database
California Department of Fish and Game
1807 13th Street, Suite 202
Sacramento, CA 95814

For Office Use Only
Source Code _____ Quad Code _____
Elm Code _____ Occ. No. _____
EO Index No. _____ Map Index No. _____

Date of Field Work: 9 (month (mm)) - 12 (date (dd)) - 2003 (year (yyyy))

Scientific Name: Juglans hindsii — 1

Common Name: Northern California black walnut

Species Found? ☑ yes ☐ no _____ If not, why?
Total No. Individuals 10 Subsequent Visit? ☐ yes ☐ no
Is this an existing NDDB occurrence? _____ ☐ no ☑ unk.
Yes, Occ. #
Collection? If yes: _____ Number _____ Museum / Herbarium

Reporter: Ann Howald
Address: 210 Chestnut Avenue
Sonoma, CA 95476
Email Address: annhowald@vom.com
Phone: (707) 939-0775

Plant Information
Phenology: _____ % vegetative _____ % flowering 100.00 % fruiting

Animal Information
Age Structure: _____ # adults _____ # juveniles _____ # unknown
☐ breeding ☐ wintering ☐ burrow site ☐ rookery ☐ nesting ☐ other

Location (please also attach or draw map on back)
Sonoma Creek, at the intersection of Watmaugh Road, in the City of Sonoma.

County: Sonoma Landowner / Mgr.: private
Quad Name: Sonoma Elevation: 45 ft
T _____ R _____ _____ 1/4 of _____ 1/4 of Section _____ T _____ R _____ _____ 1/4 of _____ 1/4 of Section _____
UTM: Zone: _____ (10, 11) Datum: _____ (NAD83, NAD27, WGS84, other)
Source: _____ (GPS, map & type, etc.) Point Accuracy: _____ Meters
UTM Coordinates _____

Habitat Description *(plant communities, dominants, associates, substrates/soils, aspects/slope)*
Mixed riparian woodland, no one species dominates: Quercus agrifolia, Q. lobata, Umbellularia californica, Salix lasiolepis, S. exigua, S. lasiandra, Vitis californica, Toxicodendron diversilobum, Arundo donax.

Other rare species? No

Site Information Overall site quality: ☐ Excellent ☑ Good ☐ Fair ☐ Poor
Current / surrounding land use: Vineyards and rural residential on adjacent land.
Visible disturbances / possible threats: Invasive plants.
Comments: Unlikely that these trees have resulted from natural dispersal but cannot determine with certainty.

Determination: *(check one or more, and fill in blanks)*
☑ Keyed (cite reference): Jepson Manual, Flora of Sonoma Co.
☐ Compared with specimen housed at: _____
☐ Compared with photo / drawing in: _____
☐ By another person (name): _____
☐ Other: _____

Photographs: *(check one or more)* Slide Print
Plant / animal ☐ ☐
Habitat ☐ ☐
Diagnostic feature ☐ ☐
May we obtain duplicates at our expense? ☐ yes ☐ no

California Native Species Field Survey Form

Mail to:
Natural Diversity Database
California Department of Fish and Game
1807 13th Street, Suite 202
Sacramento, CA 95814

For Office Use Only
Source Code _____ Quad Code _____
Elm Code _____ Occ. No. _____
EO Index No. _____ Map Index No. _____

Date of Field Work: 9 (month (mm)) - 12 (date (dd)) - 2003 (year (yyyy))

Scientific Name: Juglans hindsii — 2

Common Name: Northern California black walnut

Species Found? ☑ yes ☐ no _____ If not, why?
Total No. Individuals 8 Subsequent Visit? ☐ yes ☐ no
Is this an existing NDDB occurrence? _____ ☐ no ☑ unk.
Yes, Occ. #
Collection? If yes: _____ Number _____ Museum / Herbarium

Reporter: Ann Howald
Address: 210 Chestnut Avenue
Sonoma, CA 95476
Email Address: annhowald@vom.com
Phone: (707) 939-0775

Plant Information
Phenology: _____ % vegetative _____ % flowering 100.00 % fruiting

Animal Information
Age Structure: _____ # adults _____ # juveniles _____ # unknown
☐ breeding ☐ wintering ☐ burrow site ☐ rookery ☐ nesting ☐ other

Location ***(please also attach or draw map on back)***
Sonoma Creek, at the intersection of unnamed road that is the eastern extension of Specht Road. Specht Road intersects Highway 12 between Leveroni and Watmaugh Roads, in the City of Sonoma.

County: Sonoma Landowner / Mgr.: private
Quad Name: Sonoma Elevation: 45 ft
T _____ R _____ _____ 1/4 of _____ 1/4 of Section _____ T _____ R _____ _____ 1/4 of _____ 1/4 of Section _____
UTM: Zone: _____ (10, 11) Datum: _____ (NAD83, NAD27, WGS84, other)
Source: _____ (GPS, map & type, etc.) Point Accuracy: _____ Meters
UTM Coordinates _____

Habitat Description *(plant communities, dominants, associates, substrates/soils, aspects/slope)*
Mixed riparian woodland, no one species dominates: Quercus agrifolia, Q. lobata, Umbellularia californica, Aesculus californica, Alnus rhombifolia, Salix lasiolepis, S. exigua, S. lasiandra, Vitis californica, Toxicodendron diversilobum, Arundo donax.

Other rare species? No

Site Information Overall site quality: ☐ Excellent ☑ Good ☐ Fair ☐ Poor
Current / surrounding land use: Vineyards and rural residential on adjacent land.
Visible disturbances / possible threats: Invasive plants.
Comments: Large trees. Unlikely that these trees have resulted from natural dispersal but cannot determine with certainty.

Determination: *(check one or more, and fill in blanks)*
☑ Keyed (cite reference): Jepson Manual, Flora of Sonoma Co.
☐ Compared with specimen housed at: _____
☐ Compared with photo / drawing in: _____
☐ By another person (name): _____
☐ Other: _____

Photographs: *(check one or more)* Slide Print
Plant / animal ☐ ☐
Habitat ☐ ☐
Diagnostic feature ☐ ☐
May we obtain duplicates at our expense? ☐ yes ☐ no

California Native Species Field Survey Form

Mail to:
Natural Diversity Database
California Department of Fish and Game
1807 13th Street, Suite 202
Sacramento, CA 95814

For Office Use Only
Source Code _____ Quad Code _____
Elm Code _____ Occ. No. _____
EO Index No. _____ Map Index No. _____

Date of Field Work: 9 (month (mm)) - 15 (date (dd)) - 2003 (year (yyyy))

Scientific Name: Juglans hindsii – 3

Common Name: Northern California black walnut

Species Found? ☑ yes ☐ no _____ If not, why?
Total No. Individuals 5 Subsequent Visit? ☐ yes ☐ no
Is this an existing NDDB occurrence? _____ ☐ no ☑ unk.
Yes, Occ. #
Collection? If yes: _____ Number _____ Museum / Herbarium

Reporter: Ann Howald
Address: 210 Chestnut Avenue
Sonoma, CA 95476
Email Address: annhowald@vom.com
Phone: (707) 939-0775

Plant Information
Phenology: _____ % vegetative _____ % flowering 100.00 % fruiting

Animal Information
Age Structure: _____ # adults _____ # juveniles _____ # unknown
☐ breeding ☐ wintering ☐ burrow site ☐ rookery ☐ nesting ☐ other

Location (please also attach or draw map on back)
Sonoma Creek, at the intersection of Leveroni Road, in the City of Sonoma.

County: Sonoma Landowner / Mgr.: private
Quad Name: Sonoma Elevation: 60 ft
T _____ R _____ _____ 1/4 of _____ 1/4 of Section _____ T _____ R _____ _____ 1/4 of _____ 1/4 of Section _____
UTM: Zone: _____ (10, 11) Datum: _____ (NAD83, NAD27, WGS84, other)
Source: _____ (GPS, map & type, etc.) Point Accuracy: _____ Meters
UTM Coordinates _____

Habitat Description *(plant communities, dominants, associates, substrates/soils, aspects/slope)*
Mixed riparian woodland, no one species dominates: Quercus agrifolia, Q. lobata, Umbellularia californica, Alnus rhombifolia, Populus fremontii, Salix lasiolepis, S. exigua, S. lasiandra, Vitis californica, Toxicodendron diversilobum, Arundo donax.

Other rare species? No

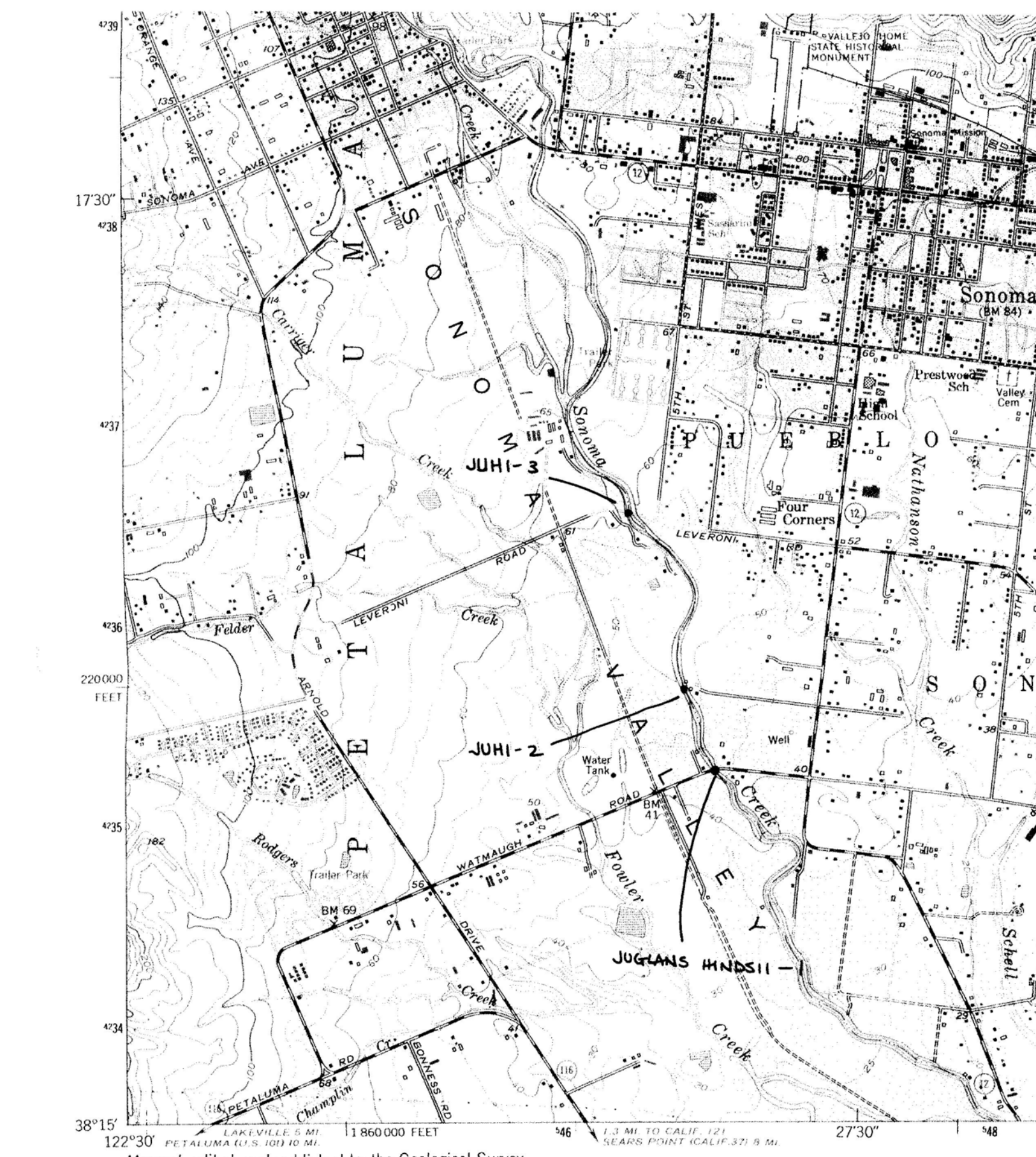
Site Information Overall site quality: ☐ Excellent ☑ Good ☐ Fair ☐ Poor
Current / surrounding land use: Vineyards and rural residential on adjacent land.
Visible disturbances / possible threats: Invasive plants.
Comments: Unlikely that these trees have resulted from natural dispersal but cannot determine with certainty.

Determination: *(check one or more, and fill in blanks)*
☑ Keyed (cite reference): Jepson Manual, Flora of Sonoma Co.
☐ Compared with specimen housed at: _____
☐ Compared with photo / drawing in: _____
☐ By another person (name): _____
☐ Other: _____

Photographs: *(check one or more)*

	Slide	Print
Plant / animal	☐	☐
Habitat	☐	☐
Diagnostic feature	☐	☐

May we obtain duplicates at our expense? ☐ yes ☐ no



Mapped, edited, and published by the Geological Survey

Control by USGS, USC&GS, and USCE

Topography from aerial photographs by multiplex methods and by plane-table surveys 1951. Aerial photographs taken 1948

Polyconic projection

10,000-foot grid based on California coordinate system, zone 2

SONOMA 7½' QUAD

California Native Species Field Survey Form

Mail to:
Natural Diversity Database
California Department of Fish and Game
1807 13th Street, Suite 202
Sacramento, CA 95814

For Office Use Only
Source Code _____ Quad Code _____
Elm Code _____ Occ. No. _____
EO Index No. _____ Map Index No. _____

Date of Field Work: 5 (month (mm)) - 15 (date (dd)) - 2003 (year (yyyy))

Scientific Name: Navarretia cotulifolia

Common Name: cotula navarretia

Species Found? ☑ yes ☐ no _____ If not, why?

Total No. Individuals 20,000 Subsequent Visit? ☐ yes ☐ no

Is this an existing NDDB occurrence? _____ ☐ no ☑ unk.

Collection? If yes: 2,334.00 (Number) Jepson Herbarium (Museum / Herbarium) Yes, Occ. #

Reporter: Ann Howald
Address: 210 Chestnut Avenue
Sonoma, CA 95476

Email Address: annhowald@vom.com
Phone: (707) 939-0775

Plant Information

Phenology: _____ % vegetative 100.00 % flowering _____ % fruiting

Animal Information

Age Structure: _____ # adults _____ # juveniles _____ # unknown

☐ breeding ☐ wintering ☐ burrow site ☐ rookery ☐ nesting ☐ other

Location ***(please also attach or draw map on back)***

Eastern base of Sonoma Mountain, approx. 0.2 mile southwest of west end of Felder Creek Road.

County: Sonoma Landowner / Mgr.: private

Quad Name: Glen Ellen Elevation: 135 m

T _____ R _____ _____ 1/4 of _____ 1/4 of Section _____ T _____ R _____ _____ 1/4 of _____ 1/4 of Section _____

UTM: Zone: 10 (10, 11) Datum: NAD 83 (NAD83, NAD27, WGS84, other)

Source: GPS (GPS, map & type, etc.) Point Accuracy: 3 Meters

UTM Coordinates 0542034, 4235700

Habitat Description *(plant communities, dominants, associates, substrates/soils, aspects/slope)*

Annual grassland, moist clay hollow, with Lasthenia californica, Delphinium variegatum, Achyrachaena mollis, Microseris douglasii, Trifolium faucibarbata, Sisyrhynchium bellum.

Other rare species? No

Site Information Overall site quality: ☐ Excellent ☑ Good ☐ Fair ☐ Poor

Current / surrounding land use: cattle grazing

Visible disturbances / possible threats:

Comments: Grazing keeps non-native grasses in check, although natives affected by trampling. Water trough nearby. Only known pop in Sonoma Valley (Sonoma Creek watershed). Few locations for county.

Determination: *(check one or more, and fill in blanks)*

- ☑ Keyed (cite reference): Jepson Manual, Flora of Sonoma Co.
- ☐ Compared with specimen housed at: _____
- ☐ Compared with photo / drawing in: _____
- ☐ By another person (name): _____
- ☐ Other: _____

Photographs: *(check one or more)*

	Slide	Print
Plant / animal	☐	☐
Habitat	☐	☐
Diagnostic feature	☐	☐

May we obtain duplicates at our expense? ☐ yes ☐ no

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For Office Use Only
Source Code _____ Quad Code _____
Elm Code _____ Occ. No. _____
EO Index No. _____ Map Index No. _____

Date of Field Work: 3 (month (mm)) - 28 (date (dd)) - 2003 (year (yyyy))

Scientific Name: Ranunculus lobbii

Common Name: Lobb's aquatic buttercup

Species Found? ☑ yes ☐ no _____ If not, why?
Total No. Individuals _____ Subsequent Visit? ☐ yes ☐ no
Is this an existing NDDB occurrence? _____ ☐ no ☑ unk. Yes, Occ. #
Collection? If yes: _____ Number _____ Museum / Herbarium

Reporter: Ann Howald
Address: 210 Chestnut Avenue
Sonoma, CA 95476
Email Address: annhowald@vom.com
Phone: (707) 939-0775

Plant Information
Phenology: _____ % vegetative 100.00 % flowering _____ % fruiting

Animal Information
Age Structure: _____ # adults _____ # juveniles _____ # unknown
☐ breeding ☐ wintering ☐ burrow site ☐ rookery ☐ nesting ☐ other

Location (please also attach or draw map on back)
Sonoma Mountain, approx. 0.1 mile northeast of intersection of electric transmission line and Rodgers Creek.

County: Sonoma Landowner / Mgr.: private
Quad Name: Glen Ellen Elevation: 550 ft
T _____ R _____ _____ 1/4 of _____ 1/4 of Section _____ T _____ R _____ _____ 1/4 of _____ 1/4 of Section _____
UTM: Zone: _____ (10, 11) Datum: _____ (NAD83, NAD27, WGS84, other)
Source: _____ (GPS, map & type, etc.) Point Accuracy: _____ Meters
UTM Coordinates _____

Habitat Description *(plant communities, dominants, associates, substrates/soils, aspects/slope)*
Natural vernal pool in annual grassland, with Lilaea scilloides, Plagiobothrys bracteatus, Montia fontana, Eryngium aristulatum, Callitriche heterophylla ssp. bolanderi. Vernal pool large for area (20m in diameter), round, shallow, isolated. Coast live oak woodland on slopes nearby.

Other rare species? No

Site Information Overall site quality: ☐ Excellent ☑ Good ☑ Fair ☐ Poor

Current / surrounding land use: cattle grazing

Visible disturbances / possible threats: Pool heavily trampled by cattle.

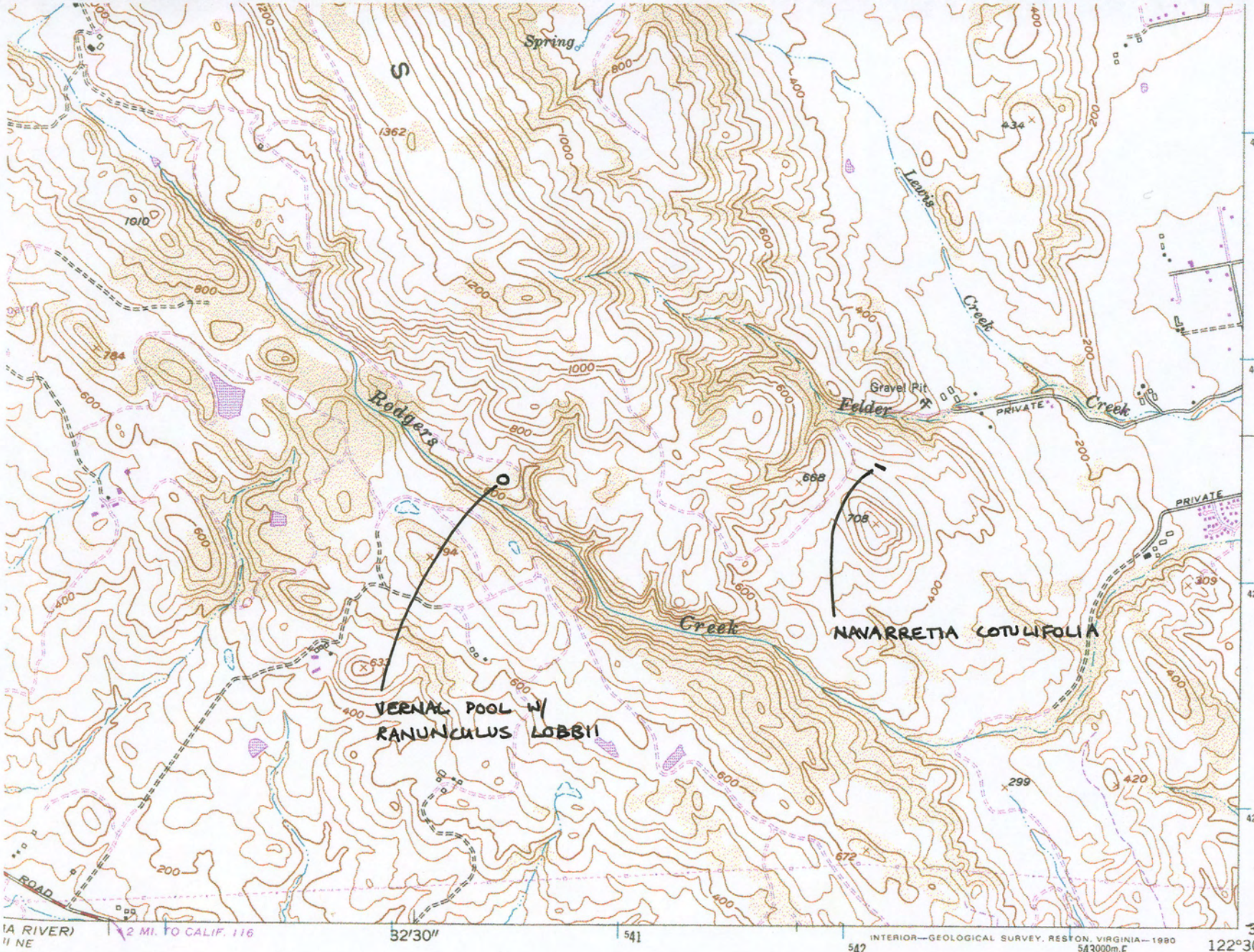
Comments: The flora of these isolated vernal pools on Sonoma Mountain has not been well-studied. These pools do not fit any of the categories in Holland or Sawyer & Keeler-Wolf. Not possible to estimate numbers of plants. Plants covered approx. 40 square meters.

Determination: *(check one or more, and fill in blanks)*
☑ Keyed (cite reference): Jepson Manual, Flora of Sonoma Co.
☐ Compared with specimen housed at: _____
☐ Compared with photo / drawing in: _____
☐ By another person (name): _____
☐ Other: _____

Photographs: *(check one or more)*

	Slide	Print
Plant / animal	☐	☐
Habitat	☐	☐
Diagnostic feature	☐	☐

May we obtain duplicates at our expense? ☐ yes ☐ no


Spring
Lewis Creek
Gravel Pit
Felder Creek
PRIVATE
Rodgers Creek
VERNAL POOL W/ RANUNCULUS LOBBII
NAVARRETIA COTULIFOLIA
ROAD
4237
4236
4235
4234000m.N.
38°15'
32'30"
541
542
543000m.E.
122°30'
INTERIOR—GEOLOGICAL SURVEY, RESTON, VIRGINIA—1980
1:24000
1 MILE
4000 5000 6000 7000 FEET
1 KILOMETER
RVAL 40 FEET
ENT 10 FOOT CONTOURS
ROAD CLASSIFICATION
Medium-duty
Light-duty
Unimproved dirt
State Route
CALIF
(SEARS POINT)
1560 III NW
GLEN ELLEN 7 1/2' QUAD

APPENDIX D

California Red-legged Frog Habitat Assessment and Protocol Surveys

July 2004

CALIFORNIA RED-LEGGED FROG HABITAT ASSESSMENT AND PROTOCOL SURVEYS FOR THE LAKEVILLE-SONOMA 115 kV TRANSMISSION LINE PROJECT

Prepared For:

Pacific Gas and Electric Company
Technical and Ecological Services
3400 Crow Canyon Road
San Ramon, California 94583

Prepared By:

Garcia and Associates (GANDA)
1 Saunders Avenue
San Anselmo, CA 94960
(Job 359-3A, 3E)

GARCIA and ASSOCIATES

NATURAL & CULTURAL RESOURCE CONSULTANTS

GANDA

Revised Final Report

CALIFORNIA RED-LEGGED FROG HABITAT ASSESSMENT AND PROTOCOL SURVEYS FOR THE LAKEVILLE – SONOMA 115 kV TRANSMISSION LINE PROJECT

Prepared For:

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San Anselmo, CA 94960

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Job 359/3A, 3E

July 2004

GANDA

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1.0 Executive Summary

Habitat assessment and protocol surveys for California red-legged frog (*Rana aurora draytonii*) were conducted by Garcia and Associates (GANDA) for Pacific Gas and Electric Company's (PG&E) Lakeville – Sonoma 115 kV Transmission Line Project. The surveys followed the U.S. Fish and Wildlife Service (USFWS) protocol for California red-legged frog site assessment and field surveys (USFWS 1997). Habitat assessment surveys were performed from August 15 to October 10, 2002, September 25 to 26, 2003, and June 17 to July 20, 2004 at aquatic sites identified within approximately 0.6 kilometer (km) (0.4 mile) of the project corridor. Suitable aquatic habitat for California red-legged frog was identified at 25 sites in the vicinity of the proposed route. Protocol surveys (two daytime and two nighttime surveys) were conducted in October 2002, May, June, and October 2003, and June and July 2004 at 15 of these suitable habitat sites where California red-legged frogs or their habitat could potentially be affected by project activities, absent impact avoidance and minimization measures. Six adult California red-legged frogs were found in June 2004 in the upper portion of Felder Creek and an adjoining tributary near the eastern portion of segment 1. Western pond turtles (*Clemmys marmorata*), a federal species of concern and California Species of Special Concern, also were identified at two ponds in the vicinity of segment 1. In light of these findings, recommendations are provided to avoid potential adverse effects on California red-legged frog individuals and minimize impacts to suitable aquatic and terrestrial habitats for this species.

2.0 Introduction

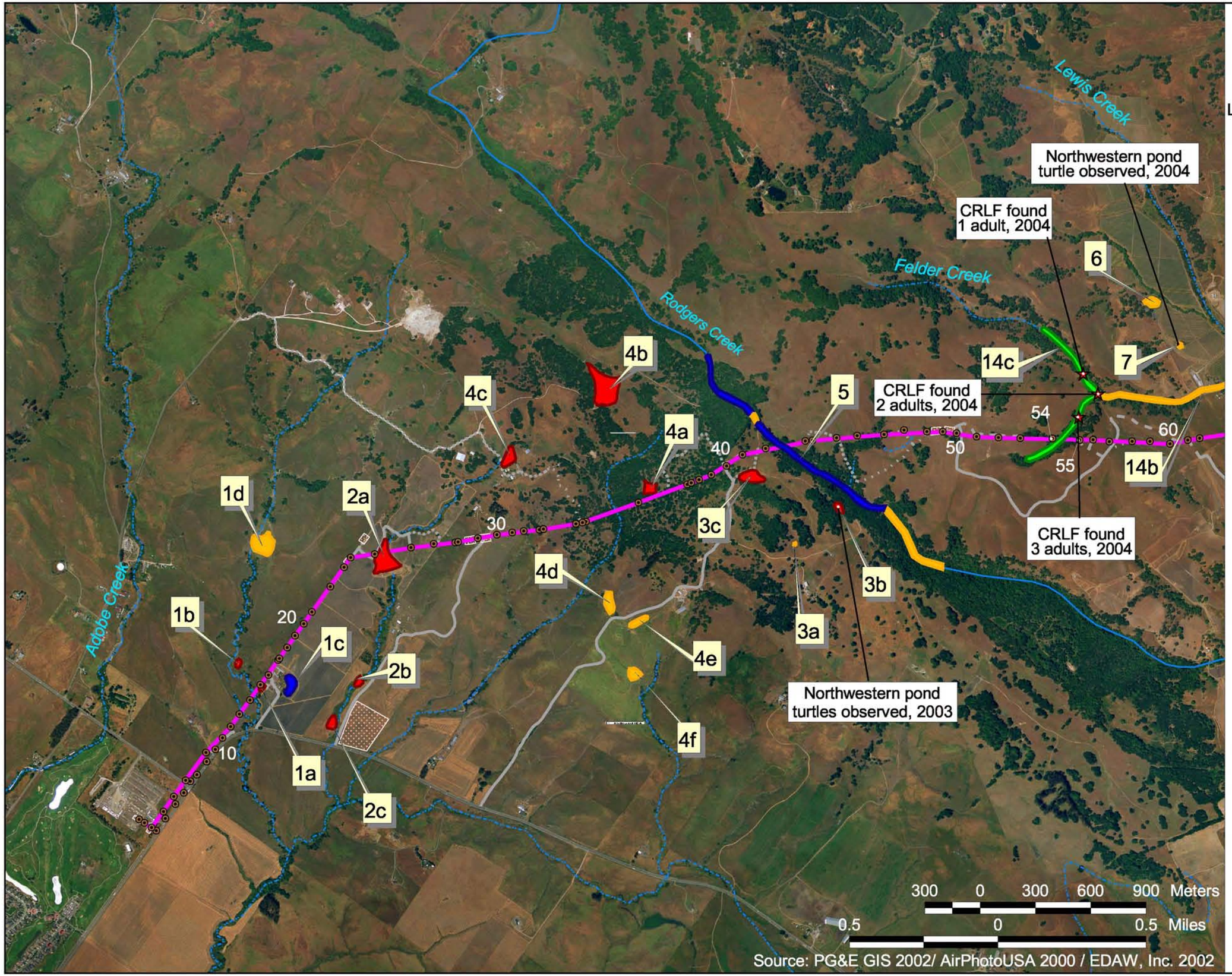
2.1 Project Location and Environmental Setting

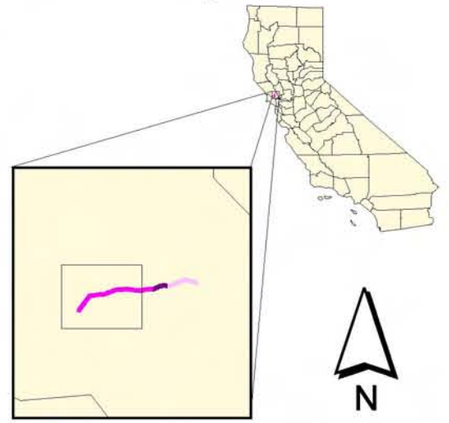
The proposed Lakeville – Sonoma 115 kV Transmission Line Project is located in southeastern Sonoma County, California (Figures 1a and 1b). It extends from the Lakeville substation east of the City of Petaluma to the Sonoma substation in the City of Sonoma. The project is composed of three transmission line segments (numbered 1, 2, and 17) which follow the route of an existing transmission line. The route covers a distance of approximately 11.6 km (7.2 miles). Segment 1 has a length of 7.4 km (4.6 miles), segment 2 of 1.4 km (0.9 mile), and segment 17 of 2.8 km (1.7 miles). Project activities will include:

- substation improvements;
- construction of new access roads and improvement of existing roads;
- installation of stream crossing structures on access roads;
- vegetation clearing and grading of landing zones, staging areas, and conductor pull sites;
- operation of project vehicles, helicopters, and heavy equipment;
- installation of new transmission poles and removal of existing poles; and
- installation of new conductors.

These activities could affect California red-legged frogs if they are present within the project area.

Figure 1a.
California Red-legged Frog Habitat Assessment and Field Survey Site Locations:
Segment 1 West
Lakeville-Sonoma 115kV Transmission Line Project
July 2004





- California Red-legged Frog Occupied Habitat
- Suitable California Red-legged Frog Aquatic Habitat, With Potential Impact
- Suitable California Red-legged Frog Aquatic Habitat, No Potential Impact
- Unsuitable California Red-legged Frog Aquatic Habitat
- California Red-legged Frogs Observed in 2004 Surveys
- Proposed Transmission Line (Segment 1)
- Proposed Transmission Line (Segment 2)
- Proposed Transmission Line (Segment 17)
- 30 Poles (Numbered in increments of 10)
- Intermittent or Ephemeral Stream
- Perennial Stream
- Existing Permanent Road
- Existing Temporary Road
- New Permanent Road
- New Temporary Road
- Landing Zone/Staging Area
- Pull Site

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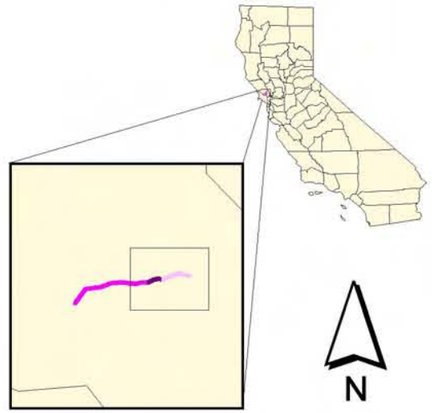
Figure 1b.
California Red-legged Frog Habitat Assessment and Field Survey Site Locations:
Segments 1 East, 2, and 17
Lakeville-Sonoma 115kV Transmission Line Project
July 2004



- Suitable California Red-legged Frog Aquatic Habitat, With Potential Impact
- Suitable California Red-legged Frog Aquatic Habitat, No Potential Impact
- Unsuitable California Red-legged Frog Aquatic Habitat
- California Red-legged Frog Occurrence (CDFG 2003)
- Proposed Transmission Line (Segment 1)
- Proposed Transmission Line (Segment 2)
- Proposed Transmission Line (Segment 17)
- 30 Poles (Numbered in increments of 10)
- Intermittent or Ephemeral Stream
- Perennial Stream
- Existing Permanent Road
- Existing Temporary Road
- New Permanent Road
- New Temporary Road
- Landing Zone/Staging Area
- Pull Site

9 10 8 15 18 19 21 110 120 100 14b 16 80 90 14a 17 20 70 11 13 12

Champlin Creek

Rodgers Creek

300 0 300 600 900 Me

0.5 0 0.5 Miles

Source: PG&E GIS 2002/ AirPhotoUSA 2000 / EDAW, Inc. 2002

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The project segments traverse mostly private lands, including agricultural land (cattle grazing and vineyards) and residential properties. Vegetation types found in the project area and vicinity include California annual grassland, vernal pool, freshwater marsh, seasonal wetland, riparian forest and woodland, oak forest and woodland, California bay forest and woodland, redwood forest, agriculture, and urban landscape. Wildlife habitat types are defined according to the California Wildlife Habitat Relationships (CWHR) System (CDFG 2002a) and correspond to equivalent vegetation types except for unvegetated, open water areas of aquatic habitats. Terrestrial wildlife habitats in the project area include coastal oak woodland, coastal mixed conifer forest, annual grassland, and vineyards/irrigated row crops. Wetland and riparian habitats include valley foothill riparian, fresh emergent wetland, and seasonal wetland. Aquatic habitats in the project vicinity include several ponds (permanent and seasonal) and creeks (perennial, intermittent, and ephemeral).

2.2 Status and Natural History of California Red-legged Frog

The California red-legged frog is a federally-listed threatened species and a California Species of Special Concern. Historically, populations of this subspecies were found from Shasta County to Baja California, along both the coast range and the west slope of the Sierra Nevada Mountains, at elevations below 1,500 meters (m) (4,900 feet (ft)) (Jennings and Hayes 1994). Their current range is greatly reduced, with only a few, highly localized populations in the Sierra Nevada and most remaining populations occurring along the coast ranges from Marin County to Ventura County.

California red-legged frogs occur primarily in perennial ponds or pools and perennial or ephemeral streams where water remains long enough for breeding and development of young (Jennings and Hayes 1994). Habitats with the highest densities of frogs may contain dense emergent or shoreline riparian vegetation closely associated with fairly shallow to deep (> 0.5 m or 1.6 ft), still or slow-moving water. The types of riparian and wetland vegetation that seem to be most structurally suitable are willows (*Salix* sp.), cattails (*Typha* sp.), and bulrushes (*Scirpus* sp.). Another key habitat indicator for California red-legged frogs is the absence or near-absence of introduced predators such as bullfrogs (*Rana catesbeiana*) and predatory fish, particularly centrarchids (i.e., sunfish and bass), which may feed on the larvae at higher levels than naturally co-evolved predators (Jennings and Hayes 1994). Emergent vegetation, undercut banks, and semi-submerged rootballs afford shelter from predators (USFWS 1997).

California red-legged frogs lay their eggs from late November to late April in ponds or in backwater pools of creeks, attaching them to emergent vegetation such as cattails and bulrushes. Larvae remain in these aquatic habitats until metamorphosis. Increased siltation during the breeding season can cause asphyxiation of eggs and small larvae. California red-legged frog may disperse upstream, downstream, or upslope of their breeding habitat to forage and seek sheltering habitat. They take shelter in small mammal burrows and other refugia up to several dozen meters from the water any time of the year (Jennings and Hayes 1994). During wet periods, California red-legged frog can move long distances between aquatic habitats, traversing upland habitats or ephemeral drainages up to 1.6 km (one mile) from the nearest known frog populations. Seeps and springs in open grasslands can function as foraging habitat or refugia for wandering frogs (Jennings and Hayes 1994).

Multiple factors may be responsible for the decline of California red-legged frog populations (Davidson et al. 2001). The main factor appears to be habitat destruction due to urbanization, but ultraviolet (UV-B) radiation and wind-borne chemicals from upwind agricultural land uses may also be contributing to their decline. Other factors include diseases, trematode parasites, and introduced species such as bullfrogs and mosquitofish (*Gambusia* sp.).

Critical habitat for California red-legged frog was designated by the USFWS in 2001; however, most of this designation was vacated by a U.S. District Court ruling in 2002. The USFWS (2004) recently re-issued proposed critical habitat designations for this species. The project area is not within any proposed critical habitat for California red-legged frog. The closest proposed critical habitat to the project area is Unit 10, Stage Gulch and Lower Petaluma River, which extends as far north as southeastern Petaluma, approximately one mile south of Lakeville substation.

3.0 Methods

3.1 Habitat Assessment

Prior to conducting the habitat assessment, several current information sources on California red-legged frog were reviewed, including the California Natural Diversity Database (CNDDB) (CDFG 2002b and 2004), *A Field Guide to Western Reptiles and Amphibians* (Stebbins 1985), *Guidance on Site Assessment and Field Surveys for California Red-legged Frogs* (USFWS 1997), and other relevant literature including Jennings and Hayes (1994). Additionally, major museum collection databases (California Academy of Sciences, Santa Barbara Natural History Museum, and Stanford University) were consulted.

The habitat assessment was conducted by GANDA biologist Pierre Fidenci from August 15 to October 10, 2002, September 25 to 26, 2003, June 17 to 18, and July 1-20, 2004 according to the site assessment guidelines provided in the USFWS (1997) protocol. A literature search was conducted for known localities of California red-legged frog within 8 km (5 miles) of the project area. Aquatic habitats within 1.6 km (one mile) of the proposed route segments were inventoried using topographic maps and aerial photographs. The inventory consisted of identifying aquatic habitat types (wetlands, ponds, reservoir, creeks) that could support California red-legged frog, and barriers (e.g., major roads) that would minimize or preclude California red-legged frog movement. Based on the results of the map inventory, detailed field assessments were performed at aquatic sites where California red-legged frogs or their habitat could potentially be affected by project activities. Most of the field assessment sites were located within approximately 0.6 km (0.4 mile) of the proposed route (segments 1, 2 and 17). The field assessment involved documenting the aquatic habitat types and conditions, and evaluating habitat suitability for California red-legged frog. All sites visited in the field assessment were numbered and mapped on aerial photographs.

At each site assessed, data were recorded on habitat type, habitat conditions, percentage cover of vegetation, and signs of disturbance such as cattle grazing. Habitat suitability criteria important

to California red-legged frog were recorded, including width and depth of water bodies, bank gradient, water flow, substrate, percent of floating and emergent vegetation, and percent of shade (Appendix A, Table 1). Care was taken to avoid disturbing sediments, vegetation, and any visible aquatic life during the site visits. Sites identified as potential habitat were mapped on aerial photographs. Representative photographs of sites assessed are included in Appendix B. All reptiles and amphibians encountered during the habitat assessment were recorded on the survey data forms (Appendix C). Presence of fish and bullfrog was also recorded because of their potential to impact California red-legged frogs. Fish were detected by scanning aquatic habitats with binoculars. Also, any indicators left from fishermen (e.g., fishing line) were used as indirect evidence of fish presence. A combination of visual and auditory observation was used to detect bullfrogs.

3.2 Protocol Surveys

Following the initial habitat assessment, protocol surveys (USFWS 1997) were conducted by GANDA biologists Pierre Fidenci, Chloe Scott, Kevin Wiseman, Jeff Mitchell, and Jeff Steinman from October 21 to 31, 2002, May 1 to June 30 and October 20 to 30, 2003, and June 17 to July 20, 2004. The protocol surveys consisted of two daytime and two nighttime surveys. The surveys were conducted at fifteen suitable habitat sites along the proposed route that could potentially be affected by the project: sites nos. 1a, 1b, 2a, 2b, 2c, 3b, 3c, 4a, 4b, 4c, 14b, 14c, 17, 18, and 19. Protocol surveys were not performed at sites that would not be affected because of their distance from the proposed transmission line or access roads (sites 1d, 3a, 4d, 4e, 4f, 6, 7, 8, 9, and 15).

Daytime surveys were conducted by visually scanning all aquatic habitats and shoreline areas with binoculars. Nighttime surveys were conducted using binoculars and a 6-volt flashlight. Both visual (eyeshine detection) and auditory methods (listening for frog calls) were used to detect frogs. In cases where no view was available, the vegetation was parted where possible to uncover hidden pools. Care was used while walking to avoid disturbing sediment, vegetation, and amphibian larvae.

Daytime surveys were conducted during October 2002, May, June, and October 2003, and June and July 2004 between 0930 and 1700 hours. Nighttime surveys were conducted during May, June, and October 2003, and July 2004, between 2000 hours and midnight. At least 24 hours elapsed before repeating surveys at the same site.

To reduce the risk of spread of disease agents and parasites that affect amphibians between study sites, GANDA biologists followed the Code of Practice prepared by the Declining Amphibian Populations Task Force (DAPTF 1998). After surveying each site, field equipment (e.g., boots, nets) was rinsed with sterilized water (e.g., boiled or treated) and then scrubbed with 70% ethanol solution and rinsed clean with sterilized water.

4.0 Results

4.1 Occurrences in the Project Vicinity

The CNDDB (CDFG 2004) contains one record of California red-legged frog within 8 km (5 miles) of the project area. This occurrence is north of Highway 116, approximately 2.8 km (1.7 miles) south of segments 1 and 2 (2004; Figure 1b). Here, one adult and two tadpole California red-legged frogs were found in an abandoned pond in May 2002. The next nearest CNDDB occurrence is about 8.3 km (5.2 miles) southwest of the project area and west of the City of Petaluma. This sighting is isolated from the project area by significant barriers (e.g., Highway 101).

The project area is within the historic and current range of California red-legged frog, and several suitable habitat sites were identified within the assessment area (Figures 1a and 1b; Appendix A, Table 1).

4.2 Habitat Assessment

In general, aquatic habitats in the project vicinity consist of many ponds (permanent and seasonal) and creeks (permanent and seasonal). The major drainages traversed by the proposed route are Rodgers Creek, Felder Creek, Carriger Creek, and Sonoma Creek. Fryer Creek, a smaller creek, crosses the route just west of Sonoma substation. Habitat quality is generally good for California red-legged frog at most of these aquatic sites. Artificial stock ponds are the predominant aquatic habitats along segments 1 and 2. These ponds are mostly permanent and lack dense emergent vegetation, but most have submerged vegetation along their banks. Sonoma Creek, Felder Creek, and Fryer Creek also contain suitable habitat for California red-legged frog in the project area. Portions of these creeks have dense riparian vegetation along the banks, shallow to deep waters for juveniles and adults, and some backwater areas protected from potential fish predation. Habitat assessment results are discussed in more detail below (Appendix A, Table 1).

<u>Segment 1</u>
Seventeen ponds (site nos.1a, 1b, 1d, 2a, 2b, 2c, 3a, 3b, 3c, 4a, 4b, 4c, 4d, 4e, 4f, 6 and 7) provide potential breeding habitats for California red-legged frog in the assessment area along segment 1 (Table 1 and Figures 1a and 1b). Of the seventeen ponds, ten (sites 1a, 1b, 2a, 2b, 2c, 3b, 3c, 4a, 4b, and 4c) are located where potential impact to California red-legged frogs or their habitat could occur during project activities, absent avoidance and minimization measures. These ponds are all permanent, artificial stock ponds, except for 3a. Ponds 1a (Photo 1) and 1b are small ponds; Pond 2a (Photo 2) is a larger water body. They are used to provide surface storage water for vineyards. Ponds 2b and 2c are large artificial ponds with shallow and deep water. They are mostly bordered by emergent vegetation providing suitable basking and refuge sites for California red-legged frog. Ponds 3b (Photo 3), 3c (Photo 4), 4a, 4b, and 4c are located near the middle of segment 1. These ponds provide suitable habitat characteristics for California red-legged frog. Their banks offer potential basking sites (areas with full sun or mixed sun and

shade). Frogs could bask on logs, vegetation, and bare banks. Other favorable habitat characteristics at these sites include emergent vegetation, shallow to deep water, terrestrial refuge sites, and minimal human disturbance.

Rodgers Creek (site 5) and Felder Creek (sites 14b and 14c) are the major lotic habitats along segment 1. Rodgers Creek is a medium-sized perennial creek with small pools and riffles. Rodgers Creek is well shaded and mostly does not provide potential habitat for California red-legged frog due to the lack of aquatic vegetation, areas of sun, and sufficient pool size. However, a few pools located about 700 m (2,300 ft) downstream from the transmission line, and one isolated pool located about 200 m (650 ft) upstream from the line provide suitable habitat for California red-legged frog. In general, these pools are medium sized and lack emergent vegetation.

Felder Creek and its unnamed tributary along segment 1 provide suitable habitat for the California red-legged frog. Site 14c includes the tributary and the main branch of Felder Creek to just downstream of the tributary confluence. The creek in this area is a medium-sized, permanent to intermittent creek bordered by a dense riparian and coast live oak (*Quercus agrifolia*) canopy. The stream bed is mostly composed of silt, gravel, and cobble. The tributary has characteristics similar to upper Felder Creek but has a narrower channel and is confined within a steep ravine. Site 14b encompasses Felder Creek from just downstream of the tributary confluence to Arnold Road at the eastern end of segment 2. The topography becomes more gradual downstream and the channel contains dense thickets of blackberry (*Rubus discolor*) in some areas. At both sites, water flow ceases by later summer and the stream bed becomes mostly dry. However, some water continues to percolate underground from one pool to another and a few deep pools (0.8 m or 2.6 ft deep) appear to persist until the first rains of fall. These pools provide suitable habitat for all California red-legged frog life stages and could be used for breeding sites. Both sites provide moist open banks devoid of aquatic vegetation.

The upper reach of Felder Creek and its tributary are heavily impacted by livestock, particularly in the vicinity of the tributary confluence. Signs of cattle trampling and manure were evident within the stream bed and along the banks. This likely has reduced bank vegetation and affects water quality in the creek. Indeed, turbidity was high from cattle trampling and associated erosion, with possible high nitrogen and sulfate content from cattle urine and feces.

Segment 2

Potential habitat for California red-legged frog is located within Felder Creek along the western portion of segment 2 (site 14b). The creek in this area is an intermittent, low gradient stream which is well shaded by dense riparian vegetation (Photo 5). The creek is bordered by vineyards and rural-residences and a paved road runs along the north side of the creek. The substrate is composed of silt, gravel, and cobble. Water flow ceases in this reach by late summer; however, a few deep pools that could be used by California red-legged frogs appear to persist through the summer and into early fall. The banks generally lack aquatic vegetation and contain semi-submerged root balls and woody debris. The presence of fish and bullfrogs could limit frog breeding success in this section of the creek, possibly making it unsuitable for tadpoles and metamorphs. Farther downstream in the eastern portion of segment 2, Felder Creek becomes totally dry by mid summer and is not suitable habitat.

Two ponds within 1 mile of segment 2 to the north (sites 8 and 9) also provide potential habitat (Figure 1b). These two ponds are permanent and artificial, and are small to moderate in size. The ponds are isolated from segment 1 by vineyards and dirt roads, and are not expected to be impacted by project activities.

Segment 17

Two ponds (sites 15 and 17) and two creeks (Sonoma Creek, site 18, and Fryer Creek, site 19) provide suitable habitat for California red-legged frog (Table 1 and Figure 1b). Ponds 15 and 17 are permanent artificial water bodies. Site 15 is a medium-sized pond with deep areas. Site 17 is a small-sized pond with deep areas along Sonoma Creek. Both ponds lack emergent vegetation but provide potential submerged basking and foraging sites along the banks. The shallow and deep pools of both ponds offer suitable aquatic habitat for all California red-legged frog life stages. However, based on its location relative to planned project activities, site 15 is considered to be outside the impact area.

Sonoma Creek (Site 18) is a major permanent creek with dense riparian vegetation along the shoreline (Photo 6). The creek is characterized by deep pools (> 1 m or 3 ft) with riffles. The substrate is mainly composed of gravel, cobble, and boulder. In general, the creek supports a wide range of habitat characteristics suitable for California red-legged frogs: suitable breeding sites (deep and shallow pools with few backwaters protected from fish predation); basking sites (e.g., rocks, gravel, logs); and refuge retreats (e.g., dense riparian vegetation, deep pools, and woody debris).

Fryer Creek (site 19) is characterized by shallow pools with silt, clay, and gravel substrate. The tributary section within the project area has permanent water all year providing suitable breeding sites for California red-legged frogs (Photo 7). The banks are mostly covered by dense riparian vegetation. Semi-submerged root balls are found along the banks. In general, the creek offers suitable habitat characteristics for California red-legged frog: breeding sites (e.g., large pools), basking sites (e.g., banks with sun exposure), and refuge retreats (e.g., riparian vegetation, woody debris or root balls).

The other creeks (sites 14a, 16 and 21) located within the segment 17 survey corridor do not provide suitable habitat for California red-legged frogs (Table 1, Figure 1b). Those creek reaches lack permanent water, deep pools and aquatic vegetation. During the field habitat assessment conducted along segment 17, these three creeks were dry.

4.3 Protocol Surveys

Weather conditions were favorable for conducting California red-legged frog protocol surveys. During daytime surveys, air temperatures ranged from 15°C to 28°C (59°F to 82°F) with winds from zero to 5 m/s (0-10 mph). Water temperatures at 5 cm (2 inches) depth ranged from 14°C to 25°C (57°F to 77°F). During nighttime surveys, air temperatures ranged from 15°C to 24°C (59°F to 75°F) with winds from 0-5 m/s (0-10 mph), and water temperatures ranged from 15°C to 25°C (59°F to 77°F).

California red-legged frogs were present at one site along the eastern portion of segment 1. This site (14c) includes the upper branch of Felder Creek and its adjoining tributary (Figure 1a). Six adult frogs were observed here on June 17, 2004. Two of them were found at the downstream end of a concrete culvert where a private dirt road crosses Felder Creek (Photo 8). As noted above, this location showed impacts from livestock that use this area of the creek for drinking. Three of the frogs were located adjacent to a small pool in the tributary (Photo 9) approximately 90 m (300 ft) north of where the transmission line spans over the tributary. One frog was found in a pool in the main branch of Felder Creek, approximately 60 m (200 ft) upstream of the tributary confluence (Photo 10). California red-legged frogs were not observed at any of the other protocol survey sites visited during any of the daytime or nighttime surveys, including sites farther downstream in Felder Creek adjacent to the transmission line route.

Other Herpetofauna Encountered

Other native amphibians and aquatic reptiles detected during the field surveys included California newt (*Taricha torosa*), Pacific treefrog (*Hyla = Pseudacris regilla*), and western pond turtle, a federal species of concern and California Species of Special Concern. Two western pond turtle adults were observed near segment 1 at site 3b and one adult was observed at site 7. Non-native bullfrogs were present, often at high population densities, at several of the sites surveyed (sites 1a, 1b, 2a, 2b, 2c, 3c, 3b, 4a, 4b, 4c, 5, 7, 14b, 17, and 18).

5.0 Discussion and Recommendations

5.1 Potential Effects on the California Red-legged Frog

Construction activities, including pole installation, pole removal, access road construction, and conductor installation in the vicinity of Felder Creek could affect California red-legged frogs if they are present in the work areas. The survey results indicate that California red-legged frogs are present in the upper Felder Creek watershed near the proposed project area. Results were negative farther downstream where the transmission line route runs adjacent to Felder Creek, and this area of the creek was almost completely dry in July 2004. This supports the conclusion that the species is probably absent in this lower reach of the creek during the dry season. However, since stream zones provide potential dispersal corridors, and red-legged frogs can move one mile or more during the wet season, it is possible that individuals could move into this downstream area and adjacent upland habitats during the wet season.

The proposed transmission line spans the tributary to Felder Creek approximately 90 m (300 ft) from where California red-legged frogs were observed. Project activities would not affect aquatic habitat in this area and would have minimal effect on adjacent upland habitats. Pole 54, on the northwest side of the tributary, is located within oak woodland which could provide suitable estivation or dispersal habitat (Photo 11). This pole is proposed to be removed by crews walking in to the site and will be carried away by helicopter. There will be no new pole installed at this location. Pole 55, which is closest to the tributary on the east side, is also proposed to be removed in the same manner. It is located on a ridge top in open grassland high above the creek (Photo 12) and there is no suitable estivation habitat within the proposed pole footprint or work area.

A new upland access road is proposed that would avoid the crossing of Felder Creek where California red-legged frogs were found. This new unpaved road would be located approximately 120 m (400 ft) from the creek at its closest point. Construction of this road would take place during the dry season (June 1 to October 15), which would avoid potential impacts to individual frogs or their habitat in the vicinity of Felder Creek.

Segment 2 and the eastern end of segment 1 (poles 69-87) are located adjacent to Felder Creek approximately 1.3 to 2.4 km (0.8 to 1.5 miles) downstream from where California red-legged frogs were found. In this segment, several poles are situated at or near the edge of the riparian woodland corridor of Felder Creek (Photo 13). Most project activities in this area, including installation of pole foundations and structures and construction/improvement of access roads, will be performed during the dry season. As noted above, the negative survey results and dry conditions observed in this reach of the creek during the summer indicate that the species is not likely to occur there during the dry season. Therefore, project activities in this area during the dry season are not likely to affect California red-legged frogs. In addition, the new poles will be set back farther from Felder Creek than the existing poles and will be outside of the riparian vegetation zone. This will avoid impacts to potential estivation habitat.

Some project activities such as conductor installation, topping of wood poles, removal of poles 54 and 55, and installation of pole 77 (above-ground attachment of the tubular steel pole to the foundation prepared in the dry season), are proposed to be conducted during the wet season. This is necessary to enable electricity shutdown clearances to be obtained; clearances are generally only feasible during periods of lower power demand. It is possible that individual frogs could move into work areas along portions of the route adjacent to Felder Creek during the wet season. Thus, there is some potential for individual frogs to be affected in this area, absent avoidance and minimization measures described below.

The negative survey results at sites other than the upper Felder Creek area indicate that California red-legged frogs may not occur elsewhere along the project route. However, while absence may be concluded in accordance with the USFWS (1997) protocol, it is possible (although unlikely) that California red-legged frogs could be present but not detected in the surveys. Small numbers of individuals are especially difficult to find in dense vegetation. The presence of bullfrogs (in some instances in large numbers) at most of the protocol survey sites reduces, but does not eliminate, the chance of finding viable populations of California red-legged frogs at these sites. With the high densities of bullfrogs that were observed, predation by larger bullfrogs on smaller California red-legged frogs would be inevitable. Other exotic predators that could impact California red-legged frogs such as introduced fish and crayfish were also encountered (e.g., sites 2b, 2c, 3c and 19).

5.2 Avoidance and Minimization Recommendations

To avoid potential adverse effects on California red-legged frogs and other special-status aquatic species and minimize potential impacts to their habitat, GANDA recommends that the following measures be implemented prior to and during construction:

- Before construction begins, a qualified biologist should provide environmental awareness training for all project personnel. This training should include topics such as recognition of California red-legged frogs and their habitat, what to do to avoid and minimize impacts to habitat, and what to do if a California red-legged frog is found.

- Driving to work sites should be limited to established roadways and identified access routes.

- All fueling and vehicle maintenance areas should be located away from creeks (at least 30 m [100 ft] from edge of a creek) and ponds (at least 90 m [300 ft] from edge of a pond), and away from any other sensitive biological resource exclusion areas marked by a qualified biologist.

- To the extent practicable, ground-disturbing construction activities such as site grading, access road construction, and installation of pole foundations should be done during the dry season (June 1 to October 15). The dry season window may begin as early as May 1 if ground conditions at the work sites and access routes are determined to be sufficiently dry by a qualified biologist. If work must occur during the wet season (November 1 to May 31), use appropriate erosion control measures for the local site, which might include one or more of: tacked straw, erosion control fabrics, silt fencing, and graded bedding on roads. For wet-season work in the vicinity of Felder Creek, apply the following measures.

- Immediately prior to wet-season work activities in the vicinity of Felder Creek, a qualified biologist should perform a preconstruction survey for California red-legged frog. The survey area should consist of all proposed wet-season work sites within one mile of Felder Creek and should include all suitable aquatic and upland habitats within 90 m (300 ft) of these proposed work sites.

  If a California red-legged frog is found nearby but outside a proposed work area, it should not be disturbed. Temporary construction fencing should be installed to mark the limits of the affected work area(s) and to limit construction personnel and equipment to the designated work area. The location of the fencing should be determined by the biologist in coordination with the construction supervisor. In addition, as recommended by the biologist, a temporary drift fence (e.g. silt-fence) barrier should be installed to prevent California red-legged frogs from entering those work area(s) during project activities.

  If CRLF are found within a work area prior to construction, the biologist, with prior authorization from the USFWS, will relocate the frogs out of harm's way. Immediately thereafter, a temporary silt-fence barrier will be installed to prevent CRLF from re-entering the work area.

- A qualified biologist should monitor work activities in the vicinity of Felder Creek and other streams, wetlands, and riparian habitats that could be affected during project implementation. The monitor should be present full time during all work activities in the wet season within 90 m (300 ft) of Felder Creek, and periodically in the vicinity of other wetland and stream areas. The monitor will verify that environmental fencing, erosion and sediment control measures, and any other protection measures are properly installed and are effective. If problems are found, the monitor will recommend remedial measures.

If a CRLF is encountered during construction, project activities will cease in the area where the frog is found until the biologist, with prior authorization from the USFWS, relocates the frog out of harm's way and/or takes other appropriate steps previously authorized by the USFWS to protect the animal. Work may resume once the biologist has determined that construction activities will not harm any CRLF and barrier fencing has been installed to prevent the animal from re-entering the work area. The USFWS will be contacted within 24 hours of the finding and informed of actions taken.

6.0 Literature Cited

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Appendix A

Table 1. Habitat Assessment For California Red-legged Frog in the Vicinity of the Lakeville – Sonoma 115 kV Transmission Line Project

Table 1. Habitat Assessment For the California Red-legged Frog (*Rana aurora draytonii*) in the Vicinity of the Lakeville – Sonoma 115 kV Transmission Line Project

Site number/ Habitat type	Segment number(s)	Water Bodies: permanent or seasonal	Width/ Max. Depth (meters)	Bank gradient/ Water flow	Dominant Substrate	% floating vegetation % emergent vegetion % shade	Potential habitat for CRLF?	Potential project-related impacts (absent avoidance or minimization)?	Herpetofauna species and predators encountered
1a Pond	1	permanent	20 2	Medium to high/ None	Silt-clay	10-20 0 0	Yes	Yes	BF Raccoon
1b Pond	1	permanent	20 1.5	Medium/ None	Silt-clay	1-10 0 0	Yes	Yes	BF Blue heron, raccoon
1c Pond	1	permanent	25 2	High/ None	Silt-clay	0 0 0	No	Yes	None
1d Pond	1	permanent	30 2	Medium/ None	Silt-clay	ND ND ND	Yes	No	None
2a Pond	1	permanent	150 2	Low/ None	Silt-clay	0 10 10	Yes	Yes	BF, TF Raccoons
2b Pond	1	permanent	20 2	Low/ None	Silt-clay	10 10 10	Yes	Yes	BF Fish, crayfish, heron
2c Pond	1	permanent	20 2	Medium/ None	Silt-clay	10 10 5	Yes	Yes	BF Fish, crayfish, heron
3a Pond	1	Seasonal	15 0.3	Low/ None	Silt-clay	5 5 10	No	Yes	None
3b Pond	1	permanent	30 1.5	Low/ None	Silt-clay	5 10 30	Yes	Yes	BF, WPT Fish (*Gambusia*)

Site number/ Habitat type	Segment number(s)	Water Bodies: permanent or seasonal	Width/ Max. Depth (meters)	Bank gradient/ Water flow	Dominant Substrate	% floating vegetation % emergent vegetion % shade	Potential habitat for CRLF?	Potential project-related impacts (absent avoidance or minimization)?	Herpetofauna species and predators encountered
3c Pond	1	permanent	30 1.5	Low/ None	Silt-clay	80 20 20	Yes	Yes	BF Fish (*Gambusia*)
4a Pond	1	permanent	20 2	Low/ None	Silt-clay	70 10 10	Yes	Yes	BF, TF Fish
4b Pond	1	permanent	50/ 3	Low/ None	Sand/silt	1 1 1	Yes	Yes	BF Fish, heron
4c Pond	1	permanent	8/ 1.5	Low/ None	Sand/silt	10 0 0	Yes	Yes	BF
4d Pond	1	permanent	10/ 1.5	Low/ None	Sand/silt	40 1 10	Yes	No	BF
4e Pond	1	permanent	8/ 1.5	Low/ None	Sand/silt	10 0 0	Yes	No	none
4f Pond	1	permanent	10/ 1.5	Low/ None	Sand/silt	10 0 0	Yes	No	none
5 Rodgers Creek	1	permanent	2-3/ 0.8	Low to high/ Low to medium	Silt-clay, cobble	70 0 0	No	No	BF, TF, Fish: sculpin and trout
6 Pond	1, 2	permanent	NA	Low/ none	Sand/silt	NA	Yes	No	None
7 Pond	1, 2	permanent	20/ 2	Low/ None	Sand/silt	5 5 1	Yes	No	WPT, BF

Site number/ Habitat type	Segment number(s)	Water Bodies: permanent or seasonal	Width/ Max. Depth (meters)	Bank gradient/ Water flow	Dominant Substrate	% floating vegetation % emergent vegetion % shade	Potential habitat for CRLF?	Potential project-related impacts (absent avoidance or minimization)?	Herpetofauna species and predators encountered
8 Pond	2	permanent	20/ 2	Low/ None	Sand/silt	0 0 0	Yes	No	None
9 Pond	3	permanent	NA	Low/ None	Sand/silt	NA	Yes	No	None
10 Pond	2, 17	permanent	10 2	Low/ None	Sand/silt	NA	No	No	None
11 Pond	2	permanent	10 1.5	Low/ Low	Cement	0 0 0	No	No	None
12 Pond	2	permanent	10 1.5	Low/ None	Cement	0 0 0	No	No	None
13 Pond	17	permanent	10/ 1.5	Low/ None	Sand/silt	5 5 1	No	No	None
14a Felder Creek, lower reach	17	temporary	2-3/ 0.3	Low/ None	Silt, gravel, cobble	0 0 20	No	Yes	None
14b Felder Creek, middle reach	2, eastern end of 1	permanent	2-4/ 0.8	Low/ Low	Silt, gravel, cobble	0 0 80-90	Yes	Yes	BF Fish
14c Felder Creek, upper reach and tributary	1	permanent	2-4/ 0.6	Low/ Low	Silt, gravel, cobble	0 0 80	Yes	Yes	**CRLF** TF
15 Pond	17	permanent	15 2	Low/ None	Sand/silt	10 0 0	Yes	No	None

Site number/ Habitat type	Segment number(s)	Water Bodies: permanent or seasonal	Width/ Max. Depth (meters)	Bank gradient/ Water flow	Dominant Substrate	% floating vegetation % emergent vegetion % shade	Potential habitat for CRLF?	Potential project-related impacts (absent avoidance or minimization)?	Herpetofauna species and predators encountered
16 Carriger Creek	17	seasonal	2-3/ 0.5	Low/ None	Silt, gravel, cobble	0 0 0	No	Yes	None
17 Pond	17	permanent	10/ 2	Low/ None	Sand/silt	10 0 0	Yes	Yes	BF Raccoon
18 Sonoma Creek	17	permanent	4-10/ 1.5	Low to high/ Low to medium	Silt, gravel, cobble, boulder	0-5 0-20 70-80	Yes	Yes	BF Fish, crayfish, raccoon
19 Fryer Creek	17	permanent	2-4/ 1	Low to medium/ Low	Silt, clay, gravel	0 5 40	Yes	Yes	Fish (*Gambusia*) and crayfish
20 Pond	17	permanent	5/ 1	Low/ None	Plastic cover	0 0 0	No	No	None
21 Nathanson Creek	17	seasonal	2/ 0.5	Low to high/ None in August ‘02	Silt, gravel, cobble	0 0 60	No	No	None

Gradient: Low < 4 %, Medium 4-35%, High >35%; BF: bullfrog, CN: California newt, CRLF: California red-legged frog, TF: Pacific treefrog, WPT: western pond turtle.

Appendix B

Photographs

Photo 1. Suitable habitat for California red-legged frog, site 1a (segment 1).

Photo 2. Suitable habitat for California red-legged frog, site 2a (segment 1).

Photo 3. Suitable habitat for California red-legged frog, site 3b (segment 1).

Photo 4. Suitable habitat for California red-legged frog, site 3c (segment 1).

Photo 5. Suitable habitat for California red-legged frog along Felder Creek, site 14b (segment 2).

Photo 6. Suitable habitat for California red-legged frog along Sonoma Creek, site 18 (segment 17).

Photo 7. Suitable habitat for California red-legged frog along Fryer Creek, site 19 (segment 17).

Photo 8. Culvert at upper Felder Creek where California red-legged frogs were found in June 2004 (site 14c, segment 1).

Photo 9. California red-legged frog adults at an unnamed tributary to Felder Creek, June 2004 (site 14c, segment 1).

Photo 10. Pool in upper Felder Creek where California red-legged frog was found (site 14c, segment 1).

Photo 11. Pole 54, located in oak woodland upslope of tributary to Felder Creek near where California red-legged frogs were found.

Photo 12. Pole 55, located upslope and east of tributary to Felder Creek near where California red-legged frogs were found.

Photo 13. Transmission line along the edge of riparian vegetation of Felder Creek approximately 1.5 miles downstream from California red-legged frog location.

Appendix C

California Red-legged Frog Protocol Survey Data Forms

First Daytime Survey / Second Daytime Survey

California Red-legged Frog Survey Data Sheet

First Nighttime Survey / Second Nighttime Survey

Date: 10/23/02	Begin time 10:00 AM	End time 10:30	Observer (s): PF, KW

Site #: 1a	Locality: Segment 1		County/State: Sonoma
Elevation: /	USGS Topographic Map: /	UTM North: GPS map /	UTM East: GPS map /
Mile Point: /			

Weather: foggy	Wind: 0	Air Temp.: 15°C Time: 10:00	Water Temp.: 15°C Time: 10:00

Habitat — Habitat type/name:

Site length: 20 m	Site width: 20 m	Ave Depth: 1 m	Water Flow: 0
Water: 2 Turbidity ((1-5) 1=clear)	Mid-day Shade %: 0	Under Cut Bank %: 0	Overhanging Bank Veg. %: 0

Substrate: ___% Bedrock ___% Boulder ___% Rock\ Cobble ___% Gravel 100 % Sand\Silt

Riparian Veg. 20 % Herbaceous _____ Type

___%Woody _____ Type

Aquatic Vegetation: 10 % Floating algae Type ___% Woody _____ Type

0 % Herbaceous _____ Type

Non Vegetated: 20% Open Water (aquatic habitat) 20 % Bare Ground (riparian habitat)

Specific frog habitat present or not

Deep pools (Y) N	Semi-submerged root balls Y (N)	dense riparian veg. Y (N)
Backwater pools Y (N)	Woody Debris Y (N)	Shallow pools (Y) N — Max Depth of pool: 2 m

Frog Observations Y (N)

Species	Adults	Subadults	Tadpoles	Eggs
none				

Other amphibian observations:

none

Predator observed: raccoon

Fish observed: none

Observations and Comments

First Daytime Survey / Second Daytime Survey (circled)

California Red-legged Frog Survey Data Sheet

First Nighttime Survey / Second Nighttime Survey

Date:	Begin time	End time	Observer (s):
10/28/12	12:30	12:55	P. F

Site #:	Locality:		County/State:
1a	Segment (pond)		Sonoma
Elevation: —	USGS Topographic Map: —	UTM North: GPS map —	UTM East: GPS map —
Mile Point: —			

Weather:	Wind:	Air Temp.: Time:	Water Temp.: Time:
clear	0	21 12:30	15°C 12:30

Habitat — Habitat type/name: pond

Site length:	Site width:	Ave Depth:	Water Flow:
20	20	1	NA
Water Turbidity: 2 ((1-5) 1=clear)	Mid-day Shade %: 0	Under Cut Bank %: 0	Overhanging Bank Veg. %: 0

Substrate: ___% Bedrock ___% Boulder ___% Rock\ Cobble ___% Gravel 100% Sand\Silt

Riparian Veg. 20% Herbaceous _____ Type

___%Woody _____ Type

Aquatic Vegetation: 10% Floating algae Type ___% Woody _____ Type

___% Herbaceous _____ Type

Non Vegetated: 80% Open Water (aquatic habitat) 10% Bare Ground (riparian habitat)

Specific frog habitat present or not

Deep pools (Y) N	Semi-submerged root balls Y (N)		dense riparian veg. Y (N)
Backwater pools Y (N)	Woody Debris Y (N)	Shallow pools (Y) N	Max Depth of pool: 2m

Frog Observations Y (N)

Species	Adults	Subadults	Tadpoles	Eggs

Other amphibian observations:

none

Predator observed: none

Fish observed: none

Observations and Comments

First Daytime Survey

Second Daytime Survey

California Red-legged Frog Survey Data Sheet

First Nighttime Survey

Second Nighttime Survey

Date: 06/18/03	Begin time 11:20PM	End time 12:00 PM	Observer (s): PF; JM

Site #: 1A	Locality: segment 1		County/State: Sonoma
Elevation: NA Mile Point: NA	USGS Topographic Map: NA	UTM North: NA GPS map	UTM East: NA GPS map

Weather: clear	Wind: 0	Air Temp.: 15°C Time: 11:20 PM	Water Temp.: 22°C Time: 11:20 PM

Habitat Habitat type/name: Pond

Site length: 20	Site width: 20	Ave Depth: 1	Water Flow: 0
Water: 4 Turbidity ((1-5) 1=clear)	Mid-day Shade %: 0	Under Cut Bank %: 0	Overhanging Bank Veg. %: 20

Substrate: ___% Bedrock ___% Boulder ___% Rock\ Cobble ___% Gravel 100% Sand\Silt

Riparian Veg. 0 % Herbaceous _____ Type

0 %Woody _____ Type

Aquatic Vegetation: 20 % Floating _____ Type ___% Woody _____ Type

20% Herbaceous _____ Type

Non Vegetated: 0 % Open Water (aquatic habitat) 0 % Bare Ground (riparian habitat)

Specific frog habitat present or not

Deep pools (Y) N	Semi-submerged root balls (Y) N	dense riparian veg. (Y) N
Backwater pools Y (N)	Woody Debris Y (N)	Shallow pools (Y) N Max Depth of pool: 2 m

Frog Observations (Y)	N

Species	Adults	Subadults	Tadpoles	Eggs
Bullfrogs	>3			
Treefrogs	2			

Other amphibian observations:

none

Predator observed: bullfrogs
Fish observed: none

Observations and Comments

First Daytime Survey

Second Daytime Survey

California Red-legged Frog Survey Data Sheet

First Nighttime Survey

Second Nighttime Survey

Date: 06/20/03	Begin time 10:30PM	End time 11:00PM	Observer (s): P.F; JM

Site #: 1A	Locality: Segment 1		County/State: Sonoma
Elevation: NA Mile Point: NA	USGS Topographic Map: NA	UTM North: GPS map NA	UTM East: GPS map NA

Weather: clear	Wind: 0	Air Temp.: 17 C Time: 10:30 PM	Water Temp.: 23 C Time: 10:30 PM

Habitat Habitat type/name: Pond

Site length: 20	Site width: 20	Ave Depth: 1	Water Flow: NA (0)
Water: Turbidity 4 ((1-5) 1=clear)	Mid-day Shade %: 0	Under Cut Bank %: 0	Overhanging Bank Veg. %: 20

Substrate: ___% Bedrock ___% Boulder ___% Rock\ Cobble ___% Gravel 100% Sand\Silt

Riparian Veg. 0 % Herbaceous _____ Type

0 %Woody _____ Type

Aquatic Vegetation: 20% Floating _____ Type ___% Woody _____ Type

20% Herbaceous _____ Type

Non Vegetated: ___% Open Water (aquatic habitat) ___% Bare Ground (riparian habitat)

Specific frog habitat present or not

Deep pools (Y) N	Semi-submerged root balls Y (N)	dense riparian veg. (Y) N
Backwater pools Y (N)	Woody Debris Y (N)	Shallow pools (Y) N	Max Depth of pool: 2 m

Frog Observations (Y) N

Species	Adults	Subadults	Tadpoles	Eggs
Bullfrogs	2	1		
Treefrog		1		

Other amphibian observations:

none

Predator observed: none beside bullfrogs

Fish observed: none

Observations and Comments

First Daytime Survey

Second Daytime Survey

California Red-legged Frog Survey Data Sheet

First Nighttime Survey

Second Nighttime Survey

Date:	Begin time	End time	Observer (s):
10/23/02	10:30	10:55	P.F; KW

Site #:	Locality:		County/State:
1b	segment 1		Sonoma
Elevation: / Mile Point:	USGS Topographic Map: /	UTM North: GPS map /	UTM East: GPS map /

Weather:	Wind:	Air Temp.: Time:	Water Temp.: Time:
foggy - clear	0	15°C 10:30	15°C 10:30

Habitat Habitat type/name:

Site length:	Site width:	Ave Depth:	Water Flow:
35 m	20 m	0.5	0
Water: 3 Turbidity ((1-5) 1=clear)	Mid-day Shade %: 0	Under Cut Bank %: 0	Overhanging Bank Veg. %: 5

Substrate: ___% Bedrock ___% Boulder ___% Rock\ Cobble ___% Gravel 100 % Sand\Silt

Riparian Veg. 1 % Herbaceous algae Type

0 %Woody Type

Aquatic Vegetation: 1 % Floating Type ___% Woody Type

0 % Herbaceous Type

Non Vegetated: 40 % Open Water (aquatic habitat) 40 % Bare Ground (riparian habitat)

Specific frog habitat present or not

Deep pools (Y) N	Semi-submerged root balls Y (N)		dense riparian veg. Y (N)
Backwater pools Y (N)	Woody Debris Y (N)	Shallow pools (Y) N	Max Depth of pool: 1.5 m

Frog Observations Y (N)

Species	Adults	Subadults	Tadpoles	Eggs
none				

Other amphibian observations:

none

Predator observed: none

Fish observed: ~~none~~ none

Observations and Comments

First Daytime Survey

Second Daytime Survey

California Red-legged Frog Survey Data Sheet

First Nighttime Survey

Second Nighttime Survey

Date: 10/28/02	Begin time 13:00	End time 13:50	Observer (s): P.F

Site #: 1b	Locality: Pond Segment 1		County/State: Sonoma
Elevation: ~	USGS Topographic Map: ~	UTM North: GPS map ~	UTM East: GPS map ~
Mile Point: ~			

Weather: clear	Wind: < less than 5 mph	Air Temp.: 22 °C Time: 13:00	Water Temp.: 15 °C Time: 13:00

Habitat Habitat type/name: Pond

Site length: 35 m	Site width: 20 m	Ave Depth: 0.5 m	Water Flow: 0
Water Turbidity: 3 ((1-5) 1=clear)	Mid-day Shade %: 0	Under Cut Bank %: 0	Overhanging Bank Veg. %: 5

Substrate: ___% Bedrock ___% Boulder ___% Rock\ Cobble ___% Gravel 100 % Sand\Silt

Riparian Veg. 20 % Herbaceous _____ Type

___%Woody _____ Type

Aquatic Vegetation: 1 % Floating algae Type ___% Woody _____ Type

~ % Herbaceous _____ Type

Non Vegetated: 40 % Open Water (aquatic habitat) 40 % Bare Ground (riparian habitat)

Specific frog habitat present or not

Deep pools (Y) N	Semi-submerged root balls Y (N)		dense riparian veg. Y (N)
Backwater pools Y (N)	Woody Debris Y (N)	Shallow pools (Y) N	Max Depth of pool: 2 m

Frog Observations Y	(N)

Species	Adults	Subadults	Tadpoles	Eggs
none				

Other amphibian observations:

none

Predator observed: heron
Fish observed: no

Observations and Comments

First Daytime Survey

Second Daytime Survey

California Red-legged Frog Survey Data Sheet

First Nighttime Survey

Second Nighttime Survey

Date: 06/18/03	Begin time 10:45 PM	End time 11:15 PM	Observer (s): et PF; JM

Site #: 1B	Locality: Segment 1		County/State: Sonoma
Elevation: NA Mile Point: NA	USGS Topographic Map: NA	UTM North: GPS map NA	UTM East: GPS map NA

Weather: clear	Wind: 0	Air Temp.: 15°C Time: 10:45 PM	Water Temp.: 23°C Time: 10:45 PM

Habitat Habitat type/name: Pond

Site length: ~~200~~ 35	Site width: ~~40~~ 20	Ave Depth: 0.8	Water Flow: 0
Water: 4 Turbidity ((1-5) 1=clear)	Mid-day Shade %: 0	Under Cut Bank %: 0	Overhanging 50 Bank Veg. %: ~~40~~

Substrate: ___% Bedrock ___% Boulder ___% Rock\ Cobble ___% Gravel 100% Sand\Silt

Riparian Veg. 0 % Herbaceous _____ Type

0 %Woody _____ Type

Aquatic Vegetation: 10 % Floating algae Type ___% Woody _____ Type

10 % Herbaceous _____ Type

Non Vegetated: 0 % Open Water (aquatic habitat) 0 % Bare Ground (riparian habitat)

Specific frog habitat present or not

Deep pools (Y) N	Semi-submerged root balls Y (N)	dense riparian veg. Y (N)
Backwater pools Y (N)	Woody Debris Y (N)	Shallow pools (Y) N	Max Depth of pool: 2 m

Frog Observations (Y)	N

Species	Adults	Subadults	Tadpoles	Eggs
Bullfrogs	2			

Other amphibian observations:

none

Predator observed: none

Fish observed: none

Observations and Comments

First Daytime Survey

Second Daytime Survey

California Red-legged Frog Survey Data Sheet

First Nighttime Survey

(Second Nighttime Survey)

Date: 06/20/03	Begin time 9:45PM	End time 10:20 PM	Observer (s): PF; JM

Site #: 1B	Locality: Segment 1		County/State: Sonoma
Elevation: NA	USGS Topographic Map: NA	UTM North: GPS map NA	UTM East: GPS map NA
Mile Point: NA			

Weather: clear	Wind: 0 mpH	Air Temp.: 18°C Time: 9:45 PM	Water Temp.: 24°C Time: 9:45PM

Habitat Habitat type/name: Pond

Site length: 95	Site width: 20	Ave Depth: 0.8	Water Flow:
Water: Turbidity .4 ((1-5) 1=clear)	Mid-day Shade %: 0	Under Cut Bank %: 0	Overhanging Bank Veg. %: 50

Substrate: ___% Bedrock ___% Boulder ___% Rock\ Cobble ___% Gravel 100% Sand\Silt

Riparian Veg. 0 % Herbaceous _____ Type

0 %Woody _____ Type

Aquatic Vegetation: 10 % Floating _____ Type ___% Woody _____ Type

10 % Herbaceous _____ Type

Non Vegetated: ___% Open Water (aquatic habitat) ___% Bare Ground (riparian habitat)

Specific frog habitat present or not

Deep pools (Y) N	Semi-submerged root balls Y (N)	dense riparian veg. Y (N)
Backwater pools Y (N)	Woody Debris Y (N)	Shallow pools (Y) N	Max Depth of pool: 2 m

Frog Observations (Y)	N

Species	Adults	Subadults	Tadpoles	Eggs
Bullfrogs	3			

Other amphibian observations:

none

Predator observed: Bullfrogs

Fish observed: no

Observations and Comments

First Daytime Survey

Second Daytime Survey

California Red-legged Frog Survey Data Sheet

First Nighttime Survey

Second Nighttime Survey

Date: 10/23/02	Begin time 10:55	End time 11:30	Observer (s): KW ; PF

Site #: 2a	Locality: segment 1		County/State: Sonoma
Elevation: –	USGS Topographic Map: ✓	UTM North: GPS map ✓	UTM East: GPS map ✓
Mile Point:			

Weather: foggy	Wind: 0	Air Temp.: 15 C Time: 10:55	Water Temp.: 15 °C Time: 10:55

Habitat — Habitat type/name: Pond

Site length: 150	Site width: 100	Ave Depth: 0.5	Water Flow: 0 (NA)
Water Turbidity: 3 ((1-5) 1=clear)	Mid-day Shade %: 0	Under Cut Bank %: 0	Overhanging Bank Veg. %: 0

Substrate: ___% Bedrock ___% Boulder ___% Rock\ Cobble ___% Gravel 100% ✓ % Sand\Silt

Riparian Veg. 10 % Herbaceous _____ Type

___%Woody _____ Type

Aquatic Vegetation: 10 % Floating algae Type ___% Woody _____ Type

___% Herbaceous _____ Type

Non Vegetated: 10 % Open Water (aquatic habitat) 80 % Bare Ground (riparian habitat)

Specific frog habitat present or not

Deep pools (Y) N	Semi-submerged root balls Y (N)		dense riparian veg. Y (N)
Backwater pools Y (N)	Woody Debris Y (N)	Shallow pools (Y) N	Max Depth of pool: 2 m

Frog Observations Y (N)

Species	Adults	Subadults	Tadpoles	Eggs

Other amphibian observations:

Predator observed: raccoons

Fish observed: none

Observations and Comments

First Daytime Survey
Second Daytime Survey

California Red-legged Frog Survey Data Sheet

First Nighttime Survey
Second Nighttime Survey

Date:	Begin time	End time	Observer (s):
10/28/02	13:20	14:30	P.F

Site #:	Locality:		County/State:
2a	Segment 1		Sonoma
Elevation: / Mile Point: /	USGS Topographic Map: /	UTM North: GPS map /	UTM East: GPS map /

Weather:	Wind:	Air Temp.: Time:	Water Temp.: Time:
clear	0	22°C	16°C

Habitat Habitat type/name: artificial pond

Site length:	Site width:	Ave Depth:	Water Flow:
150 m	100 ~	0.5	NA
Water: 3 Turbidity ((1-5) 1=clear)	Mid-day Shade %: 0	Under Cut Bank %: 0	Overhanging Bank Veg. %: 0

Substrate: ___% Bedrock ___% Boulder ___% Rock\ Cobble ___% Gravel 100% Sand\Silt

Riparian Veg. 10 % Herbaceous _____ Type
/ %Woody _____ Type

Aquatic Vegetation: 10 % Floating algae Type ___% Woody _____ Type
/ % Herbaceous _____ Type

Non Vegetated: ___% Open Water (aquatic habitat) ___% Bare Ground (riparian habitat)

Specific frog habitat present or not

Deep pools (Y) N	Semi-submerged root balls Y (N)		dense riparian veg. Y (N)
Backwater pools Y (N)	Woody Debris Y (N)	Shallow pools (Y) N	Max Depth of pool: 2 m

Frog Observations Y (N)

Species	Adults	Subadults	Tadpoles	Eggs
none				

Other amphibian observations:

none

Predator observed: raccoons
Fish observed: none

Observations and Comments

First Daytime Survey

Second Daytime Survey

California Red-legged Frog Survey Data Sheet

First Nighttime Survey

Second Nighttime Survey

Date: 6/18/03	Begin time 9:00PM	End time 10:30	Observer (s): Jeff Mitchell, Pierre Fidenci

Site #: 2a	Locality: Segment 1		County/State:
Elevation:	USGS Topographic Map:	UTM North: GPS map	UTM East: GPS map
Mile Point:			

Weather: Clear, cool	Wind: 0-5 mph	Air Temp.: 15°C Time:	Water Temp.: 23°C Time:

Habitat Habitat type/name:

Site length: 150 m	Site width: 100m	Ave Depth: 1m	Water Flow: 0 cfm
Water: Turbidity 3 ((1-5) 1=clear)	Mid-day Shade %: 1%	Under Cut Bank %: 0%	Overhanging Bank Veg. %: 0%

Substrate: ___% Bedrock ___% Boulder ___% Rock\ Cobble ___% Gravel 100 % Sand\Silt

Riparian Veg. 100% Herbaceous _____ Type

___%Woody _____ Type

Aquatic Vegetation: 5 % Floating _____ Type 0 % Woody _____ Type

5 % Herbaceous _____ Type

Non Vegetated: 0 % Open Water (aquatic habitat) 0 % Bare Ground (riparian habitat)

Specific frog habitat present or not

Deep pools (Y) N	Semi-submerged root balls Y (N)	dense riparian veg. (Y) N
Backwater pools Y (N)	Woody Debris Y (N)	Shallow pools Y (N) Max Depth of pool: 1.5m

Frog Observations (Y)	N

Species	Adults	Subadults	Tadpoles	Eggs
Bullfrog	1	0	0	0

Other amphibian observations:

Pacific tree frog (vocalizations)

Predator observed: N
Fish observed: N

Observations and Comments

First Daytime Survey

Second Daytime Survey

California Red-legged Frog Survey Data Sheet

First Nighttime Survey

Second Nighttime Survey

Date: 06/20/03	Begin time 11:20	End time 11:55PM	Observer (s): P.F; JM

Site #: 2a	Locality: segment 1		County/State: Sonoma
Elevation: NA Mile Point: NA	USGS Topographic Map: NA	UTM North: GPS map NA	UTM East: GPS map NA

Weather: clear	Wind: 0 mpH	Air Temp.: 17 °C Time: 11:25PM	Water Temp.: 23 °C Time: 11:25PM

Habitat Habitat type/name: Pond (artificial)

Site length: 150 m	Site width: 100 m	Ave Depth: 1	Water Flow: none
Water: Turbidity 3 ((1-5) 1=clear)	Mid-day Shade %: 1	Under Cut Bank %: 0	Overhanging Bank Veg. %: 0

Substrate: ___% Bedrock ___% Boulder ___% Rock\ Cobble ___% Gravel 100% Sand\Silt

Riparian Veg. 100 % Herbaceous _____ Type

___%Woody _____ Type

Aquatic Vegetation: 5 % Floating _____ Type ___% Woody _____ Type

5 % Herbaceous _____ Type

Non Vegetated: 0 % Open Water (aquatic habitat) ___% Bare Ground (riparian habitat)

Specific frog habitat present or not

Deep pools (Y) N	Semi-submerged root balls Y (N)	dense riparian veg. (Y) N
Backwater pools Y (N)	Woody Debris Y (N)	Shallow pools Y (N) Max Depth of pool: 1.5m

Frog Observations (Y)	N

Species	Adults	Subadults	Tadpoles	Eggs
Bullfrogs	2	1	0	0
Treefrogs	0	1	0	0

Other amphibian observations:

none

Predator observed: bullfrogs

Fish observed: no

Observations and Comments

First Daytime Survey | Second Daytime Survey | First Nighttime Survey | Second Nighttime Survey

California Red-legged Frog Survey Data Sheet

Date:	Begin time	End time	Observer (s):
07/04/04	14:45	17:00	Pierre Fidenci

Site #:	Locality:	County/State:
Pond #2b + drainage	pond + drainage north of pond 1, segment 1	Sonoma
Elevation:	USGS Topographic Map:	UTM North: GPS map / UTM East: GPS map
Mile Point:		

Weather:	Wind:	Air Temp.: / Time:	Water Temp.: / Time:
clear	0-5 mph	26°C / 14:45	24°C / 14:45

Habitat — Habitat type/name: pond

Site length:	Site width:	Ave Depth:	Water Flow:
≥ 50 m	15-20 m	1.5	0
Water: Turbidity 4 ((1-5) 1=clear)	Mid-day Shade %: 10%	Under Cut Bank %: 0	Overhanging Bank Veg. %: 70

Substrate: ___% Bedrock ___% Boulder ___% Rock\ Cobble ___% Gravel 100 % Sand\Silt

Riparian Veg. 80 % Herbaceous _____ Type
20 %Woody _____ Type

Aquatic Vegetation: 10 % Floating algae Type ___% Woody _____ Type
0 % Herbaceous _____ Type

Non Vegetated: 40 % Open Water (aquatic habitat) 10 % Bare Ground (riparian habitat)

Specific frog habitat present or not

Deep pools (Y) N	Semi-submerged root balls Y (N)		dense riparian veg. (Y) N
Backwater pools Y (N)	Woody Debris (Y) N	Shallow pools (Y) N	Max Depth of pool: 2 m

Frog Observations (Y) N

Species	Adults	Subadults	Tadpoles	Eggs
bullfrogs	1	1		

Other amphibian observations:

Predator observed: crayfish (6) + 1 cigarette
Fish observed: yes

Observations and Comments

good habitat. Not possible to walk along the banks, scanned shoreline using the inflow table boat.
↓
and algea + surveyed the drainage (90% shade, moist area) north of the pond

First Daytime Survey / (Second Daytime Survey)

California Red-legged Frog Survey Data Sheet

First Nighttime Survey / Second Nighttime Survey

Date: 07/07/04	Begin time 12:40	End time 14:30	Observer (s): P.F.

Site #: 2b	Locality: Segment 1		County/State: Sonoma
Elevation: / Mile Point:	USGS Topographic Map: /	UTM North: / GPS map	UTM East: — GPS map

Weather: clear - sunny	Wind: 5-10 mph	Air Temp.: 37°C Time: 12:40	Water Temp.: 25°C Time: 12:40

Habitat — Habitat type/name: pond (artificial)

Site length: 50	Site width: 15-20 m	Ave Depth: 1 m	Water Flow: 0
Water Turbidity: 5 ((1-5) 1=clear)	Mid-day Shade %: 10	Under Cut Bank %: 0	Overhanging Bank Veg. %: 70

Substrate: ___% Bedrock ___% Boulder ___% Rock\ Cobble ___% Gravel ___% Sand\Silt

Riparian Veg. 80 % Herbaceous _____ Type

20 %Woody _____ Type

Aquatic Vegetation: 10 % Floating algae Type ___% Woody _____ Type

___% Herbaceous _____ Type

Non Vegetated: 40 % Open Water (aquatic habitat) 10 % Bare Ground (riparian habitat)

Specific frog habitat present or not

Deep pools (Y) N	Semi-submerged root balls (Y) N	dense riparian veg. (Y) N
Backwater pools Y (N)	Woody Debris (Y) N	Shallow pools (Y) N
		Max Depth of pool: 2 m

Frog Observations Y (N)

Species	Adults	Subadults	Tadpoles	Eggs

Other amphibian observations:

Predator observed: crayfish + heron

Fish observed: yes

Observations and Comments

First Daytime Survey

Second Daytime Survey

California Red-legged Frog Survey Data Sheet

First Nighttime Survey

Second Nighttime Survey

Date: 07/12/04	Begin time 22:15	End time 23:25	Observer (s): P.F; J.M

Site #: 2b	Locality: Pond Segment 1		County/State: Sonoma
Elevation:	USGS Topographic Map:	UTM North: GPS map	UTM East: GPS map
Mile Point:			

Weather: clear	Wind: 5-10 mph	Air Temp.: 18°C Time: 22:15	Water Temp.: 22°C Time: 22:15

Habitat Habitat type/name: pond

Site length: 350 m	Site width: 15-20m	Ave Depth: 1.5	Water Flow: 0
Water Turbidity 4 ((1-5) 1=clear)	Mid-day Shade %: 10	Under Cut Bank %: 0	Overhanging Bank Veg. %: 70

Substrate: ___% Bedrock ___% Boulder ___% Rock\ Cobble ___% Gravel 100% Sand\Silt

Riparian Veg. 80% Herbaceous _____ Type

20%Woody _____ Type

Aquatic Vegetation: 10 % Floating algae Type ___% Woody _____ Type

0 % Herbaceous _____ Type

Non Vegetated: 0 % Open Water (aquatic habitat) 10 % Bare Ground (riparian habitat)

Specific frog habitat present or not

Deep pools (Y) N	Semi-submerged root balls Y (N)	dense riparian veg (Y) N
Backwater pools Y (N)	Woody Debris (Y) N	Shallow pools (Y) N Max Depth of pool: 2 m

Frog Observations (Y)	N

Species	Adults	Subadults	Tadpoles	Eggs
bullfrogs	1			

Other amphibian observations:

none

Predator observed: crayfish

Fish observed: yes

Observations and Comments

First Daytime Survey

Second Daytime Survey

California Red-legged Frog Survey Data Sheet

First Nighttime Survey

Second Nighttime Survey

Date: 07/14/04	Begin time 22:15	End time 23:50	Observer (s): PF; JM

Site #: 2b	Locality: pond - segment 1		County/State: Sonoma
Elevation:	USGS Topographic Map:	UTM North: GPS map ✓	UTM East: GPS map ✓
Mile Point:	✓		

Weather: clear	Wind: 0-5 mph	Air Temp.: 22:15 Time: 19°C	Water Temp.: 22:15 Time: 23°C

Habitat Habitat type/name:

Site length: ~50	Site width: 15-20 m	Ave Depth: 1.5	Water Flow: 0
Water: 4-5 Turbidity ((1-5) 1=clear)	Mid-day Shade %: 10	Under Cut Bank %: 0	Overhanging 70 Bank Veg. %:
Substrate: ___% Bedrock ___% Boulder ___% Rock\ Cobble ___% Gravel 100 % Sand\Silt			
Riparian Veg. ___% Herbaceous _____ Type ___%Woody _____ Type			
Aquatic Vegetation: 10 % Floating _____ Type ___% Woody _____ Type 0 % Herbaceous _____ Type			
Non Vegetated: 0 % Open Water (aquatic habitat) 10 % Bare Ground (riparian habitat)			

Specific frog habitat present or not

Deep pools (Y) N	Semi-submerged root balls Y (N)	dense riparian veg. (Y) N
Backwater pools Y (N)	Woody Debris (Y) N	Shallow pools (Y) N Max Depth of pool: 2 m

Frog Observations (Y)	N

Species	Adults	Subadults	Tadpoles	Eggs
bullfrogs	2			

Other amphibian observations:

none

Predator observed: crayfish
Fish observed: yb

Observations and Comments

First Daytime Survey | Second Daytime Survey

California Red-legged Frog Survey Data Sheet

First Nighttime Survey | Second Nighttime Survey

Date: 07/01/04	Begin time 12:40	End time 14:30	Observer (s): Piene Fidence

Site #: pond 2C	Locality: segment 1, pond near landing zone		County/State: Sonoma
Elevation:	USGS Topographic Map:	UTM North: GPS map	UTM East: GPS map
Mile Point:			

Weather: clear	Wind: 0	Air Temp.: 25°C Time: 12:40	Water Temp.: 23°C Time: 12:40

Habitat — Habitat type/name: pond

Site length: ~100 m	Site width: 20	Ave Depth: 1.5	Water Flow: 0
Water: Turbidity 4 ((1-5) 1=clear)	Mid-day Shade %: 5	Under Cut Bank %: 2	Overhanging Bank Veg. %: 30-40

Substrate: ___% Bedrock ___% Boulder ___% Rock\ Cobble ___% Gravel 100 % Sand\Silt

Riparian Veg. 100 % Herbaceous / Type

___%Woody / Type

Aquatic Vegetation: 10 % Floating algae Type ___% Woody ___ Type

0 % Herbaceous ___ Type

Non Vegetated: 10 % Open Water (aquatic habitat) 10 % Bare Ground (riparian habitat)

Specific frog habitat present or not

Deep pools (Y) N	Semi-submerged root balls Y (N)	dense riparian veg. (Y) N
Backwater pools Y (N)	Woody Debris Y (N)	Shallow pools (Y) N
		Max Depth of pool: 2m

Frog Observations (Y) N

Species	Adults	Subadults	Tadpoles	Eggs
bullfrogs	2			

Other amphibian observations:

Predator observed: crayfish, herons

Fish observed: yes

Observations and Comments

good potential for CRLF, walked on the less open banks & times, and scanned for frogs using the inflatable boat.

First Daytime Survey

Second Daytime Survey

California Red-legged Frog Survey Data Sheet

First Nighttime Survey

Second Nighttime Survey

Date: 07/07/04	Begin time 10:10	End time 12:10	Observer (s): P.F

Site #: 2C	Locality: Segment 1		County/State: Sonoma
Elevation:	USGS Topographic Map:	UTM North: GPS map	UTM East: GPS map
Mile Point:			

Weather: clear . Sunny	Wind: 0-5 mph	Air Temp.: 27°C Time: 12:00	Water Temp.: 25°C Time: 12:00

Habitat Habitat type/name: pond (artificial)

Site length: ~100	Site width: 20	Ave Depth: 1.5	Water Flow: 0
Water: 5 Turbidity ((1-5) 1=clear)	Mid-day Shade %: 5	Under Cut Bank %: 2	Overhanging Bank Veg. %: 30-40

Substrate: ___% Bedrock ___% Boulder ___% Rock\ Cobble ___% Gravel 100 % Sand\Silt

Riparian Veg. 100 % Herbaceous _____ Type

___%Woody _____ Type

Aquatic Vegetation: 20 % Floating algae Type ___% Woody _____ Type

___% Herbaceous _____ Type

Non Vegetated: 10 % Open Water (aquatic habitat) 10 % Bare Ground (riparian habitat)

Specific frog habitat present or not

Deep pools (Y) N	Semi-submerged root balls Y (N)	dense riparian veg. (Y) N
Backwater pools Y (N)	Woody Debris Y (N)	Shallow pools (Y) N
		Max Depth of pool: 2 m

Frog Observations (Y)	N

Species	Adults	Subadults	Tadpoles	Eggs
bullfrog	1			

Other amphibian observations:

none

Predator observed: crayfish, heron

Fish observed: yes

Observations and Comments

First Daytime Survey

Second Daytime Survey

California Red-legged Frog Survey Data Sheet

First Nighttime Survey

Second Nighttime Survey

Date: 07/12/04	Begin time 20:50	End time 21:55	Observer (s): P.F; JM

Site #: 2C	Locality: Segment 1		County/State: Sonoma
Elevation: /	USGS Topographic Map: /	UTM North: GPS map /	UTM East: GPS map /
Mile Point:			

Weather: clear - partly cloudy	Wind: 5-10 mpH	Air Temp.: 20 °C Time: 20:50	Water Temp.: 23 °C Time: 20:50

Habitat Habitat type/name: Pond

Site length: ≥100 m	Site width: 20 m	Ave Depth: 1.5 m	Water Flow: 0
Water Turbidity: 4 ((1-5) 1=clear)	Mid-day Shade %: 5	Under Cut Bank %: 2	Overhanging Bank Veg. %: 30-40

Substrate: ___% Bedrock ___% Boulder ___% Rock\ Cobble ___% Gravel 100 % Sand\Silt

Riparian Veg. 1 % Herbaceous _____ Type

0 %Woody _____ Type

Aquatic Vegetation: 10 % Floating algae Type ___% Woody _____ Type

/ % Herbaceous _____ Type

Non Vegetated: 10 % Open Water (aquatic habitat) 10 % Bare Ground (riparian habitat)

Specific frog habitat present or not

Deep pools (Y) N	Semi-submerged root balls Y (N)	dense riparian veg. (Y) N
Backwater pools Y (N)	Woody Debris Y (N)	Shallow pools (Y) N Max Depth of pool: 2 m

Frog Observations (Y)	N

Species	Adults	Subadults	Tadpoles	Eggs
bullfrog	1			

Other amphibian observations:

none

Predator observed: crayfish
Fish observed: yes

Observations and Comments

First Daytime Survey

Second Daytime Survey

California Red-legged Frog Survey Data Sheet

First Nighttime Survey

Second Nighttime Survey

Date: 07/14/04	Begin time 21:00	End time 22:00	Observer (s): P. F; JM

Site #: 2C	Locality: Segment 1		County/State: Sonoma
Elevation:	USGS Topographic Map:	UTM North: GPS map	UTM East: GPS map
Mile Point:			

Weather: Clear	Wind: 0-5 mph	Air Temp.: 21 C Time: 21:00	Water Temp.: 24 C Time: 21:00

Habitat Habitat type/name: pond

Site length: 100 m	Site width: 20 m	Ave Depth: 1.5 m	Water Flow: 0
Water: Turbidity 4 ((1-5) 1=clear)	Mid-day Shade %: 5	Under Cut Bank %: 2	Overhanging Bank Veg. %: 30-40

Substrate: ___% Bedrock ___% Boulder ___% Rock\ Cobble ___% Gravel 100% Sand\Silt

Riparian Veg. 10 % Herbaceous algae Type

0 %Woody ___ Type

Aquatic Vegetation: 90 % Floating algae Type ___% Woody ___ Type

2 % Herbaceous ___ Type

Non Vegetated: 10 % Open Water (aquatic habitat) 10 % Bare Ground (riparian habitat)

Specific frog habitat present or not

Deep pools (Y) N	Semi-submerged root balls Y (N)	dense riparian veg. (Y) N
Backwater pools Y (N)	Woody Debris Y (N)	Shallow pools (Y) N Max Depth of pool: 2 m

Frog Observations Y (N)

Species	Adults	Subadults	Tadpoles	Eggs

Other amphibian observations:

more

Predator observed: crayfish, heron

Fish observed: yes

Observations and Comments

First Daytime Survey / Second Daytime Survey

California Red-legged Frog Survey Data Sheet

First Nighttime Survey / Second Nighttime Survey

Date: 10/22/02	Begin time 10:00	End time 11:00	Observer (s): P.F; KW

Site #: 36	Locality: Pond along segment 1		County/State: Sonoma
Elevation: /	USGS Topographic Map: /	UTM North: GPS map /	UTM East: GPS map /
Mile Point:			

Weather: fog - clear	Wind: 0	Air Temp.: 15 °C Time: 10:00 AM	Water Temp.: 15 °C Time: 10:00 AM

Habitat — Habitat type/name:

Site length: 40 m	Site width: 30 m	Ave Depth: 0.5	Water Flow: 0
Water Turbidity: 3 ((1-5) 1=clear)	Mid-day Shade %: 10	Under Cut Bank %: 0	Overhanging Bank Veg. %: 40

Substrate: ___% Bedrock ___% Boulder ___% Rock\ Cobble ___% Gravel 100 % Sand\Silt

Riparian Veg. 100 % Herbaceous _____ Type

___ %Woody _____ Type

Aquatic Vegetation: 40 % Floating _____ Type ___% Woody _____ Type

40 % Herbaceous _____ Type

Non Vegetated: 10 % Open Water (aquatic habitat) ___% Bare Ground (riparian habitat)

Specific frog habitat present or not

Deep pools Y N	Semi-submerged root balls Y N	dense riparian veg. Y N
Backwater pools Y N	Woody Debris Y N	Shallow pools Y N	Max Depth of pool: 1.5 m

Frog Observations Y	N

Species	Adults	Subadults	Tadpoles	Eggs
Bullfrogs	>10		>30	

Other amphibian observations:

Predator observed: 6
Fish observed: Gambusia

Observations and Comments

First Daytime Survey

Second Daytime Survey

California Red-legged Frog Survey Data Sheet

First Nighttime Survey

Second Nighttime Survey

Date:	Begin time	End time	Observer (s):
10/28/02	10.00	10.50	P.F

Site #:	Locality:		County/State:
3b	segment 3		
Elevation: –	USGS Topographic Map: –	UTM North: – GPS map	UTM East: – GPS map
Mile Point: –			

Weather:	Wind:	Air Temp.: / Time:	Water Temp.: / Time:
clear	0	20 °C / 10:00	14 °C / 10:00

Habitat Habitat type/name: Pond

Site length:	Site width:	Ave Depth:	Water Flow:
40 m	30 m	0.5	0
Water: 2.3 m Turbidity ((1-5) 1=clear)	Mid-day Shade %: 10	Under Cut Bank %: 0	Overhanging Bank Veg. %: 40

Substrate: ___% Bedrock ___% Boulder ___% Rock\ Cobble ___% Gravel 100% Sand\Silt

Riparian Veg. 100 % Herbaceous _____ Type

___%Woody _____ Type

Aquatic Vegetation: 40% Floating _____ Type ___% Woody _____ Type

40% Herbaceous _____ Type

Non Vegetated: 10 % Open Water (aquatic habitat) ___% Bare Ground (riparian habitat)

Specific frog habitat present or not

Deep pools (Y) N	Semi-submerged root balls Y (N)		dense riparian veg. Y (N)
Backwater pools Y (N)	Woody Debris (Y) N	Shallow pools (Y) N	Max Depth of pool: 1.5 m

Frog Observations (Y) N

Species	Adults	Subadults	Tadpoles	Eggs
Bullfrogs		> 10	> 20	

Other amphibian observations:

no

Predator observed:

Fish observed: Gambusia

Observations and Comments

-> 2 WPT at pond 3b

First Daytime Survey

Second Daytime Survey

California Red-legged Frog Survey Data Sheet

First Nighttime Survey

Second Nighttime Survey

Date: 06/17/09	Begin time 10:10 PM	End time 10:50 PM	Observer (s): P.F, CS

Site #: 3B	Locality: Segment 1		County/State: Sonoma
Elevation: NA	USGS Topographic Map: NA	UTM North: NA GPS map	UTM East: NA GPS map
Mile Point: NA			

Weather: clear	Wind: 0-3 mph	Air Temp.: 18°C Time: 10:10 PM	Water Temp.: 22°C Time: 10:10 PM

Habitat Habitat type/name: pond

Site length: 40	Site width: 30	Ave Depth: 0.7	Water Flow: 0
Water Turbidity: 3-4 ((1-5) 1=clear)	Mid-day Shade %: 30	Under Cut Bank %: 0	Overhanging Bank Veg. %: 10

Substrate: ___% Bedrock ___% Boulder ___% Rock\ Cobble ___% Gravel 100% Sand\Silt

Riparian Veg. 50% Herbaceous _____ Type

0 %Woody _____ Type

Aquatic Vegetation: 5 % Floating _____ Type ___% Woody _____ Type

20 % Herbaceous _____ Type

Non Vegetated: 90 % Open Water (aquatic habitat) 0 % Bare Ground (riparian habitat)

Specific frog habitat present or not

Deep pools (Y) N	Semi-submerged root balls Y (N)	dense riparian veg. (Y) N
Backwater pools Y (N)	Woody Debris (Y) N	Shallow pools (Y) N	Max Depth of pool: 1.5m

Frog Observations (Y) N

Species	Adults	Subadults	Tadpoles	Eggs
Bullfrogs	7, 20			

Other amphibian observations:

found Bufo boreas on the road to this pond.

Predator observed:

Fish observed: Gambusia (mosquito fish)

Observations and Comments

many adults bullfrogs!

First Daytime Survey

Second Daytime Survey

California Red-legged Frog Survey Data Sheet

First Nighttime Survey

Second Nighttime Survey

Date: 06/19/03	Begin time 10:15PM	End time 11:15 PM	Observer (s): CS, PF.

Site #: 3B	Locality: Segment		County/State:
Elevation: NA	USGS Topographic Map: NA	UTM North: GPS map	UTM East: GPS map
Mile Point:			

Weather: Clear	Wind: 0	Air Temp.: 17°C Time: 10:15PM	Water Temp.: 21°C Time: 10:15PM

Habitat Habitat type/name: Pond

Site length: 40	Site width: 30	Ave Depth: 0.7	Water Flow: 0
Water: 3-4 Turbidity ((1-5) 1=clear)	Mid-day Shade %: 30	Under Cut Bank %: 0	Overhanging Bank Veg. %: 10

Substrate: ___% Bedrock ___% Boulder ___% Rock\ Cobble ___% Gravel 100% Sand\Silt

Riparian Veg. 50% Herbaceous _____ Type

0 %Woody _____ Type

Aquatic Vegetation: 5% Floating _____ Type ___% Woody _____ Type

20% Herbaceous _____ Type

Non Vegetated: 90% Open Water (aquatic habitat) 0% Bare Ground (riparian habitat)

Specific frog habitat present or not

Deep pools (Y) N	Semi-submerged root balls (Y) N	dense riparian veg. (Y) N
Backwater pools Y (N)	Woody Debris (Y) N	Shallow pools (Y) N	Max Depth of pool: 1.5

Frog Observations (Y)	N

Species	Adults	Subadults	Tadpoles	Eggs
Bullfrogs	>5	>5		

Other amphibian observations:

none

Predator observed: fish, bullfrogs

Fish observed: yes Gambusia and sun fish

Observations and Comments

First Daytime Survey / Second Daytime Survey

California Red-legged Frog Survey Data Sheet

First Nighttime Survey / Second Nighttime Survey

Date:	Begin time	End time	Observer (s):
10/22/08	12:10	15:10	P, F, KW

Site #:	Locality:		County/State:
3c	segment 1		Sonoma
Elevation: / Mile Point:	USGS Topographic Map:	UTM North: GPS map	UTM East: GPS map
/	/	/	/

Weather:	Wind:	Air Temp.: / Time:	Water Temp.: / Time:
fog - clear	0	15°C / 12:10	15°C / 12:10

Habitat — Habitat type/name:

Site length:	Site width:	Ave Depth:	Water Flow:
60 m	30 m	0.4	NA
Water: Turbidity 3 ((1-5) 1=clear)	Mid-day Shade %: 20	Under Cut Bank %: 0	Overhanging Bank Veg. %: 70

Substrate: ___% Bedrock ___% Boulder ___% Rock\ Cobble ___% Gravel 100 % Sand\Silt

Riparian Veg. 50 % Herbaceous _____ Type

___ %Woody _____ Type

Aquatic Vegetation: 80 % Floating _____ Type ___% Woody _____ Type

/ % Herbaceous _____ Type

Non Vegetated: 0 % Open Water (aquatic habitat) ___% Bare Ground (riparian habitat)

Specific frog habitat present or not

Deep pools	Semi-submerged root balls	dense riparian veg.
Y N	Y (N)	(Y) N
Backwater pools Y (N)	Woody Debris (Y) N	Shallow pools (Y) N
		Max Depth of pool: 1.5 m

Frog Observations (Y)	N

Species	Adults	Subadults	Tadpoles	Eggs
Bullfrogs		✓		

Other amphibian observations:

none

Predator observed:	no
Fish observed:	no

Observations and Comments

First Daytime Survey
Second Daytime Survey

California Red-legged Frog Survey Data Sheet

First Nighttime Survey
Second Nighttime Survey

Date:	Begin time	End time	Observer (s):
10/28/02	11:00	11:50	P.F

Site #:	Locality:		County/State:
3C	segment 1		Sonoma
Elevation: /	USGS Topographic Map: /	UTM North: GPS map /	UTM East: GPS map /
Mile Point: /			

Weather:	Wind:	Air Temp.: Time:	Water Temp.: Time:
clear	0	20°C 11:10	16°C 11:10

Habitat Habitat type/name: Pond

Site length:	Site width:	Ave Depth:	Water Flow:
60 m	30 m	0.4 m	0
Water: Turbidity 3 ((1-5) 1=clear)	Mid-day Shade %: 20	Under Cut Bank %: 0	Overhanging Bank Veg. %: 70

Substrate: ___% Bedrock ___% Boulder ___% Rock\ Cobble ___% Gravel 100 % Sand\Silt

Riparian Veg. 50 % Herbaceous _____ Type
1 %Woody _____ Type

Aquatic Vegetation: 80 % Floating _____ Type ___% Woody _____ Type
1 % Herbaceous _____ Type

Non Vegetated: 0 % Open Water (aquatic habitat) ___% Bare Ground (riparian habitat)

Specific frog habitat present or not

Deep pools (Y) N	Semi-submerged root balls Y (N)		dense riparian veg (Y) N
Backwater pools Y (N)	Woody Debris (Y) N	Shallow pools (Y) N	Max Depth of pool: 1.5 m

Frog Observations (Y)	N

Species	Adults	Subadults	Tadpoles	Eggs
Bullfrogs		>100		

Other amphibian observations:

none

Predator observed: none
Fish observed: ~~none~~ Gambusia

Observations and Comments

First Daytime Survey

Second Daytime Survey

California Red-legged Frog Survey Data Sheet

First Nighttime Survey

Second Nighttime Survey

Date: 06/17/03	Begin time 9:30pm	End time 10:00pm	Observer (s): P. Fidenci + C. Scott

Site #: 3 C	Locality: Segment One		County/State: Sonoma
Elevation: NA	USGS Topographic Map: NA	UTM North: NA GPS map	UTM East: NA GPS map
Mile Point: NA			

Weather: clear	Wind: mod. light	Air Temp.: 18°C Time: 9:30 pm	Water Temp.: 23°C Time: 9:30m

Habitat Habitat type/name: pond

Site length: 60 m	Site width: 30 m	Ave Depth: 0.5m	Water Flow: 0
Water: Turbidity 3 ((1-5) 1=clear)	Mid-day Shade %: 5	Under Cut Bank %: 0	Overhanging Bank Veg. %: 0

Substrate: ___% Bedrock ___% Boulder ___% Rock\ Cobble ___% Gravel 100% Sand\Silt

Riparian Veg. 5% Herbaceous _____ Type

0 %Woody _____ Type

Aquatic Vegetation: 75% Floating _____ Type ___% Woody _____ Type

20% Herbaceous cat tails Type

Non Vegetated: 50% Open Water (aquatic habitat) 0% Bare Ground (riparian habitat)

Specific frog habitat present or not

Deep pools Y (N)	Semi-submerged root balls Y (N)		dense riparian veg. Y (N)
Backwater pools Y (N)	Woody Debris (Y) N	Shallow pools (Y) N	Max Depth of pool: 1m

Frog Observations (Y)	N

Species	Adults	Subadults	Tadpoles	Eggs
Bull frog	>25			

Other amphibian observations:

Predator observed:

Fish observed: Gambusia observed

Observations and Comments

First Daytime Survey

Second Daytime Survey

California Red-legged Frog Survey Data Sheet

~~First Nighttime Survey~~ (second nighttime)

~~Second Nighttime Survey~~

Date: 06/19/2003	Begin time 9:45 pm	End time 10:15 pm	Observer (s): C. Scott + P. FIDSNCI

Site #: 3C	Locality: Segment One		County/State: Sonoma, CA
Elevation: NA	USGS Topographic Map:	UTM North: GPS map NA	UTM East: GPS map NA
Mile Point: NA	NA		

Weather: clear	Wind: 0	Air Temp.: 17°C Time: 9:45 pm	Water Temp.: 20°C Time: 9:45 pm

Habitat Habitat type/name: pond

Site length: 60 m	Site width: 30 m	Ave Depth: 0.5m	Water Flow: 0
Water: Turbidity 3 ((1-5) 1=clear)	Mid-day Shade %: 5	Under Cut Bank %: 0	Overhanging Bank Veg. %: 0

Substrate: ___% Bedrock ___% Boulder ___% Rock\ Cobble ___% Gravel 100 % Sand\Silt

Riparian Veg. 5 % Herbaceous _____ Type

0 %Woody _____ Type

Aquatic Vegetation: 75 % Floating _____ Type ___% Woody _____ Type

20 % Herbaceous cattails Type

Non Vegetated: 5 % Open Water (aquatic habitat) 0 % Bare Ground (riparian habitat)

Specific frog habitat present or not

Deep pools Y (N)	Semi-submerged root balls Y (N)	dense riparian veg. Y (N)
Backwater pools Y (N)	Woody Debris (Y) N	Shallow pools (Y) N Max Depth of pool: 1m

Frog Observations (Y)	N

Species	Adults	Subadults	Tadpoles	Eggs
Bull frog	±50			

Other amphibian observations:

Predator observed:

Fish observed: Gambusia observed

Observations and Comments

First Daytime Survey / Second Daytime Survey / First Nighttime Survey / Second Nighttime Survey

California Red-legged Frog Survey Data Sheet

Date:	Begin time	End time	Observer (s):
10/22/02	13:20	14:20	PF; KW

Site #:	Locality:		County/State:
4a	Segment 1		Sonoma Co
Elevation: ~	USGS Topographic Map: ~	UTM North: ~ GPS map	UTM East: ~ GPS map
Mile Point: ~			

Weather:	Wind:	Air Temp.: 15°C Time:	Water Temp.: 15°C Time:
foggy - clear	0		

Habitat — Habitat type/name: Pond

Site length:	Site width:	Ave Depth:	Water Flow:
50 m	20 m	0.6 m	0
Water Turbidity: 2 ↘ ((1-5) 1=clear)	Mid-day Shade %: 10	Under Cut Bank %: 0	Overhanging Bank Veg. %: 0

Substrate: ___% Bedrock ___% Boulder ___% Rock\ Cobble ___% Gravel 100 % Sand\Silt

Riparian Veg. 0 % Herbaceous ___ Type
0 %Woody ___ Type

Aquatic Vegetation: 10 % Floating algae Type ___% Woody ___ Type
___% Herbaceous ___ Type

Non Vegetated: 0 % Open Water (aquatic habitat) 0 % Bare Ground (riparian habitat)

Specific frog habitat present or not

Deep pools (Y) N	Semi-submerged root balls Y (N)	dense riparian veg. (Y) N
Backwater pools Y (N)	Woody Debris Y (N)	Shallow pools (Y) N — Max Depth of pool: ~2 m

Frog Observations (Y) N

Species	Adults	Subadults	Tadpoles	Eggs
Bullfrogs		3		

Other amphibian observations:

none

Predator observed: none
Fish observed: no

Observations and Comments

First Daytime Survey

Second Daytime Survey

California Red-legged Frog Survey Data Sheet

First Nighttime Survey

Second Nighttime Survey

Date:	Begin time	End time	Observer (s):
10/28/02	15:30	16:15	P.F

Site #:	Locality:		County/State:
4a	Segment 1		Sonoma Co.
Elevation: —	USGS Topographic Map: —	UTM North: — GPS map	UTM East: — GPS map
Mile Point: —			

Weather:	Wind:	Air Temp.:	Water Temp.:
clear	0	21° C Time: 15:30	15C Time: 15:30

Habitat Habitat type/name: Pond

Site length:	Site width:	Ave Depth:	Water Flow:
2	20 m	0.6	NA
Water: Turbidity 2 ((1-5) 1=clear)	Mid-day Shade %: 10	Under Cut Bank %: 0	Overhanging Bank Veg. %: 0

Substrate: ___% Bedrock ___% Boulder ___% Rock\ Cobble ___% Gravel 100 % Sand\Silt

Riparian Veg. 0 % Herbaceous _____ Type

0 %Woody _____ Type

Aquatic Vegetation: 10 % Floating algae Type ___% Woody _____ Type

___% Herbaceous _____ Type

Non Vegetated: 0 % Open Water (aquatic habitat) 0 % Bare Ground (riparian habitat)

Specific frog habitat present or not

Deep pools (Y) N	Semi-submerged root balls Y (N)		dense riparian veg. (Y) N
Backwater pools Y (N)	Woody Debris Y (N)	Shallow pools (Y) N	Max Depth of pool: 2m

Frog Observations (Y) N

Species	Adults	Subadults	Tadpoles	Eggs
Bullfrogs		720		

Other amphibian observations:

none

Predator observed:

Fish observed: Fish (bass)

Observations and Comments

First Daytime Survey

Second Daytime Survey

California Red-legged Frog Survey Data Sheet

First Nighttime Survey

Second Nighttime Survey

Date: 06/24/03	Begin time 22:00	End time 23:00	Observer (s): P.F; JM

Site #: 4A	Locality: Segment 1		County/State: Napa
Elevation: NA	USGS Topographic Map: NA	UTM North: NA GPS map	UTM East: NA GPS map
Mile Point: NA			

Weather: clear	Wind: 0	Air Temp.: 17 Time: 22:00	Water Temp.: 24 C Time: 22:00

Habitat Habitat type/name: pond

Site length: 50 m	Site width: 20 m	Ave Depth: 0.6 m	Water Flow: 0
Water: Turbidity 3 ((1-5) 1=clear)	Mid-day Shade %: 10	Under Cut Bank %: 0	Overhanging Bank Veg. %: 5

Substrate: ___% Bedrock ___% Boulder ___% Rock\ Cobble ___% Gravel 100 % Sand\Silt

Riparian Veg. 70 % Herbaceous _____ Type

___%Woody _____ Type

Aquatic Vegetation: 0 % Floating _____ Type ___% Woody _____ Type

5 % Herbaceous _____ Type

Non Vegetated: 5 % Open Water (aquatic habitat) 5 % Bare Ground (riparian habitat)

Specific frog habitat present or not

Deep pools (Y) N	Semi-submerged root balls Y (N)	dense riparian veg. (Y) N
Backwater pools Y (N)	Woody Debris Y (N)	Shallow pools (Y) N Max Depth of pool: 2 m

Frog Observations (Y)	N

Species	Adults	Subadults	Tadpoles	Eggs
bullfrogs	3			
fathogs		4	≥ 50	

Other amphibian observations:

Predator observed:

Fish observed: yes

Observations and Comments

First Daytime Survey

Second Daytime Survey

California Red-legged Frog Survey Data Sheet

First Nighttime Survey

Second Nighttime Survey

Date: 06/26/03	Begin time 22:00	End time 23:10	Observer (s): P. F; JM

Site #: 4a	Locality: Segment 1		County/State: Napa
Elevation: NA	USGS Topographic Map: NA	UTM North: GPS map NA	UTM East: GPS map NA
Mile Point: NA			

Weather: clear	Wind: 0	Air Temp.: 24°C Time:	Water Temp.: 25°C Time:

Habitat Habitat type/name: pond

Site length: 50 m	Site width: 20 m	Ave Depth: 0.6 m	Water Flow: 0
Water: 3 Turbidity ((1-5) 1=clear)	Mid-day Shade %: 10	Under Cut Bank %: 0	Overhanging Bank Veg. %: 5

Substrate: ___% Bedrock ___% Boulder ___% Rock\ Cobble ___% Gravel 100% Sand\Silt

Riparian Veg. 70 % Herbaceous _____ Type

___%Woody _____ Type

Aquatic Vegetation: 0 % Floating _____ Type ___% Woody _____ Type

5 % Herbaceous _____ Type

Non Vegetated: 5 % Open Water (aquatic habitat) 5 % Bare Ground (riparian habitat)

Specific frog habitat present or not

Deep pools (Y) N	Semi-submerged root balls Y (N)	dense riparian veg. (Y) N
Backwater pools Y (N)	Woody Debris Y (N)	Shallow pools (Y) N
		Max Depth of pool: 2 m

Frog Observations (Y) N

Species	Adults	Subadults	Tadpoles	Eggs
Bullfrogs	4			

Other amphibian observations:

Predator observed:

Fish observed: yes fish (sun fish)

Observations and Comments

First Daytime Survey

Second Daytime Survey

California Red-legged Frog Survey Data Sheet

First Nighttime Survey

Second Nighttime Survey

Date: 07/14/03	Begin time 9:30	End time 12:30	Observer (s): P. F

Site #: 4b	Locality: segment 1		County/State:
Elevation:	USGS Topographic Map:	UTM North: GPS map	UTM East: GPS map
Mile Point:			

Weather: clear	Wind: 0-5 mpH	Air Temp.: 28°C Time: 12:00	Water Temp.: 24°C Time: 12:00

Habitat Habitat type/name: pond - small reservoir

Site length: 100	Site width: 50	Ave Depth: 1	Water Flow: 0
Water: 3-4 Turbidity ((1-5) 1=clear)	Mid-day Shade %: 1	Under Cut Bank %: 0	Overhanging Bank Veg. %: 10

Substrate: ___% Bedrock ___% Boulder ___% Rock\ Cobble ___% Gravel 100 % Sand\Silt

Riparian Veg. 100 % Herbaceous _____ Type

0 %Woody _____ Type

Aquatic Vegetation: 1 % Floating _____ Type ___% Woody _____ Type

1 % Herbaceous _____ Type

Non Vegetated: 0 % Open Water (aquatic habitat) 0 % Bare Ground (riparian habitat)

Specific frog habitat present or not

Deep pools (Y) N	Semi-submerged root balls Y (N)		dense riparian veg. (Y) N
Backwater pools Y (N)	Woody Debris Y (N)	Shallow pools (Y) N	Max Depth of pool: 3-4 m

Frog Observations (Y)	N

Species	Adults	Subadults	Tadpoles	Eggs
bullfrogs	10	4		

Other amphibian observations:

none

Predator observed: heron
Fish observed: yes

Observations and Comments

none.

First Daytime Survey

Second Daytime Survey

California Red-legged Frog Survey Data Sheet

First Nighttime Survey

Second Nighttime Survey

Date: 07/16/03	Begin time 9:45	End time 12:30	Observer (s): P. F

Site #: 4b	Locality: segment 1		County/State: Sonoma
Elevation: NA	USGS Topographic Map: /	UTM North: / GPS map	UTM East: / GPS map
Mile Point: NA			

Weather: clear	Wind: 0-5 mpH	Air Temp.: 26°C Time: 10:00	Water Temp.: 24°C Time: 10:00

Habitat Habitat type/name:

Site length: ~100	Site width: ~50	Ave Depth: 1	Water Flow: 0
Water: 3-4 Turbidity ((1-5) 1=clear)	Mid-day Shade %: 1	Under Cut Bank %: 0	Overhanging Bank Veg. %: 10

Substrate: ___% Bedrock ___% Boulder ___% Rock\ Cobble ___% Gravel 100 % Sand\Silt

Riparian Veg. 100 % Herbaceous _____ Type

0 %Woody _____ Type

Aquatic Vegetation: 1 % Floating _____ Type ___% Woody _____ Type

1 % Herbaceous _____ Type

Non Vegetated: 0 % Open Water (aquatic habitat) 0 % Bare Ground (riparian habitat)

Specific frog habitat present or not

Deep pools (Y) N	Semi-submerged root balls Y (N)	dense riparian veg. (Y) N
Backwater pools Y (N)	Woody Debris Y (N)	Shallow pools (Y) N	Max Depth of pool: 5-6m

Frog Observations (Y)	N

Species	Adults	Subadults	Tadpoles	Eggs
bullfrogs	~12	1		

Other amphibian observations:

none

Predator observed: none

Fish observed: yes

Observations and Comments

First Daytime Survey

Second Daytime Survey

California Red-legged Frog Survey Data Sheet

First Nighttime Survey

Second Nighttime Survey

Date: 07/21/03	Begin time 9:30 PM	End time 11:00 PM	Observer (s): P. F; JM

Site #: 4b	Locality: Segment 1		County/State: Sonoma
Elevation: ✓	USGS Topographic Map: ✓	UTM North: GPS map ✓	UTM East: GPS map ✓
Mile Point: ✓			

Weather: clear	Wind: 0-5 mph	Air Temp.: 22 °C Time: 9:30 PM	Water Temp.: 24 °C Time: 9:30 PM

Habitat Habitat type/name: Pond

Site length: 100	Site width: 50	Ave Depth: 1	Water Flow: 0
Water Turbidity: 4 ((1-5) 1=clear)	Mid-day Shade %: 0/1	Under Cut Bank %: 0	Overhanging Bank Veg. %: 0

Substrate: ___% Bedrock ___% Boulder ___% Rock\ Cobble ___% Gravel 100% Sand\Silt

Riparian Veg. 100% Herbaceous _____ Type

0 %Woody _____ Type

Aquatic Vegetation: 1/1 % Floating _____ Type ___% Woody _____ Type

___% Herbaceous _____ Type

Non Vegetated: 0 % Open Water (aquatic habitat) 0 % Bare Ground (riparian habitat)

Specific frog habitat present or not

Deep pools (Y) N	Semi-submerged root balls Y (N)	dense riparian veg. (Y) N
Backwater pools Y (N)	Woody Debris Y (N)	Shallow pools (Y) N
		Max Depth of pool: 3 m

Frog Observations (Y)	N

Species	Adults	Subadults	Tadpoles	Eggs
bullfrogs	≥ 20	≥ 20		

Other amphibian observations:

none

Predator observed: none
Fish observed: yes

Observations and Comments

First Daytime Survey

Second Daytime Survey

California Red-legged Frog Survey Data Sheet

First Nighttime Survey

~~Second Nighttime Survey~~

Date: 07/23/03	Begin time 9:20 PM	End time 11:00PM	Observer (s): P. F ; JM

Site #: 4b	Locality: Segment 1		County/State: Sonoma
Elevation: -	USGS Topographic Map: -	UTM North: GPS map -	UTM East: GPS map -
Mile Point:			

Weather: clear	Wind: 0 mpH	Air Temp.: 27 C Time: 8:30 PM	Water Temp.: 24 C Time: 9:30 PM

Habitat Habitat type/name:

Site length: 100	Site width: 50	Ave Depth: 1	Water Flow: 0
Water: 3-4 Turbidity ((1-5) 1=clear)	Mid-day Shade %: 1	Under Cut Bank %: 0	Overhanging Bank Veg. %: 0

Substrate: ___% Bedrock ___% Boulder ___% Rock\ Cobble ___% Gravel 100 % Sand\Silt

Riparian Veg. 100 % Herbaceous _____ Type

0 %Woody _____ Type

Aquatic Vegetation: 1 % Floating _____ Type ___% Woody _____ Type

1 % Herbaceous _____ Type

Non Vegetated: 0 % Open Water (aquatic habitat) 0 % Bare Ground (riparian habitat)

Specific frog habitat present or not

Deep pools (Y) N	Semi-submerged root balls Y (N)	dense riparian veg (Y) N
Backwater pools Y (N)	Woody Debris Y (N)	Shallow pools (Y) N Max Depth of pool: 3m

Frog Observations (Y)	N

Species	Adults	Subadults	Tadpoles	Eggs
Bullfrog	~ 10	L 10		

Other amphibian observations:

none

Predator observed: none

Fish observed: yes

Observations and Comments

First Daytime Survey

Second Daytime Survey

California Red-legged Frog Survey Data Sheet

First Nighttime Survey

Second Nighttime Survey

Date: 07/14/03	Begin time 13:30	End time 14:50	Observer (s): P.F

Site #: 4 C	Locality: segment 1		County/State: Sonoma
Elevation: /	USGS Topographic Map: /	UTM North: / GPS map	UTM East: GPS map /
Mile Point: /			

Weather: clear	Wind: 0-5 mpH	Air Temp.: 30°C Time: 13:00	Water Temp.: 25°C Time: 13:00

Habitat Habitat type/name: small artificial pond

Site length: 10	Site width: 8	Ave Depth: 0.5	Water Flow: 0
Water: 4 Turbidity ((1-5) 1=clear)	Mid-day Shade %: 0	Under Cut Bank %: 0	Overhanging Bank Veg. %: 0

Substrate: ___% Bedrock ___% Boulder ___% Rock\ Cobble ___% Gravel 100 % Sand\Silt

Riparian Veg. 0 % Herbaceous _____ Type

1 %Woody _____ Type

Aquatic Vegetation: 10 % Floating _____ Type ___% Woody _____ Type

0 % Herbaceous _____ Type

Non Vegetated: 40 % Open Water (aquatic habitat) 40 % Bare Ground (riparian habitat)

Specific frog habitat present or not

Deep pools (Y) N	Semi-submerged root balls Y (N)	dense riparian veg. Y (N)
Backwater pools Y (N)	Woody Debris Y (N)	Shallow pools (Y) N Max Depth of pool: 1.5m?

Frog Observations (Y)	N

Species	Adults	Subadults	Tadpoles	Eggs
bullfrogs	>/ 10	>/ 50		

Other amphibian observations:

none

Predator observed: none

Fish observed: none

Observations and Comments

First Daytime Survey

Second Daytime Survey

California Red-legged Frog Survey Data Sheet

First Nighttime Survey

Second Nighttime Survey

Date: 07/16/03	Begin time 13:40	End time 14:40	Observer (s): P. F

Site #: 4c	Locality: Segment 1		County/State: Sonoma
Elevation: /	USGS Topographic Map: /	UTM North: / GPS map	UTM East: / GPS map
Mile Point: /			

Weather: Clear	Wind: 0-5 mpH	Air Temp.: 28 °C Time: 13:00	Water Temp.: 25 °C Time: 13:00

Habitat Habitat type/name:

Site length: 10	Site width: 8	Ave Depth: 0.5	Water Flow: 0
Water: Turbidity 4 ((1-5) 1=clear)	Mid-day Shade %: 0	Under Cut Bank %: 0	Overhanging Bank Veg. %: 0

Substrate: ___% Bedrock ___% Boulder ___% Rock\ Cobble ___% Gravel 100% Sand\Silt

Riparian Veg. 0 % Herbaceous _____ Type

1 %Woody _____ Type

Aquatic Vegetation: 10 % Floating _____ Type ___% Woody _____ Type

0 % Herbaceous _____ Type

Non Vegetated: 40 % Open Water (aquatic habitat) 40 % Bare Ground (riparian habitat)

Specific frog habitat present or not

Deep pools (Y) N	Semi-submerged root balls Y (N)	dense riparian veg. Y (N)
Backwater pools Y (N)	Woody Debris Y (N)	Shallow pools (Y) N
		Max Depth of pool: 1.5 m

Frog Observations (Y)	N

Species	Adults	Subadults	Tadpoles	Eggs
bullfrogs	≥ 20	≥ 20		

Other amphibian observations:

none

Predator observed: none

Fish observed: none

Observations and Comments

First Daytime Survey

Second Daytime Survey

California Red-legged Frog Survey Data Sheet

First Nighttime Survey

Second Nighttime Survey

Date: 07/21/03	Begin time 11:15 PM	End time 12:00 PM	Observer (s): P.F; JM

Site #: 4C	Locality: segment 1		County/State: Sonoma
Elevation: —	USGS Topographic Map: —	UTM North: GPS map —	UTM East: GPS map —
Mile Point:			

Weather: clear	Wind: 0 mpH	Air Temp.: 22°C Time: 11:20 PM	Water Temp.: 24 °C Time: 11:20 PM

Habitat Habitat type/name: Pond

Site length: 10	Site width: 8	Ave Depth: 0.5	Water Flow: 0
Water: 4 Turbidity ((1-5) 1=clear)	Mid-day Shade %: 0	Under Cut Bank %: 0	Overhanging Bank Veg. %: 0

Substrate: ___% Bedrock ___% Boulder ___% Rock\ Cobble ___% Gravel 100 % Sand\Silt

Riparian Veg. 0 % Herbaceous _____ Type

1 %Woody _____ Type

Aquatic Vegetation: 10 % Floating _____ Type ___% Woody _____ Type

0 % Herbaceous _____ Type

Non Vegetated: 40 % Open Water (aquatic habitat) ___% Bare Ground (riparian habitat)

Specific frog habitat present or not

Deep pools (Y) N	Semi-submerged root balls Y (N)	dense riparian veg. Y (N)
Backwater pools Y (N)	Woody Debris Y (N)	Shallow pools (Y) N	Max Depth of pool: 1.5m

Frog Observations (Y)	N

Species	Adults	Subadults	Tadpoles	Eggs
Bullfrog	7, 20	7, 20		

Other amphibian observations:

none

Predator observed: none

Fish observed: none

Observations and Comments

First Daytime Survey

Second Daytime Survey

California Red-legged Frog Survey Data Sheet

First Nighttime Survey

Second Nighttime Survey

Date: 07/23/03	Begin time 11:15 PM	End time 11:50 PM	Observer (s): P.F; JM

Site #: 4C	Locality: Segment 1		County/State: Sonoma
Elevation: /	USGS Topographic Map: /	UTM North: GPS map /	UTM East: GPS map /
Mile Point:			

Weather: clear	Wind: 0-5 mpH	Air Temp.: 21 °C Time: 11:15	Water Temp.: 24 °C Time: 11:15 PM

Habitat Habitat type/name: Pond

Site length: 10	Site width: 8	Ave Depth: 0.5	Water Flow: 0
Water: Turbidity 4 ((1-5) 1=clear)	Mid-day Shade %: 0	Under Cut Bank %: 0	Overhanging Bank Veg. %: 0

Substrate: ___% Bedrock ___% Boulder ___% Rock\ Cobble ___% Gravel 100 % Sand\Silt

Riparian Veg. 0 % Herbaceous _____ Type

1 %Woody _____ Type

Aquatic Vegetation: 10 % Floating _____ Type ___% Woody _____ Type

0 % Herbaceous _____ Type

Non Vegetated: 40 % Open Water (aquatic habitat) ___% Bare Ground (riparian habitat)

Specific frog habitat present or not

Deep pools (Y) N	Semi-submerged root balls Y (N)	dense riparian veg. Y (N)
Backwater pools Y (N)	Woody Debris Y (N)	Shallow pools (Y) N	Max Depth of pool: 1.5 m

Frog Observations Y	N

Species	Adults	Subadults	Tadpoles	Eggs
Bullfrogs	≥ 30	≥ 30		

Other amphibian observations:

none

Predator observed: none

Fish observed: none

Observations and Comments

First Daytime Survey / Second Daytime Survey

California Red-legged Frog Survey Data Sheet

First Nighttime Survey / Second Nighttime Survey

Date: 06/17/04	Begin time 16:40	End time 17:00	Observer (s): PF; DC

Site #: 14 a	Locality: Felder Creek segment 2 (lower section)		County/State: Sonoma
Elevation:	USGS Topographic Map:	UTM North: GPS map	UTM East: GPS map
Mile Point:			

Weather: clear	Wind: 0-5 mph	Air Temp.: 25°C Time: 16:40	Water Temp.: dry Time: —

Habitat Habitat type/name:

Site length: ~ 400 - 600 m	Site width: 2-4 m	Ave Depth: dry	Water Flow: ~~slow~~ none
Water: 1-2 Turbidity ((1-5) 1=clear)	Mid-day Shade %: 80-90%	Under Cut Bank %: 10 %	Overhanging Bank Veg. %: 70 %

Substrate: ___% Bedrock ___% Boulder 25 % Rock\ Cobble 50 % Gravel 20 % Sand\Silt

Riparian Veg. 30 % Herbaceous _____ Type

70 %Woody _____ Type

Aquatic Vegetation: 0 % Floating _____ Type ___% Woody _____ Type

0 % Herbaceous _____ Type

Non Vegetated: ___% Open Water (aquatic habitat) ___% Bare Ground (riparian habitat)

Specific frog habitat present or not

Deep pools Y (N)	Semi-submerged root balls Y (N)	dense riparian veg. Y (N)
Backwater pools Y (N)	Woody Debris Y (N)	Shallow pools Y (N)	Max Depth of pool:

Frog Observations Y (N)

Species	Adults	Subadults	Tadpoles	Eggs

Other amphibian observations:

none

Predator observed:

Fish observed:

Observations and Comments

dry, ~~---~~ no water, no CRLF potential habitat

First Daytime Survey / Second Daytime Survey

California Red-legged Frog Survey Data Sheet

First Nighttime Survey / Second Nighttime Survey

Date: 06/17/04	Begin time 16:00	End time 16:40	Observer (s):

Segments 1-2

Site #: 14b	Locality: Felder Creek (. middle section)		County/State: Sonoma
Elevation:	USGS Topographic Map:	UTM North: GPS map	UTM East: GPS map
Mile Point:			

Weather: clear	Wind: 0-5 -pH	Air Temp.: 26 C Time:	Water Temp.: Time:

Habitat Habitat type/name:

Site length:	Site width: 2-4 m	Ave Depth: 0.2	Water Flow: very low
Water: 1-2 m	Mid-day	Under Cut	Overhanging
Turbidity ((1-5) 1=clear)	Shade %: 80-90%	Bank %: 10%	Bank Veg. %: 70%

Substrate: ___% Bedrock ___% Boulder 25% Rock\ Cobble 50% Gravel 25% Sand\Silt

Riparian Veg. 30% Herbaceous _____ Type

70% Woody _____ Type

Aquatic Vegetation: 0% Floating _____ Type ___% Woody _____ Type

0% Herbaceous _____ Type

Non Vegetated: 5% Open Water (aquatic habitat) ___% Bare Ground (riparian habitat)

Specific frog habitat present or not

Deep pools (Y) N	Semi-submerged root balls (Y) N	dense riparian veg. (Y) N
Backwater pools Y (N)	Woody Debris (Y) N	Shallow pools (Y) N	Max Depth of pool: 0.8 m

Frog Observations Y (N)

Species	Adults	Subadults	Tadpoles	Eggs

Other amphibian observations:

Bullfrog 1

Predator observed: none

Fish observed: yes

Observations and Comments

First Daytime Survey
Second Daytime Survey

California Red-legged Frog Survey Data Sheet

First Nighttime Survey
Second Nighttime Survey

Date: 07/08/04	Begin time 14:50	End time 16:40	Observer (s): P.F.

Site #: 14b	Locality: Felder Creek middle section		County/State: Sonoma
Elevation:	USGS Topographic Map: /	UTM North: GPS map /	UTM East: GPS map /
Mile Point:			

Weather: partly-Sunny	Wind: 0-5 mph	Air Temp.: 26C Time: 14.50	Water Temp.: 23°C Time: 14:50

Habitat Habitat type/name:

Site length:	Site width: 2.4 m	Ave Depth: 0.2	Water Flow: very low
Water: 1-2 m Turbidity ((1-5) 1=clear)	Mid-day Shade %: 80-90%	Under Cut Bank %: 10%	Overhanging Bank Veg. %: 70%

Substrate: ___% Bedrock ___% Boulder 25% Rock\ Cobble 50% Gravel 25 % Sand\Silt

Riparian Veg. 30% Herbaceous _____ Type
70 %Woody _____ Type

Aquatic Vegetation: 0 % Floating _____ Type ___% Woody _____ Type
0 % Herbaceous _____ Type

Non Vegetated: 5 % Open Water (aquatic habitat) 5 % Bare Ground (riparian habitat)

Specific frog habitat present or not

Deep pools (Y) N	Semi-submerged root balls (Y) N	dense riparian veg. (Y) N
Backwater pools Y (N)	Woody Debris (Y) N	Shallow pools (Y) N	Max Depth of pool: 0.8

Frog Observations Y (N)

Species	Adults	Subadults	Tadpoles	Eggs

Other amphibian observations:
none

Predator observed: none
Fish observed: yes

Observations and Comments

First Daytime Survey

Second Daytime Survey

California Red-legged Frog Survey Data Sheet

First Nighttime Survey

Second Nighttime Survey

Date: 07/15/04	Begin time 21:15	End time 23:25	Observer (s): P.F; JM.

Site #: 14b	Locality: Felder Creek Middle Section		County/State: Sonoma
Elevation:	USGS Topographic Map:	UTM North: GPS map	UTM East: GPS map
Mile Point:			

Weather: clear	Wind: 0-5 mpH	Air Temp.: Time: 21:15	Water Temp.: Time: 21:15

Habitat Habitat type/name:

Site length:	Site width: 2-4m	Ave Depth: 0-2m	Water Flow: very low
Water: 1-2 Turbidity ((1-5) 1=clear)	Mid-day Shade %: 80-90	Under Cut Bank %: 10	Overhanging Bank Veg. %: 70%

Substrate: ___% Bedrock ___% Boulder 25% Rock\ Cobble 50% Gravel 25% Sand\Silt

Riparian Veg. 30% Herbaceous _____ Type

70%Woody _____ Type

Aquatic Vegetation: 6% Floating _____ Type ___% Woody _____ Type

2% Herbaceous _____ Type

Non Vegetated: 5% Open Water (aquatic habitat) 5% Bare Ground (riparian habitat)

Specific frog habitat present or not

Deep pools (Y) N	Semi-submerged root balls (Y) N	dense riparian veg. (Y) N
Backwater pools (Y) N	Woody Debris (Y) N	Shallow pools (Y) N	Max Depth of pool: 0.8m

Frog Observations Y (N)

Species	Adults	Subadults	Tadpoles	Eggs

Other amphibian observations:

more

Predator observed:

Fish observed: yes

Observations and Comments

First Daytime Survey

Second Daytime Survey

California Red-legged Frog Survey Data Sheet

First Nighttime Survey

Second Nighttime Survey

Date:	Begin time	End time	Observer (s):
07/20/04	20:50	23:00	P.F; CS

Site #:	Locality:		County/State:
14b	Felder Creek middle		Sonoma
Elevation:	USGS Topographic Map:	UTM North: Section	UTM East:
Mile Point:		GPS map	GPS map

Weather:	Wind:	Air Temp.:	Water Temp.:
clear	0	22 °C Time: 20:50	21 °C Time: 20:50

Habitat Habitat type/name: creek

Site length:	Site width:	Ave Depth:	Water Flow:
	2-4 m	0.2	very low
Water: 1-2 Turbidity ((1-5) 1=clear)	Mid-day Shade %: 80-90%	Under Cut Bank %: 10%	Overhanging Bank Veg. %: 70%

Substrate: ___% Bedrock ___% Boulder 25 % Rock\ Cobble 50 % Gravel 25 % Sand\Silt

Riparian Veg. 30 % Herbaceous _____ Type

70 %Woody _____ Type

Aquatic Vegetation: 0 % Floating _____ Type ___% Woody _____ Type

0 % Herbaceous _____ Type

Non Vegetated: 5 % Open Water (aquatic habitat) 5 % Bare Ground (riparian habitat)

Specific frog habitat present or not

Deep pools (Y) N	Semi-submerged root balls (Y) N		dense riparian veg. Y (N)
Backwater pools Y (N)	Woody Debris (Y) N	Shallow pools (Y) N	Max Depth of pool: 0.7m

Frog Observations Y (N)

Species	Adults	Subadults	Tadpoles	Eggs

Other amphibian observations:

none

Predator observed:

Fish observed: yes

Observations and Comments

good weather conditions for conducting surveys

→ and last found CRLF

First Daytime Survey | Second Daytime Survey | First Nighttime Survey | Second Nighttime Survey

California Red-legged Frog Survey Data Sheet

Date:	Begin time	End time	Observer (s):
06/17/04	13:15	14:45	P.F, DC

Site #:	Locality:	County/State:
14c	Felder Creek upper branch & tributary	Sonoma
Elevation: / Mile Point:	USGS Topographic Map:	UTM North: GPS map / UTM East: GPS map

Weather:	Wind:	Air Temp.: / Time:	Water Temp.: / Time:
clear	0-5 mph	24°C / 13:15	24°C / 13:15

Habitat — Habitat type/name: creek

Site length:	Site width:	Ave Depth:	Water Flow:
≈ 800-1,000 m	≈ 2-4 m	0.5 m	almost zero
Water: 3-4 Turbidity ((1-5) 1=clear)	Mid-day Shade %: 80	Under Cut Bank %: 5	Overhanging Bank Veg. %: 0

Substrate: ___% Bedrock ___% Boulder 10% Rock\ Cobble 30% Gravel 60% Sand\Silt

Riparian Veg. 0% Herbaceous ___ Type
0 %Woody ___ Type

Aquatic Vegetation: 0% Floating ___ Type ___% Woody ___ Type
0% Herbaceous ___ Type

Non Vegetated: 100% Open Water (aquatic habitat) 100% Bare Ground (riparian habitat)

Specific frog habitat present or not

Deep pools (Y) N	Semi-submerged root balls (Y) N		dense riparian veg. Y (N)
Backwater pools Y (N)	Woody Debris (Y) N	Shallow pools (Y) N	Max Depth of pool: 0.6 m

Frog Observations (Y) N

Species	Adults	Subadults	Tadpoles	Eggs
Rana aurora draytonii	6	0	0	0
Hyla regilla	0	0	≈ 20	0

Other amphibian observations:

none

Predator observed: none
Fish observed: none

Observations and Comments

heavy impact from cattle grazing along the creek

First Daytime Survey (circled) Second Daytime Survey

California Red-legged Frog Survey Data Sheet

First Nighttime Survey Second Nighttime Survey

Date: 10/21/03	Begin time 10:00	End time 12:00	Observer (s): Pierre Fidenci

Site #: 17	Locality: Pond site 17 along Sonoma Creek		County/State: Sonoma
Elevation:	USGS Topographic Map: Sonoma	UTM North: GPS map —	UTM East: GPS map —
Mile Point:			

Weather: clear - sunny	Wind: 0 mpH	Air Temp.: 28 C Time: 11:00 AM	Water Temp.: 20 °C Time: 11:00 AM

Habitat Habitat type/name: unnamed artificial pond

Site length: ± 10 m	Site width: ± 10 m	Ave Depth: 0.8	Water Flow: 0
Water Turbidity: 3-4 ((1-5) 1=clear)	Mid-day Shade %: 0	Under Cut Bank %: 0	Overhanging Bank Veg. %: 0

Substrate: ___% Bedrock ___% Boulder ___% Rock\ Cobble ___% Gravel 100 % Sand\Silt

Riparian Veg. 0 % Herbaceous _____ Type

0 %Woody _____ Type

Aquatic Vegetation: 0 % Floating _____ Type ___% Woody _____ Type

0 % Herbaceous _____ Type

Non Vegetated: 100 % Open Water (aquatic habitat) 100 % Bare Ground (riparian habitat)

Specific frog habitat present or not

Deep pools (Y) N	Semi-submerged root balls Y (N)	dense riparian veg. Y (N)
Backwater pools Y (N)	Woody Debris Y (N)	Shallow pools (Y) N	Max Depth of pool: 2 m

Frog Observations (Y) N

Species	Adults	Subadults	Tadpoles	Eggs
Bullfrogs	3			

Other amphibian observations:

none

Predator observed: none

Fish observed: none

Observations and Comments

irrigation pond for vineyards

First Daytime Survey

(Second Daytime Survey)

California Red-legged Frog Survey Data Sheet

First Nighttime Survey

Second Nighttime Survey

Date: 10/23/03	Begin time 10:15	End time 12:30	Observer (s): Pierre Fidenci

Site #: 17	Locality: pond along segment 17, along Sonoma Lk.		County/State: Sonoma
Elevation: /	USGS Topographic Map: Sonoma	UTM North: / GPS map	UTM East: / GPS map
Mile Point: /			

Weather: Clear	Wind: 0 mpH	Air Temp.: 29 °C Time: 11:15	Water Temp.: 20° °C Time: 11:15

Habitat Habitat type/name: unnamed pond

Site length: 10	Site width: 10	Ave Depth: 0.8	Water Flow: 0
Water: 3-4 Turbidity ((1-5) 1=clear)	Mid-day Shade %: 0	Under Cut Bank %: 0	Overhanging Bank Veg. %: 0

Substrate: ___% Bedrock ___% Boulder ___% Rock\ Cobble ___% Gravel 100% Sand\Silt

Riparian Veg. 0 % Herbaceous _____ Type

0 %Woody _____ Type

Aquatic Vegetation: 0 % Floating _____ Type ___% Woody _____ Type

0 % Herbaceous _____ Type

Non Vegetated: 100 % Open Water (aquatic habitat) ___% Bare Ground (riparian habitat)

Specific frog habitat present or not

Deep pools (Y) N	Semi-submerged root balls Y (N)		dense riparian veg. Y (N)
Backwater pools Y (N)	Woody Debris Y (N)	Shallow pools (Y) N	Max Depth of pool: 2 m

Frog Observations (Y)	N

Species	Adults	Subadults	Tadpoles	Eggs
Bullfrogs	2	2		

Other amphibian observations:

none

Predator observed: none
Fish observed: none

Observations and Comments

First Daytime Survey

Second Daytime Survey

California Red-legged Frog Survey Data Sheet

First Nighttime Survey

Second Nighttime Survey

Date: 10/27/03	Begin time 8:00 PM	End time 9:10 PM	Observer (s): P.F; JS

Site #: 17	Locality: Segment 17 along Sonoma Creek		County/State: Sonoma
Elevation: ~	USGS Topographic Map: Sonoma	UTM North: / GPS map	UTM East: / GPS map
Mile Point: ~			

Weather: clear	Wind: 0 mpH	Air Temp.: 24°C Time: 8:00 PM	Water Temp.: 17°C Time: 8:00 PM

Habitat Habitat type/name: unnamed pond

Site length: 10 m	Site width: 10 m	Ave Depth: 0.8	Water Flow: 0
Water: 3-4 Turbidity ((1-5) 1=clear)	Mid-day Shade %: 0	Under Cut Bank %: 0	Overhanging Bank Veg. %: 0

Substrate: ___% Bedrock ___% Boulder ___% Rock\ Cobble ___% Gravel 100 % Sand\Silt

Riparian Veg. 0 % Herbaceous _____ Type

0 %Woody _____ Type

Aquatic Vegetation: 0 % Floating _____ Type ___% Woody _____ Type

0 % Herbaceous _____ Type

Non Vegetated: 100 % Open Water (aquatic habitat) ___% Bare Ground (riparian habitat)

Specific frog habitat present or not

Deep pools (Y) N	Semi-submerged root balls Y (N)	dense riparian veg. Y (N)
Backwater pools Y (N)	Woody Debris Y (N)	Shallow pools (Y) N Max Depth of pool: 2 m

Frog Observations (Y)	N

Species	Adults	Subadults	Tadpoles	Eggs
bullfrogs	4	1		

Other amphibian observations:

none

Predator observed: raccoon tracks

Fish observed: none

Observations and Comments

First Daytime Survey

Second Daytime Survey

California Red-legged Frog Survey Data Sheet

First Nighttime Survey

Second Nighttime Survey

Date: 10/30/03	Begin time 8:00 PM	End time 9:15 PM	Observer (s): P.F; JS.

Site #: 17	Locality: Segment 17 along Sonoma Creek		County/State: Sonoma
Elevation: ~	USGS Topographic Map: Sonoma	UTM North: ~ GPS map	UTM East: GPS map ~
Mile Point: ~			

Weather: clear	Wind: 0	Air Temp.: 16 °C Time: 8:00 PM	Water Temp.: 15 Time: 8:00 PM

Habitat Habitat type/name: ~~stream~~ unnamed pond

Site length: 10 m	Site width: 10 m	Ave Depth: 0.8	Water Flow: 0
Water: 3-4 m Turbidity	Mid-day 0 ((1-5) 1=clear) Shade %:	Under Cut 0 Bank %:	Overhanging Bank Veg. %: 0

Substrate: ___% Bedrock ___% Boulder ___% Rock\ Cobble ___% Gravel 100 % Sand\Silt

Riparian Veg. 0 % Herbaceous _____ Type

0 %Woody _____ Type

Aquatic Vegetation: 0 % Floating _____ Type ___% Woody _____ Type

0 % Herbaceous _____ Type

Non Vegetated: 100 % Open Water (aquatic habitat) ___% Bare Ground (riparian habitat)

Specific frog habitat present or not

Deep pools (Y) N	Semi-submerged root balls Y (N)	dense riparian veg. Y (N)
Backwater pools Y (N)	Woody Debris Y (N) Shallow pools (Y) N	Max Depth of pool: 2 m

Frog Observations Y	N

Species	Adults	Subadults	Tadpoles	Eggs
bullfrogs	2			

Other amphibian observations:

none

Predator observed: raccoon

Fish observed: none

Observations and Comments

First Daytime Survey (Second Daytime Survey)

California Red-legged Frog Survey Data Sheet

First Nighttime Survey (Second Nighttime Survey)

Date: 10/21/02	Begin time 9:45	End time 12:45	Observer (s): PF

Site #: 18	Locality: segment 17		County/State: Sonoma
Elevation: / Mile Point:	USGS Topographic Map: ✓	UTM North: GPS map ✓	UTM East: GPS map ✓

Weather: clear	Wind: 0	Air Temp.: 18 °C Time: 06:00 PM	Water Temp.: 14 °C Time: 10:00 PM

Habitat — Habitat type/name: Sonoma Creek

Site length: 1000 m	Site width: 4 - 6 m	Ave Depth: 0.4	Water Flow: 5 7 m/h
Water: 2-3 Turbidity ((1-5) 1=clear)	Mid-day Shade %: 70	Under Cut Bank %: 30	Overhanging Bank Veg. %: 70

Substrate: ___% Bedrock 10 % Boulder 30 % Rock\ Cobble 30 % Gravel 30 % Sand\Silt

Riparian Veg. 30 % Herbaceous _____ Type

70 %Woody _____ Type

Aquatic Vegetation: 5 % Floating algae Type ___% Woody _____ Type

0 % Herbaceous _____ Type

Non Vegetated: 0 % Open Water (aquatic habitat) ___% Bare Ground (riparian habitat)

Specific frog habitat present or not

Deep pools (Y) N	Semi-submerged root balls (Y) N	dense riparian veg (Y) N
Backwater pools (Y) (N)	Woody Debris (Y) N	Shallow pools (Y) N	Max Depth of pool: 1.5

Frog Observations Y (N)

Species	Adults	Subadults	Tadpoles	Eggs
none				

Other amphibian observations:

none

Predator observed:

Fish observed: yes

Observations and Comments

Garbage in the creek

First Daytime Survey

Second Daytime Survey

California Red-legged Frog Survey Data Sheet

First Nighttime Survey

Second Nighttime Survey

Date: 10/31/02	Begin time 10:00 AM	End time 14:00 PM	Observer (s): P.F

Site #: 6 18	Locality: Sonoma Creek		County/State: Sonoma
Elevation: NA Mile Point: NA	USGS Topographic Map:	UTM North: GPS map	UTM East: GPS map

Weather: Clear	Wind: 0 mpH	Air Temp.: 21 C Time: 10:00 AM	Water Temp.: 15 C Time: 10:00 AM

Habitat Habitat type/name: Creek

Site length: 1000 m	Site width: 4-6 m	Ave Depth: 0-6 m	Water Flow: <1 cfs
Water: Turbidity 2 ((1-5) 1=clear)	Mid-day Shade %: 70	Under Cut Bank %: 30	Overhanging Bank Veg. %: 70

Substrate: ___% Bedrock 10 % Boulder 30 % Rock\ Cobble 30 % Gravel 30 % Sand\Silt

Riparian Veg. 35 % Herbaceous / Type

70 %Woody / Type

Aquatic Vegetation: 5 % Floating / Type ___% Woody ___ Type

0 % Herbaceous / Type

Non Vegetated: ___% Open Water (aquatic habitat) ___% Bare Ground (riparian habitat)

Specific frog habitat present or not

Deep pools (Y) N	Semi-submerged root balls (Y) N	dense riparian veg. (Y) N
Backwater pools Y N	Woody Debris (Y) N	Shallow pools (Y) N	Max Depth of pool: 1.5

Frog Observations Y (N)

Species	Adults	Subadults	Tadpoles	Eggs
none				

Other amphibian observations:

none

Predator observed:

Fish observed: fish glo.

Observations and Comments

First Daytime Survey

Second Daytime Survey

California Red-legged Frog Survey Data Sheet

First Nighttime Survey

Second Nighttime Survey

Date:	Begin time	End time	Observer (s):
6-24-03	2142	2248	KEVIN WISEMAN

Site #: 18	Locality: SONOMA CREEK		County/State: SONOMA CO., CA
Elevation:	USGS Topographic Map:	UTM North: GPS map	UTM East: GPS map
Mile Point: 2.0 (2) 1.2 (3)			

Weather: CLEAR	Wind: NONE	Air Temp.: 23°C Time: 2142	Water Temp.: 20°C Time: 2152

Habitat Habitat type/name: CREEK

Site length: ≥1000m	Site width: 2-3 m	Ave Depth: 0.5 m	Water Flow: 0-10 cm/s
Water: Turbidity 3 ((1-5) 1=clear)	Mid-day Shade %: 40	Under Cut Bank %: 30	Overhanging Bank Veg. %: 30

Substrate: 10 % Bedrock 20 % Boulder 30 % Rock\ Cobble 30 % Gravel 10 % Sand\Silt

Riparian Veg. 40 % Herbaceous CATTAILS, SEDGE, GRASSES Type

60 %Woody OAKS, COTTONWOOD, WILLOW, ALDER Type

Aquatic Vegetation: 10 % Floating ALGAE Type 20 % Woody WILLOW Type

70 % Herbaceous CATTAILS/SEDGE Type

Non Vegetated: 30 % Open Water (aquatic habitat) 70 % Bare Ground (riparian habitat)

Specific frog habitat present or not

Deep pools (Y) N	Semi-submerged root balls (Y) N	dense riparian veg. (Y) N
Backwater pools (Y) N	Woody Debris (Y) N	Shallow pools (Y) N
		Max Depth of pool: 1.5m

Frog Observations (Y)	N

Species	Adults	Subadults	Tadpoles	Eggs
RANA CATESBEIANA		2	>20	

Other amphibian observations:

Predator observed: CRAYFISH

Fish observed: CYPRINID MINNOWS, SCULPIN

Observations and Comments

- Barn Owl, Bats obs. over creek

First Daytime Survey

Second Daytime Survey

California Red-legged Frog Survey Data Sheet

First Nighttime Survey

Second Nighttime Survey

Date: 6-29-03	Begin time 2141	End time 2310	Observer (s): KEVIN WISEMAN

Site #: 6 of 8	Locality: SONOMA CREEK		County/State: SONOMA CO., CA
Elevation:	USGS Topographic Map:	UTM North: GPS map	UTM East: GPS map
Mile Point: 2.0(2) 1.2(3)			

Weather: CLEAR	Wind: NONE	Air Temp.: 21°C Time: 2141	Water Temp.: 21.5°C Time: 2148

Habitat Habitat type/name: CREEK

Site length: ≈1000m	Site width: 2-3m	Ave Depth: 0.5m	Water Flow: 0-10 cm/s
Water: Turbidity 3 ((1-5) 1=clear)	Mid-day Shade %: 40	Under Cut Bank %: 30	Overhanging Bank Veg. %: 30

Substrate: 10 % Bedrock 20 % Boulder 30 % Rock\ Cobble 30 % Gravel 10 % Sand\Silt

Riparian Veg. 40 % Herbaceous CATTAILS, GRASSES, SEDGE Type

60 %Woody OAKS, COTTONWOOD, WILLOW, ALDER Type

Aquatic Vegetation: 10 % Floating ALGAE Type 20 % Woody WILLOW Type

70 % Herbaceous CATTAILS/SEDGE Type

Non Vegetated: 30 % Open Water (aquatic habitat) 70 % Bare Ground (riparian habitat)

Specific frog habitat present or not

Deep pools (Y) N	Semi-submerged root balls (Y) N	dense riparian veg. (Y) N
Backwater pools (Y) N	Woody Debris (Y) N	Shallow pools (Y) N	Max Depth of pool: 1.5m

Frog Observations (Y) N

Species	Adults	Subadults	Tadpoles	Eggs
RANA CATESBEIANA		1	61	

Other amphibian observations:

Predator observed: OPOSSUM, RACCOON, CRAYFISH

Fish observed: SCULPIN, CYPRINID MINNOWS

Observations and Comments

Bats obs. over creek;

First Daytime Survey | Second Daytime Survey | First Nighttime Survey | Second Nighttime Survey

California Red-legged Frog Survey Data Sheet

Date: 07/02/04	Begin time 10:30	End time 14:50	Observer (s): Pierre Fidenci

Site #: 18 (extension)*	Locality: Sonoma Creek ~~section 2~~ upper section		County/State: Sonoma
Elevation:	USGS Topographic Map:	UTM North: GPS map	UTM East: GPS map
Mile Point:			

Weather: clear	Wind: 0	Air Temp.: 23°C Time: 10:30	Water Temp.: 23°C Time: 10:30

Habitat — Habitat type/name:

Site length: 1000 m	Site width: 5-10 m	Ave Depth: 0.8 m	Water Flow: low
Water: 2-3 Turbidity ((1-5) 1=clear)	Mid-day Shade %: 80%	Under Cut Bank %: 20	Overhanging Bank Veg. %: 70
Substrate: ___% Bedrock	___% Boulder	___% Rock\ Cobble	___% Gravel 100% Sand\Silt
Riparian Veg. 50% Herbaceous _____ Type			
50 %Woody _____ Type			
Aquatic Vegetation: 0 % Floating _____ Type	___% Woody _____ Type		
0 % Herbaceous _____ Type			
Non Vegetated: 0 % Open Water (aquatic habitat)	0 % Bare Ground (riparian habitat)		

Specific frog habitat present or not

Deep pools (Y) N	Semi-submerged root balls (Y) N	dense riparian veg. (Y) N
Backwater pools Y (N)	Woody Debris (Y) N	Shallow pools (Y) N
		Max Depth of pool: ~1.5m

Frog Observations (Y)	N

Species	Adults	Subadults	Tadpoles	Eggs
bullfrog	1			

Other amphibian observations:

none

Predator observed:	turkeys.
Fish observed:	yes

Observations and Comments

* Survey area was extended northward due to proximity of proposed landing zone/staging area.

First Daytime Survey
Second Daytime Survey

California Red-legged Frog Survey Data Sheet

First Nighttime Survey
Second Nighttime Survey

Date: 07/08/04	Begin time 10:00	End time 14:00	Observer (s): P.F

Site #: 18 (extension)	Locality: Sonoma Creek upper section		County/State: Sonoma
Elevation: ~	USGS Topographic Map: "	UTM North: ~ GPS map	UTM East: ~ GPS map
Mile Point: ~			

Weather: partly sunny	Wind: 0-5 mph	Air Temp.: 22°C Time:	Water Temp.: 28°C Time:

Habitat Habitat type/name: Sonoma Creek

Site length: 1000	Site width: 6-10 m	Ave Depth: 0.8	Water Flow: flow
Water: Turbidity 2-3 ((1-5) 1=clear)	Mid-day Shade %: 80	Under Cut Bank %: 20	Overhanging Bank Veg. %: 70

Substrate: ___% Bedrock ___% Boulder 20 % Rock\ Cobble 60 % Gravel 20 % Sand\Silt

Riparian Veg. 50 % Herbaceous _____ Type
50 %Woody _____ Type

Aquatic Vegetation: 0 % Floating _____ Type ___% Woody _____ Type
0 % Herbaceous _____ Type

Non Vegetated: 0 % Open Water (aquatic habitat) ___% Bare Ground (riparian habitat)

Specific frog habitat present or not

Deep pools (Y) N	Semi-submerged root balls (Y) N	dense riparian veg. (Y) N
Backwater pools Y (N)	Woody Debris (Y) N	Shallow pools (Y) N	Max Depth of pool: 1.5 m

Frog Observations Y (N)

Species	Adults	Subadults	Tadpoles	Eggs

Other amphibian observations:

none

Predator observed: turkey again!
Fish observed: yes

Observations and Comments

First Daytime Survey

Second Daytime Survey

California Red-legged Frog Survey Data Sheet

First Nighttime Survey

Second Nighttime Survey

Date:	Begin time	End time	Observer (s):
07/13/04	20:30	23:45	P.F; JM

Segment 17

Site #:	Locality:	County/State:
18 (extension)	Sonoma Creek upper Section	Sonoma

Elevation: / Mile Point:	USGS Topographic Map:	UTM North: GPS map	UTM East: GPS map
	/		

Weather:	Wind:	Air Temp.: Time:	Water Temp.: Time:
clear	0	21°C 20:40	23°C 20:40

Habitat Habitat type/name: Creek

Site length:	Site width:	Ave Depth:	Water Flow:
~1000 m	6 - 10 m	0.8 m	low
Water Turbidity: 2-3 ((1-5) 1=clear)	Mid-day Shade %: 80%	Under Cut Bank %: 20	Overhanging Bank Veg. %: 70

Substrate: ___% Bedrock ___% Boulder 20% Rock\ Cobble 60% Gravel 20% Sand\Silt

Riparian Veg. 50% Herbaceous / Type

50% Woody / Type

Aquatic Vegetation: 0% Floating ___ Type ___% Woody ___ Type

0% Herbaceous ___ Type

Non Vegetated: 0% Open Water (aquatic habitat) 0% Bare Ground (riparian habitat)

Specific frog habitat present or not

Deep pools (Y) N	Semi-submerged root balls (Y) N	dense riparian veg. (Y) N	
Backwater pools Y (N)	Woody Debris (Y) N	Shallow pools (Y) N	Max Depth of pool: 1.5m

Frog Observations (Y) N

Species	Adults	Subadults	Tadpoles	Eggs
bullfrog			1	

Other amphibian observations:

Predator observed: crayfish, turkey

Fish observed: yes (trout and others)

Observations and Comments

First Daytime Survey

Second Daytime Survey

California Red-legged Frog Survey Data Sheet

First Nighttime Survey

Second Nighttime Survey

Date: 07/19/04	Begin time 20:30	End time 10:30	Observer (s): PF; CS

Site #: 18 (extension)	Locality: Sonoma Creek		County/State: Sonoma
Elevation:	USGS Topographic Map:	UTM North: GPS map	UTM East: GPS map
Mile Point:			

Weather: clear	Wind: 0 mph	Air Temp.: 23C Time: 20:30	Water Temp.: 23C Time: 10:30

Habitat Habitat type/name: Creek

Site length: 1000 m	Site width: 6-10 m	Ave Depth: 0.8	Water Flow: low
Water Turbidity: 2 ((1-5) 1=clear)	Mid-day Shade %: 80	Under Cut Bank %: 20	Overhanging Bank Veg. %: 70

Substrate: ___% Bedrock ___% Boulder 20% Rock\ Cobble ___% Gravel ___% Sand\Silt

Riparian Veg. 50% Herbaceous _____ Type

50 %Woody _____ Type

Aquatic Vegetation: 0 % Floating _____ Type ___% Woody _____ Type

0 % Herbaceous _____ Type

Non Vegetated: 0 % Open Water (aquatic habitat) ___% Bare Ground (riparian habitat)

Specific frog habitat present or not

Deep pools (Y) N	Semi-submerged root balls (Y) N	dense riparian veg. (Y) N
Backwater pools Y (N)	Woody Debris Y (N)	Shallow pools (Y) N
		Max Depth of pool: 1.5 m

Frog Observations Y (N)

Species	Adults	Subadults	Tadpoles	Eggs

Other amphibian observations:

none

Predator observed: crayfish (4)

Fish observed: yes

Observations and Comments

First Daytime Survey

Second Daytime Survey

California Red-legged Frog Survey Data Sheet

First Nighttime Survey

Second Nighttime Survey

Date: 10/20/03	Begin time 10:50AM	End time 15:30PM	Observer (s): Pierre Fidenci

Site #: 19	Locality: Fryer Creek		County/State: Sonoma
Elevation:	USGS Topographic Map: Sonoma Quad.	UTM North: GPS map /	UTM East: GPS map /
Mile Point:			

Weather: clear	Wind: 0 mpH	Air Temp.: 25°C Time: 10:50 AM	Water Temp.: 19°C Time: 10.50AM

Habitat Habitat type/name: Fryer Creek.

Site length: 1000 m	Site width: 2-4 m	Ave Depth: 0.3 m	Water Flow: 7
Water: Turbidity 3 ((1-5) 1=clear)	Mid-day Shade %: 60%	Under Cut Bank %: 2-10	Overhanging Bank Veg. %: 5

Substrate: ___% Bedrock ___% Boulder ___% Rock\ Cobble 20 % Gravel 80 % Sand\Silt

Riparian Veg. 90 % Herbaceous _____ Type

10 %Woody _____ Type

Aquatic Vegetation: 0 % Floating _____ Type ___% Woody _____ Type

20 % Herbaceous _____ Type

Non Vegetated: 2 % Open Water (aquatic habitat) 0 % Bare Ground (riparian habitat)

Specific frog habitat present or not

Deep pools (Y) N	Semi-submerged root balls (Y) N	dense riparian veg. (Y) N
Backwater pools Y (N)	Woody Debris (Y) N	Shallow pools (Y) N	Max Depth of pool: 0.8m

Frog Observations (Y)	N

Species	Adults	Subadults	Tadpoles	Eggs
Bullfrogs	1		≥ 50	

Other amphibian observations:

none

Predator observed: 1 crayfish

Fish observed: yes mosquito fish

Observations and Comments

First Daytime Survey

Second Daytime Survey

California Red-legged Frog Survey Data Sheet

First Nighttime Survey

Second Nighttime Survey

Date: 10/22/03	Begin time 9:45	End time 14:45	Observer (s): Pierre Fidenci

Site #: 19	Locality: Fryer Creek		County/State: Sonoma
Elevation:	USGS Topographic Map: Sonoma	UTM North: GPS map	UTM East: GPS map
Mile Point:			

Weather: Clear	Wind: 0 mph	Air Temp.: 24°C Time: 10:00 AM	Water Temp.: 19°C Time: 10:00 AM

Habitat Habitat type/name: Creek Fryer Creek

Site length: 1,000 m	Site width: 2-4 m	Ave Depth: 0.5 m	Water Flow: ?
Water: Turbidity 3 ((1-5) 1=clear)	Mid-day Shade %: 60%	Under Cut Bank %: 2-10	Overhanging Bank Veg. %: 5

Substrate: ___% Bedrock ___% Boulder ___% Rock\ Cobble 20 % Gravel 80 % Sand\Silt

Riparian Veg. 90 % Herbaceous _____ Type

10 %Woody _____ Type

Aquatic Vegetation: 0 % Floating _____ Type ___% Woody _____ Type

20 % Herbaceous _____ Type

Non Vegetated: 2 % Open Water (aquatic habitat) 0 % Bare Ground (riparian habitat)

Specific frog habitat present or not

Deep pools (Y) N	Semi-submerged root balls (Y) N	dense riparian veg. (Y) N
Backwater pools Y (N)	Woody Debris (Y) N	Shallow pools (Y) N	Max Depth of pool: 0.7 m

Frog Observations (Y)	N

Species	Adults	Subadults	Tadpoles	Eggs
Bullfrogs			> 100	

Other amphibian observations:

Predator observed: Crayfish (dead)

Fish observed: yes.

Observations and Comments

good weather conditions

First Daytime Survey

Second Daytime Survey

California Red-legged Frog Survey Data Sheet

First Nighttime Survey

Second Nighttime Survey

Date: 10/27/03	Begin time 9:30 PM	End time 12:00 PM	Observer (s): P.F; JS

Site #: 19	Locality: Fryer Creek along ~~Sonoma Creek~~ segment 19		County/State: Sonoma
Elevation: —	USGS Topographic Map: Sonoma	UTM North: GPS map —	UTM East: GPS map —
Mile Point: —			

Weather: clear	Wind: 0 mpH	Air Temp.: 22 C Time: 10:00 PM	Water Temp.: 18 C Time: 10:00 PM

Habitat Habitat type/name: Creek

Site length: 1000 m	Site width: 2-4 m	Ave Depth: 0.5	Water Flow: ?,7
Water: 3 Turbidity ((1-5) 1=clear)	Mid-day Shade %: 60%	Under Cut Bank %: 2-10	Overhanging Bank Veg. %: 5

Substrate: ___% Bedrock ___% Boulder ___% Rock\ Cobble 10 % Gravel 90 % Sand\Silt

Riparian Veg. 90 % Herbaceous _____ Type

10 %Woody _____ Type

Aquatic Vegetation: 70 % Floating _____ Type ___% Woody _____ Type

20 % Herbaceous _____ Type

Non Vegetated: 2 % Open Water (aquatic habitat) 0 % Bare Ground (riparian habitat)

Specific frog habitat present or not

Deep pools (Y) N	Semi-submerged root balls (Y) N	dense riparian veg. (Y) N
Backwater pools Y (N)	Woody Debris (Y) N	Shallow pools (Y) N Max Depth of pool: 0.7 m

Frog Observations (Y)	N

Species	Adults	Subadults	Tadpoles	Eggs
bullfrog	1		?, 50	

Other amphibian observations:

none

Predator observed: crayfish

Fish observed: yes

Observations and Comments

First Daytime Survey

Second Daytime Survey

California Red-legged Frog Survey Data Sheet

First Nighttime Survey

Second Nighttime Survey

Date: 10/30/03	Begin time 9:35 AM	End time 12:00 PM	Observer (s): P.F; JS

Site #: 19	Locality: Fryer Creek along segment 17		County/State: Sonoma
Elevation: —	USGS Topographic Map: Sonoma	UTM North: GPS map /	UTM East: GPS map /
Mile Point: —			

Weather: clear	Wind: 0.5m pH	Air Temp.: @ 15°C Time: 10:00 PM	Water Temp.: 14°C Time: 10:00 PM

Habitat Habitat type/name: Fryer Creek

Site length: 1,000 m	Site width: 2-4 m	Ave Depth: 0.5	Water Flow: 2, 7
Water: 3 Turbidity ((1-5) 1=clear)	Mid-day Shade %: 60 %	Under Cut Bank %: 2-10	Overhanging Bank Veg. %: 5

Substrate: ___% Bedrock ___% Boulder ___% Rock\ Cobble 20 % Gravel 80 % Sand\Silt

Riparian Veg. 90 % Herbaceous _____ Type

10 %Woody _____ Type

Aquatic Vegetation: 0 % Floating _____ Type ___% Woody _____ Type

20 % Herbaceous _____ Type

Non Vegetated: 2 % Open Water (aquatic habitat) 0 % Bare Ground (riparian habitat)

Specific frog habitat present or not

Deep pools (Y) N	Semi-submerged root balls (Y) N	dense riparian veg. (Y) N
Backwater pools Y (N)	Woody Debris Y (N)	Shallow pools (Y) N Max Depth of pool: 0.7 m

Frog Observations (Y)	N

Species	Adults	Subadults	Tadpoles	Eggs
bullfrogs		7, 50		

Other amphibian observations:

none

Predator observed: crayfish

Fish observed: yes

Observations and Comments

none.

APPENDIX E

PG&E Vegetation Management Sudden Oak Death Protocols

Vegetation Management		Pacific Gas and Electric Company
Sudden Oak Death Protocols	Created	11/1/02
Version 2	Revised	6/9/04

IN COUNTIES WHERE SUDDEN OAK DEATH IS CONFIRMED

BE CAREFUL:

Oak trees killed by Sudden Oak Death (SOD) tend to fail much more quickly than trees killed by other means, probably because the tree is starting to rot while it still appears to be alive. The typical location of tree failure is at breast height. Extreme care must be taken when working in infected areas, as stem failure can occur at any time, even on green oaks.

HOST SPECIES (TREE SPECIES ONLY):

Coast live oak	Toyon	Buckeye	Big leaf maple
Canyon live oak	Tanoak	California Black Oak	Redwood (<1" diameter)
Shreve oak	Madrone	California bay laurel	Douglas-fir (<1" diameter)

Many shrub species are infected and the best current list can be found at ***suddenoakdeath.org***

INFESTED AREAS:

Portions of the following counties have been confirmed with *Phytophthora ramorum*, the fungus that causes SOD: Alameda, Contra Costa, Humboldt, Lake, Marin, Mendocino, Monterey, Napa, San Mateo, Santa Clara, Santa Cruz, Solano, Sonoma. Current maps which show the locations of disease centers and the quarter mile radius can be obtained from website ***suddenoakdeath.org*** to determine the infested area.

PRE-INSPECTION PROTOCOL:

Within areas infested with SOD and ¼ mile radius (see up-to-date maps), pre-inspectors must assume that host material is infested. Enter the following information into the handheld computer:

1. Under Alerts, enter 'SOD'.
2. In address comments field, enter 'SOD Infested, leave host vegetation on site'.

3. On oak trees, prescribe a heavy prune that does not require utility crews to return to the tree – protect the power facilities by removing overhangs and branches which could hit the lines in the event of failure. In tree comments field, enter 'SUS SOD'.
4. On other host trees, in tree comments field enter 'SUS SOD' and "leave host vegetation on site'.
5. On non-host trees, prescribe and comment without reference to SOD.

BEST MANAGEMENT PRACTICES FOR TREE CREWS:

1. In infested areas, all debris from host species (wood, branches and chips) shall be left on site.
2. Tools used to perform work shall be disinfected before leaving heavily infested sites.
3. State Law requires that host material not be transported from an infected county into an uninfected county without a compliance agreement filed with both the receiving and departing county agricultural commissioners.

APPENDIX F

PG&E Treated Wood Protocol

TREATED WOOD

Treated wood is used for structures such as utility poles, cross arms, flumes, cooling towers, and synchronous condensers. Treated wood typically contains preservatives in order to prevent deterioration and prolong service life. Treatment chemicals are typically added to the wood during the manufacturing process, but may also be added after it is in service.

Treatment chemicals most commonly used by manufacturers include pentachlorophenol, creosote, and chromium copper arsenate. Chemicals used to treat in-service utility poles include copper naphthenate and sodium methyldithiocarbamate (MITC fume). Petroleum products such as diesel are often used as the "carrier" or solvent for pole treatment chemicals.

The following specific management requirements must be followed when handling treated wood: employees must be trained on treated wood handling, a protocol must be followed when treated wood is given away to employees or the public, and specific waste management requirements must be followed when treated wood is disposed of. *Treated wood must not be burned in open fires, stoves or fireplaces because toxic chemicals may be produced. In addition, treated wood must not be used in areas or structures where human or animal contact is likely.*

EMPLOYEE TRAINING

Information about the hazards and proper handling practices shall be communicated to employees who handle treated wood as part of their Hazard Communication training, and as part of their training in specific work practices. Consult the PG&E Hazard Communication Manual issued by the Safety, Health, and Claims Dept. for specific details that must be covered to comply with this training requirement. Properties and Hazards associated with treated wood may be found in the Manual under Group 6: Pesticides and Wood Preservatives.

MATERIAL SAFETY DATA SHEETS

PG&E currently uses the following treated wood products:

McFarland Cascade Corp. - Wolamized Treated Wood and Lumber (chromated copper arsenate)
McFarland Cascade Corp. - Creosote Treated Wood
McFarland Cascade Corp. - Pentachlorophenol Treated Wood

PG&E uses copper naphthenate and sodium methyldithiocarbamate to treat in-service utility poles.

Material Safety Data Sheets for these products may be obtained from 3E Company (1-800-360-3220).

PROTOCOL FOR MANAGEMENT AND DISPOSAL OF SURPLUS TREATED WOOD

Treated Wood Give Away

Surplus treated wood products (including utility poles) that are still useable may be given way to employees or the public, *provided that specific conditions are met*. If the wood is given away, PG&E must provide the recipient with (1) a letter of agreement, to be signed by the recipient and a PG&E representative, stating that the recipient will use the wood only for specified purposes (see Figure 1), and (2) a warning statement indicating that the wood contains preservative chemicals (see Figure 2). In addition, each piece of wood given away must have the warning statement affixed to it (see Figure 2).

Transportation of Treated Wood

Treated wood may be transported from the field to a consolidation site without shipping papers. However, if treated wood utility poles have a copper naphthenate paper wrap, the paper wrap may require special handling. (See the section on Management of Copper Naphthenate Paper Wrap for transportation requirements applicable to paper that is removed from the poles). **NOTE: If treated wood is temporarily left unattended at a job-site that is accessible to the public, each piece of wood must have the treated wood warning statement (Figure 2) attached to it.**

Disposal as Waste

Treated wood that is not useable or that will not be given away is to be disposed of as non-hazardous waste at a landfill that is under contract to PG&E and is permitted by the State of California to accept it. Consult PEDS for a listing of treated wood disposal facilities. Although it is not required by law, use of a non-hazardous waste manifest (see Figure 4) is recommended when shipping treated wood to a landfill to help track the quantity of treated wood sent for disposal.

Management of Copper Naphthenate Paper Wrap

Treated wood utility poles may be wrapped around the base with copper naphtehanate paper. When new, copper naphthenate paper wrap may contain up to 14% copper naphthenate by weight. (This is equivalent to 140,000 mg/kg of copper compound. The hazardous waste limit for copper compounds is 2,500 mg/kg). However, some of the copper naphthenate originally present in the paper is absorbed into the wood during use. The amount left behind in the paper is not known unless the paper is tested.

The following requirements apply to the management of copper naphthenate paper found on utility poles:

- If the paper is in good condition and is securely attached to the poles, the poles may be transported from the field to a consolidation site with the paper intact. (No shipping paper is required).

- If the paper is in poor condition and there is the possibility that it will tear off during transport, remove the paper in the field before transporting. If the amount of copper naphthenate paper removed in the field is > 10 lb, it must be bagged, labeled as hazardous waste (see label example in Fig. 3), and transported to a PG&E consolidation site using a hazardous waste remote-site shipping paper. (If $\leq$ 10 lb. of copper naphthenate paper is shipped, a log describing the waste must be kept at the consolidation site).

- Remove the paper from the poles before they are given away or disposed of (wear gloves when handling paper).

- Manage the paper as hazardous waste.

- Use the following information for disposal of copper naphthenate paper:

Proper Shipping Name: Non-RCRA Hazardous Waste, Solid (Paper with Copper Naphthenate)
State Waste Code: 181
EPA Waste Code: Non-RCRA
Disposal Facility: Chemical Waste Management - Kettleman Hills
Profile #: DZ3532

Figure 1. - Treated Wood Letter of Agreement
(To be used with treated wood that is given away to employees or the public).

AGREEMENT
(M&S Code 62-4954)

(Used wood pole(s), crossarms(s), and/or other treated wood products)

Recipient hereby acknowledges that PG&E would not have conveyed the used wood pole(s), crossarm(s), and/or other treated wood products contemplated herein without Recipient's express agreement to the following terms and conditions:

1. ASSUMPTION OF RISK:

Recipient understands that, in coming onto PG&E's or any third party's property to load and remove the used wood pole(s), crossarms(s), and/or other treated wood products, Recipient undertakes activities involving significant risks of harm, injury and damage to persons and property. Recipient further understands that any use of the wood pole(s), crossarm(s) and or other treated wood products conveyed herein may also involve significant risks of harm, injury, or damage to persons or property, including without limitation the risks specified below. Therefore, with respect to the wood pole(s), crossarm(s), and/or other treated wood products conveyed herein and regardless of any assistance provided by PG&E to Recipient, Recipient hereby expressly assumes now and forever all risks of injury or death to any person including without limitation employees or agent of Recipient, PG&E or any third party, and also assumes all risks of injury or damage to any property, including without limitation property of Recipient, PG&E or any third party.

In addition, I understand that I, the Recipient, will be waiving the provisions of Section 1542 of the California Civil Code which provides that: "A general release does not extend to claims which the creditor does not know or suspect to exist in his favor at the time of executing the release, which if known by him must have materially affected his settlement with the debtor."

2. INDEMNIFICATION:

Recipient shall indemnify, defend and hold harmless PG&E, its officers, directors, agents, and employees, from and against all claims, demands losses, damages, costs, expenses, including workers' compensation expenses incurred by PG&E, and legal liability connected with or resulting from injury to or death of persons, including but not limited to employees of PG&E or Recipient, or a third party, or to natural resources, or violation of any local, state or federal law or regulation, including but not limited to, environmental laws or regulations, or strict liability imposed by any law or regulation; arising out of, related to or in any way connected with Recipient's performance of this AGREEMENT, however caused, regardless of any strict liability or negligence of PG&E, whether active or passive, excepting only such claims, demands losses, damages, costs, expenses, liability or violation of law or regulation as may be caused by the sole negligence or willful misconduct of PG&E, its officers, agents, or employees.

Recipient acknowledges that any claims, demands, losses, damages, costs, expenses, and legal liability that arise out of, result from, or are in any way connected with the release or spill of any legally designated hazardous material or waste as a result of the work performed under this AGREEMENT are expressly within the scope of this indemnity, and that the costs, expenses, and legal liability of environmental investigations, monitoring, containment, abatement, removal, repair, cleanup, restoration, remedial work, penalties, and fines arising from the violation of any local, state, or federal law or regulation, attorney's fees, disbursements, and other response costs are expressly within the scope of this indemnity.

Recipient shall, on PG&E request, defend any action, claim or suit asserting a claim covered by this indemnity. Recipient shall pay all costs that may be incurred by PG&E in enforcing this indemnity, including reasonable attorney's fees.

3. **DISCLAIMER OF ALL EXPRESS AND IMPLIED WARRANTIES**: PG&E MAKES NO WARRANTY, WRITTEN OR ORAL, WITH RESPECT TO THE WOOD POLE(S), CROSSARMS(S), AND/OR OTHER TREATED WOOD PRODUCTS CONVEYED HEREIN. PG&E CONVEYS THE WOOD POLE(S), CROSSARM(S), AND/OR OTHER TREATED WOOD PRODUCTS ON AN "AS IS AND WHERE IS" BASIS AND DOES NOT WARRANT THAT THEY ARE OF MERCHANTABLE QUALITY OR THAT THEY CAN BE USED FOR ANY PARTICULAR PURPOSE. NO AGENT, EMPLOYEE, OR REPRESENTATIVE OF PG&E HAS ANY AUTHORITY TO BIND PG&E TO ANY REPRESENTATION OR WARRANTY CONCERNING THESE WOOD POLE(S), CROSSARM(S), AND/OR OTHER TREATED WOOD PRODUCTS. ANY SUCH REPRESENTATION OR WARRANTY SHALL NOT CONSTITUTE A PART OF THIS AGREEMENT AND SHALL NOT BE ENFORCEABLE IN ANY WAY.

4. **WARNING: THE WOOD POLE(S), CROSSARM(S), AND/OR OTHER TREATED WOOD PRODUCTS CONVEYED HEREIN MAY CONTAIN CHEMICALS KNOWN TO THE STATE OF CALIFORNIA TO CAUSE CANCER, BIRTH DEFECTS, OR OTHER REPRODUCTIVE HARM. DO NOT BURN TREATED WOOD BECAUSE TOXIC SUBSTANCES MAY BE PRODUCED. BURNING MAY RELEASE TOXIC SUBSTANCES CAPABLE OF CAUSING SERIOUS INJURY OR DEATH. DO NOT USE FOR INTERIOR FURNITURE, PLAY STRUCTURES, OR ANIMAL FEED OR PRODUCE CONTAINERS. DO NOT USE IN AREAS WHERE DOMESTIC ANIMALS OR LIVESTOCK ARE LIKELY TO CRIB (BITE) OR LICK THE WOOD, OR IN AREAS WHERE FOOD IS PACKAGED, PROCESSED, HANDLED, OR STORED. AVOID FREQUENT OR PROLONGED SKIN CONTACT OR INHALATION OF SAWDUST. THE WOOD POLE(S), CROSSARMS(S), AND/OR OTHER TREATED WOOD PRODUCTS SHOULD BE INSPECTED FOR DEFECTS OR DAMAGE PRIOR TO USE. DISPOSE OF CUTOFFS AND PIECES FROM CUTTING OR SANDBLASTING IN COMPLIANCE WITH APPLICABLE FEDERAL, STATE, AND LOCAL LAWS.**

RECIPIENT_____DATE_____20____

PG&E APPROVER_____DATE_____20____

Figure 2. - Treated Wood Caution Label and Warning Statement

(M&S Code 37-3290)

WARNING

TREATED WOOD POLES MAY CONTAIN CHEMICALS KNOWN TO THE STATE OF CALIFORNIA TO CAUSE CANCER, BIRTH DEFECTS OR OTHER REPRODUCTIVE HARM.

THIS WOOD HAS BEEN CHEMICALLY TREATED WITH PRESERVATIVES.

DO NOT BURN IN OPEN FIRE, STOVE OR FIREPLACE BECAUSE TOXIC CHEMICALS MAY BE PRODUCED.

DO NOT USE FOR INTERIOR FURNITURE, PLAY STRUCTURES, ANIMAL FEED, OR PRODUCE CONTAINERS.

DO NOT USE IN AREAS WHERE DOMESTIC ANIMALS OR LIVESTOCK ARE LIKELY TO CRIB (BITE) OR LICK THE WOOD, OR IN AREAS WHERE FOOD IS PACKAGED, PROCESSED, HANDLED, OR STORED.

AVOID FREQUENT OR PROLONGED INHALATION OF SAWDUST. AVOID FREQUENT OR PROLONGED SKIN CONTACT.

DISPOSE OF CUT-OFFS AND PIECES FROM TRIMMING, CUTTING OR SANDING IN COMPLIANCE WITH APPLICABLE FEDERAL, STATE, & LOCAL LAWS.

PACIFIC GAS & ELECTRIC CO.

Figure 3. - Copper Naphthenate Paper Hazardous Waste Label

(NO D.O.T. LABEL IS REQUIRED)

Figure 4. Non-Hazardous Waste Manifest for Treated Wood.

NON-HAZARDOUS WASTE MANIFEST

Please print or type (Form designed for use on elite (12 pitch) typewriter)

NON-HAZARDOUS WASTE MANIFEST	1. Generator's US EPA ID No.	Manifest Document No.	2. Page 1 of
3. Generator's Name and Mailing Address Generator's Phone			
5. Transporter 1 Company Name	6. US EPA ID Number	A. State Transporter's ID B. Transporter 1 Phone	
7. Transporter 2 Company Name	8. US EPA ID Number	C. State Transporter's ID D. Transporter 2 Phone	
9. Designated Facility Name and Site Address **Fill in appropriate disposal facility information (See "Disposal as Waste" section).**	10. US EPA ID Number	E. State Facility's ID F. Facility's Phone	

11. WASTE DESCRIPTION	12. Containers No.	Type	13. Total Quantity	14. Unit Wt./Vol.
a. **Non-Regulated Solid Waste (Treated Wood)**				P
b.				
c.				
d.				

GENERATOR

G. Additional Descriptions for Materials Listed Above	H. Handling Codes for Wastes Listed Above
11a. - Treated wood.	

15. Special Handling Instructions and Additional Information

Profile #: (See "Disposal as Waste" section for profile numbers).

16. GENERTOR'S CERTIFICATION: I hereby certify that the contents of this shipment are fully and accurately described and are in all respects in proper condition for transport. The materials described on this manifest are not subject to federal hazardous waste regulations.

Printed/Typed Name	Signature	Date (Month Day Year)

TRANSPORTER

17. Transporter 1 Acknowledgment of Receipt of Materials		
Printed/Typed Name	Signature	Date (Month Day Year)
18. Transporter 2 Acknowledgment of Receipt of Materials		
Printed/Typed Name	Signature	Date (Month Day Year)

FACILITY

19. Discrepancy Indication Space		
20. Facility Owner or Operator: Certification of receipt of the waste materials covered by this manifest, except as noted in item 19.		Date
Printed/Typed Name	Signature	Date (Month Day Year)

Figure 5. Hazardous Waste Manifest for Copper Naphthenate Paper.

UNIFORM HAZARDOUS WASTE MANIFEST	1. Generator's US EPA ID No. **Fill In Appropriate No.**	Manifest Document No. **Must Include #**	2. Page 1 of	Information in the shaded areas is not required by Federal law.

3. Generator's Name and Mailing Address C.G.T. Facility Location Address City/State Location	A. State Manifest Document Number
4. Generator's Phone ( ) Facility Phone Number	B. State Generator's ID HYHQ36008798
5. Transporter 1 Company Name **Transporter Name & Address** 6. US EPA ID Number **Fill In Appropriate No.**	C. State Transporter's ID **Transp. ID No.** D. Transporter's Phone **Transp. Phone No.**
7. Transporter 2 Company Name 8. US EPA ID Number	E. State Transporter's ID F. Transporter's Phone
9. Designated Facility and Site Address **Final Destination Name & Physical Site Address** 10. US EPA ID Number **Fill In Appropriate No.**	G. State Facility's ID H. Facility's Phone **Recommended**

GENERATOR

11. US DOT Description (including Proper Shipping Name, Hazard Class, and ID Number)	12. Containers No.	12. Containers Type	13. Total Quantity	14. Unit Wt/Vol	I. Waste Number
a. **NON RCRA HAZARDOUS WASTE, SOLID, (Paper with Copper Naphthenate)**		**DM**		**P**	State **181** EPA/Other **Non RCRA**
b.					State EPA/Other
c.					State EPA/Other
d.					State EPA/Other

J. Additional Descriptions for Materials Listed Above	K. Handling Codes for Wastes Listed A bove	
Paper containing copper naphthenate wood preservative. **Profile #: DZ3532**	a.	b.
	c.	d.

15. Special Handling Instructions and Additional Information

24-hour Emergency Contact: 1-800-321-1030
ERG # 171
Avoid contact with skin, eyes, and clothing. Wear gloves and protective equipment as appropriate).

16 **GENERATOR'S CERTIFICATION:** I hereby declare that the contents of this consignment are fully and accurately described above by proper shipping name and are classified, packed, marked, and labeled, and are in all respects in proper condition transport by highway according to applicable international and national government regulations.

If I am a large quantity generator, I certify that I have a program in place to reduce the volume and toxicity of waste generated to the degree I have determined to be economically practicable and that I have selected the practicable method of treatment, storage, or disposal currently available to me which minimizes the present and future threat to human health and the environment; OR, if I am a small quantity generator, I have made a good faith effort to mimimize my waste generation and select the best waste management method that is available to me and that I can afford.

Printed/Typed Name **Person Completing/Approving Manifest**	Signature **Approver's Signature**	Date: **Current Date**

TRANSPORTER

17. Transporter 1 Acknowledgement of Receipt of Materials		
Printed/Typed Name **Transporter's Representative**	Signature **Transporter's Signature**	Date: **Current Date**
18. Transporter 2 Acknowledgement of Receipt of Materials		
Printed/Typed Name	Signature	Date:

FACILITY

19. Discrepancy Indication Space

20. Facility Owner or Operator Certification of receipt of hazardous materials covered by this manifest except as noted in Item 19.

Printed/Typed Name **Final Destination Representative**	Signature **Representative's Signature**	Date: **Current Date**

APPENDIX G

Certificate of Service and Distribution List for the Draft MND

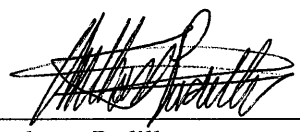
CERTIFICATE OF SERVICE

I, Anthony Padilla, certify that I have on this date caused the following:

Notice of Publication of the Mitigated Negative Declaration, regarding the Pacific Gas and Electric Company's (PG&E's) Application (No. A.04-11-011) to the California Public Utilities Commission to construct and operate an approximately 7.23-mile 115 kilovolt (kV) single-circuit transmission line between the Lakeville and Sonoma Substations pursuant to General Order (GO) 131-D, to be served by United States Postal Service mail to the owners of property adjacent to the Sonoma and Lakeville Substations and the proposed transmission line.

I declare under penalty of perjury pursuant to the laws of the State of California that the foregoing is true and correct.

Executed on December 9, 2005 in San Francisco, California.



Anthony Padilla

The following parties received copies of the Draft Mitigated Negative Declaration related to Pacific Gas and Electric Company's application (No. 04-11-001) to the California Public Utilities Commission to construct and operate an approximately 7.23-mile 115 kilovolt (kV) single-circuit transmission line between the Lakeville and Sonoma Substations pursuant to General Order (GO) 131-D:

Name	Title	Organization	Address	City, State, Zip Code
Jack Broadbent	APCO	Bay Area Air Quality Management District	939 Ellis Street	San Francisco, CA 94109
Rob Floerke	Regional Manager	California Department of Fish & Game Region 3 Central Coast	P.O. Box 47	Yountville, CA 94599
Maija Cottle		California Department of Transportation	P.O. Box 23660	Oalkand, CA 94623-0660
Ryan Broddrick	Director	California Department of Fish and Game	1416 9th Street, 12th Floor	Sacramento, CA 95814
Dana Cole	Sonoma/Lake/Napa Unit	California Department of Forestry & Fire Protection	1199 Big Tree Road	Saint Helena, CA 94574
Bijan Sartipi	Transportation Planning Dist. 4	California Department of Transportation	P.O. Box 23660	Oakland, CA 94623
Terry Winter	CEO	California Independent System Operator	P.O. Box 639014	Folsom, CA 95763-9014
Robert Feraru	Public Advisor	California Public Utilities Commission	505 Van Ness Ave. Room 5303	San Francisco, CA 94102
Mike Chrisman	Secretary	California Resources Agency	1416 9th Street	Sacramento, CA 95814
R. Austin Wiswell	Chief	CalTrans, Div. Of Aeronautics	P.O. Box 942874	Sacramento, CA 94274-0001
David Goodison	City Planner	City of Sonoma	#1 the Plaza	Sonoma, CA 95476
John Bonnoitt	City Engineer	City of Sonoma	#1 the Plaza	Sonoma, CA 95476-9000
Jim Haire	Board Member	North Bay Agricultural Alliance	29000 Skaggs Island Road	Sonoma, CA 95476
Bruce Wolfe	Executive Officer II	S.F. Bay Regional Water Quality Control Board	1515 Clay Street, Suite 1400	Oakland, CA 94612
Scott Briggs	Environmental Review, Division Manager	Sonoma County Permit & Resource Management	2550 Ventura Avenue (actual location is 2755 Mendocino Ave Suite 202)	Santa Rosa, CA 95403
Gregg Carr	Comprehensive Planning Manager	Sonoma County Planning Department	2550 Ventura Avenue	Santa Rosa, CA 95403-2829
Dave Robertson	Deputy Director	Sonoma County Transportation and Public Works Department	2300 County Center Drive, Suite B 100	Santa Rosa, CA 95403
Richard Dale	Director	Sonoma Ecology Center	205 First Street West	Sonoma, CA 95476
Ralph Benson		Sonoma Land Trust	966 Sonoma Avenue	Santa Rosa, CA 95405
Chris Taylor		Southern Sonoma County Resource Conservation District	1301 Redwood Way, #170	Petaluma, CA 94954
Arthur Baggett Jr.	Chairman	State Water Resources Control Board	P.O. Box 100	Sacramento, CA 95812
Wayne White	Field Supervisor, Region 1	U.S. Fish and Wildlife Service	2800 Cottage Way, W2606	Sacramento, CA 95825-1846
Mike Kerns		Sonoma County Board of Supervisors	575 Administration Drive, Room 100A	Santa Rosa, CA 95403-2887

Name	Title	Organization	Address	City, State, Zip Code
Milford Wayne Donaldson	State Historic Preservation Officer	Office of Historic Preservation	P.O. Box 942896	Sacramento, CA 94296
Bob Therleksen	Executive Director	California Energy Commission	1516 Ninth Street, Mail Stop 39	Sacramento, CA 95814
Terry O'Brien	Deputy Director	California Energy Commission	1516 Ninth Street, Mail Stop 39	Sacramento, CA 95814
Diana Bonta	Director	California Department of Health Services	P.O. Box 942732	Sacramento, CA 94234-7320
Catherine Witherspoon	Executive Officer	Calif. State Air Resources Control Board	P.O. Box 2815	Sacramento, CA 95812
Katie Crump	Executive Assistant	City of Petaluma City Council	11 English St.	Petaluma, CA 94952
Ann Winsor		City of Petaluma Planning Commission	11 English St.	Petaluma, CA 94952
Debbie Pilas-Treadway	Environmental Specialist 3	California Native American Heritage Commission	915 Capitol Mall, Room 364	Sacramento, CA 95814
Charlette Epifanio		Natural Resource Conservation District	1301 Redwood Way, #170	Petaluma, CA 94954
Maria Cipriani	Assistant General Manager	Sonoma County Agricultural Preservation & Open Space District	747 Mendocino Ave, Suite 100	Santa Rosa, CA 94401
Lori MacNab		Sonoma County Agricultural Preservation & Open Space District	747 Mendocino Ave Ste 100	Santa Rosa, CA 95401
Chris Finlay		Sonoma Valley Vitners and Growers Association	P. O. Box 238,	Sonoma, CA 95476
Valerie Brown		Sonoma County Board of Supervisors	575 Administration Drive, Room 100A	Santa Rosa, CA 95403-2887
		City of Sonoma City Council	#1 the Plaza	Sonoma, CA 95476
Katherine Higgins	Air Traffic Division	Federal Aviation Administration	15000 Aviation Blvd.	Hawthorne, CA 90250
		U.S. Army Corps of Engineers	333 Market Street	San Francisco, CA 94105
Jack Broadbent	APCO	Bay Area Air Quality Management District	939 Ellis Street	San Francisco, CA 94109