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TRANSMISSION CORRIDOR EVALUATION

**Humboldt Wind Energy Area
Volume 1: Report**

Prepared for



**CALIFORNIA
ENERGY COMMISSION**

Prepared by:



With assistance from:



H. T. HARVEY & ASSOCIATES
Ecological Consultants



Schatz Energy Research Center

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FORWARD

The CEC funded this transmission corridor evaluation to provide preliminary information and rankings of land-use and environmental constraints associated with alternative corridors for transmission infrastructure to access offshore wind resource from the Humboldt area as contemplated in the California Independent System Operator's 2023-2024 Transmission Planning Process. This high-level evaluation provides supplemental information for stakeholders and potential project developers on permitting challenges that may be faced in developing such transmission infrastructure.

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Appendices (see Volume 2)

- Appendix 1: Existing Transmission and Corridor Images
- Appendix 2: Geospatial Data Index and Sources

1. EXECUTIVE SUMMARY

1.1. Introduction

Aspen Environmental Group (Aspen) prepared this high-level study of onshore transmission corridors in response to a request from the California Energy Commission staff to inform Energy Commission staff and the California Independent System Operator (CAISO) about environmental feasibility concerns related to the development of potential electric transmission infrastructure needed to access wind energy in federal waters offshore of Humboldt County.

Aspen partnered with the Schatz Energy Research Center and H. T. Harvey & Associates under contract with the Energy Commission, Siting Transmission and Environmental Protection Planning Division (Contract No. 700-22-004), to complete this study as a companion to the Draft Strategic Plan for Offshore Wind Development, under Assembly Bill 525 (AB 525, Chiu, Chapter 231, Statutes of 2021).

1.2. Purpose and Scope

The function of this corridor assessment is to identify potentially major environmental siting and permitting constraints early in the transmission planning process. The study area focuses on corridors along existing built facilities that could be used by new transmission projects, although no new transmission routes or alignments have been proposed.

The report describes seven potential onshore transmission corridors that could accommodate new 500 kilovolt (kV) alternating current (AC) or high-voltage direct current (HVDC) lines. The corridors are evaluated for viability in terms of development and permitting the required rights-of-way. New, long-distance offshore HVDC submarine cable options are not included in this study.

This study includes two substations (Fern Road and Collinsville) that have not yet been constructed. The need for the Fern Road 500 kV Substation was defined in the CAISO 2018-2019 Transmission Planning Process (TPP) and it was awarded to LS Power Grid California, LLC (LSPGC) through the CAISO's competitive process. The California Public Utilities Commission (CPUC) completed California Environmental Quality Act (CEQA) review for Fern Road in January of 2024 and construction is underway.¹ The need for the Collinsville 500 kV Substation was defined in the CAISO's 2021-2022 TPP and it was also awarded to LSPGC. The CEQA process at the CPUC for Collinsville has not yet started.

Figure 1 provides an overview of all transmission corridors studied. The study area includes:

- Corridor 1: Humboldt Bay to Fern Road
- Corridor 2A: Humboldt Bay to Collinsville (Coastal Underground)
- Corridor 2B: Humboldt Bay to Collinsville (Coastal Overhead)
- Corridor 3: Humboldt Bay to Collinsville (Valley West)
- Corridor 4A: Fern Road to Collinsville (Valley East 1)
- Corridor 4B: Fern Road to Collinsville (Valley East 2)
- Corridor 5: Clear Lake

¹ https://ia.cpuc.ca.gov/environment/info/esa/round_mountain/index.html



The goal of the study is to identify areas along each study corridor where environmental, land use, and tribal/cultural factors may lead to greater or lesser siting concerns or challenges. The study relies upon currently available geospatial information and does not involve any site-specific field surveys.

1.3. Environmental and Land Use Factors Considered

This study uses over 40 sets of publicly-available geospatial data to assess the environmental and land use implications of potential transmission development in the corridors. The categories of factors that were considered include:

- Land ownership and permitting jurisdiction: Federal, State, tribal, private land; incorporated cities; density of private parcels
- Sensitive or protected lands: Parks, preserves, refuges, wilderness areas
- Biological resources: Critical habitat, important bird areas, records of wildlife and plant occurrences listed in the California Natural Diversity Database (CNDDDB)
- Tribal and cultural resources: Proximity to tribal lands, sacred lands defined by the Native American Heritage Commission (NAHC), and data obtained using a records search with California Historical Resources Information System (CHRIS) of the State Office of Historic Preservation²
- Aesthetics: Proximity to tribal land, wilderness, wild and scenic rivers, scenic highways
- Agriculture: Prime and unique farmland, Williamson Act land
- Disadvantaged Communities: CalEnviroScreen's SB 535 mapping identifies Census Tracts and Tribal Areas that are disadvantaged communities
- Hazards: Wildfire risk, active fault zone, landslide susceptibility, contaminated lands
- Airspace: Airports, military, and special-use airspace

1.4. Intended Use of this Report

The goal of providing early-stage information to the public, including communities, agency decision-makers, and transmission developers, guides the purpose and scope of this report, as described in Section 1.2. This report summarizes information gathered at a landscape-scale for comparing potential transmission corridors that would access the Humboldt Wind Energy Area (WEA). This study is an early first step in the corridor evaluation process; it is not part of a formal environmental review process for a new transmission project. Developers of future projects may use this report in the process of designing specific projects for agency review.

Conclusions presented herein are meant to be advisory. The report is aggregation of data indicating where comparatively greater challenges may exist. The conclusions rely on the professional judgement of the preparers, gained through the environmental review and construction monitoring of transmission projects across the western United States. Professional judgement is by its nature subjective, and different experts may interpret data differently and arrive at different conclusions.

The process of developing a new transmission project requires detailed routing studies, including consideration of route alternatives, and identifying site specific environmental and engineering concerns.

² CHRIS data for Corridor 5 is not yet incorporated into this report. NAHC Sacred Lands data is considered only for Butte, Glenn, and Contra Costa Counties; the remaining counties' data has been requested.

Specific proposals to develop each project would need to go through the applicable environmental review processes (i.e., CEQA and/or National Environmental Policy Act [NEPA]). These processes require public outreach and formal government-to-government consultation with Native American tribes.

This report considers information on biological and cultural resources gathered by public agencies through surveys for prior projects in the areas of the defined corridors. In some cases, these prior projects and surveys may be decades old. New projects will require future surveys that will provide more recent information.

1.5. Conclusions

The study presents results in detailed text and maps in Chapter 5. Each of the over 40 environmental or risk categories is evaluated for each corridor segment, and the conclusions are presented in summary tables. Tables and maps in this report use the following colors to illustrate environmental and permitting constraints and challenges:

- **Red** indicates factors and geographic areas with greatest concern or challenge
- **Orange** indicates factors and geographic areas with moderate concern or challenge
- **Yellow** indicates factors and geographic areas with least concern or challenge

It is important to note that **RED** does not mean that a segment is not buildable; it indicates that the permitting challenges or mitigation requirements may be very high, or that routing for some segments outside of the study corridors may be required. Similarly, **YELLOW** is not intended to imply that permitting will avoid all concerns. Design and permitting of major transmission projects always bring significant challenges. The red, orange, and yellow colors are used in summary tables and in the risk maps for each segment (Figures 6 through 11).

Figure 2 presents the overview of siting constraints for all corridors. Table 1 summarizes the corridor factors and most significant siting constraints. The table also notes the percent of each corridor that was ranked as red, orange, or yellow.

Table 1. Corridor Overview, Major Constraints, and Risk Conclusions

Corridor Name	Total Miles	Most Significant Siting and Permitting Constraints	Overall Corridor Conclusions
Corridor 1: Humboldt Bay to Fern Road	166 miles (northern segments)	<ul style="list-style-type: none"> ■ Whiskeytown National Recreation Area ■ Residential development (Eureka, Anderson, Redding, Cottonwood) 	30% Red 38% Orange 32% Yellow
	150 miles (southern segments)	<ul style="list-style-type: none"> ■ Residential development (Eureka) ■ Occupied critical habitat for threatened or endangered species 	13% Red 36% Orange 50% Yellow
Corridor 2A: Humboldt Bay to Collinsville (Coastal Underground)	295 miles	<ul style="list-style-type: none"> ■ Occupied critical habitat for threatened or endangered species ■ High landslide susceptibility ■ Active faults in corridor 	31% Red 30% Orange 39% Yellow

Corridor Name	Total Miles	Most Significant Siting and Permitting Constraints	Overall Corridor Conclusions
Corridor 2B: Humboldt Bay to Collinsville (Coastal Overhead)	295 miles	<ul style="list-style-type: none"> ■ Residential development (Eureka, Healdsburg, Windsor, Santa Rosa, Napa, Vacaville) ■ Occupied critical habitat for threatened or endangered species ■ Scenic corridors in Wine Country ■ High-value agriculture in Wine Country 	<p>21% Red 31% Orange 48% Yellow</p>
Corridor 3: Humboldt Bay to Collinsville (Valley West)	283 miles	<ul style="list-style-type: none"> ■ Occupied critical habitat for threatened or endangered species 	<p>6% Red 29% Orange 65% Yellow</p>
Corridor 4A: Fern Road to Collinsville (Valley East 1)	185 miles (+ Corridor 1 to Humboldt)	<ul style="list-style-type: none"> ■ Occupied critical habitat for threatened or endangered species 	<p>7% Red 39% Orange 55% Yellow</p>
Corridor 4B: Fern Road to Collinsville (Valley East 2)	187 miles (+ Corridor 1 to Humboldt)	<ul style="list-style-type: none"> ■ Occupied critical habitat for threatened or endangered species 	<p>1% Red 50% Orange 49% Yellow</p>
Corridor 5: Clear Lake	62 miles	<ul style="list-style-type: none"> ■ High density of residential parcels along north shore of Clear Lake 	<p>16% Red 56% Orange 29% Yellow</p>



2. BACKGROUND

The State of California has set ambitious goals for the development of offshore wind (OSW) energy, and these goals are critical to the State meeting its climate mitigation goals. The North Coast of California has a world class OSW resource, but the resource is a long distance from the load centers in the State. In addition, the transmission infrastructure serving the North Coast is sized to transmit modest amounts of energy from power sources in California's interior to meet the relatively small electrical loads in rural coastal communities. Therefore, the transmission system will require significant infrastructure investment to move North Coast OSW power to major urban load centers.

Ensuring that sufficient transmission is available when OSW projects are ready to come on-line requires robust planning. Preliminary analysis of transmission routing options can provide decisionmakers with early-stage information on the comparative impacts of these options. Transmission planning for accessing North Coast OSW resources is ongoing by the State energy agencies. At this time, the State needs more specificity about alternative transmission corridors, routes, and rights-of-way, with the associated environmental impacts and costs.³

This chapter reviews the prior studies and evaluations of the onshore transmission requirements, which are ongoing at a high-level. For this transmission corridor evaluation, the study gathers available public information to examine the likely siting constraints that may have to be considered during the environmental permitting processes for alternative transmission projects.

2.1. Federal Commercial Wind Energy Leasing

Since commercial interest emerged around 2016, the U.S. Department of the Interior and the State of California have been working to advance areas for wind energy development offshore the northern and central coasts of California. Because the OSW projects would be constructed in federal waters of the nation's Outer Continental Shelf (OCS), the Bureau of Ocean Energy Management (BOEM) within the U.S. Department of the Interior oversees the development activities.

For leasing and initial activities related to site surveys in the Humboldt Wind Energy Area (WEA), BOEM completed an Environmental Assessment (EA) and issued on May 3, 2022, a Finding of No Significant Impact (FONSI). The scope of the BOEM's 2022 EA and FONSI considered the effects of lease issuance within the Humboldt WEA, issuance of potential easements associated for each lease and grants for transmission cable corridors. The environmental analysis focused on the effects of site characterization (i.e., surveys of the lease area and potential cable routes) and assessment activities associated with lease and grant sites (i.e., temporary deployment, operation, and decommissioning of meteorological buoys).⁴

2.2. AB 525 Strategic Plan

This corridor evaluation study supports implementation of the provisions of Assembly Bill 525 (AB 525, Chiu, Chapter 231, Statutes of 2021) as they relate to assessment of the electric transmission system. AB 525 requires the CEC, in consultation with the California Public Utilities Commission (CPUC) and CAISO, to

³ January 2024, AB 525, Draft Strategic Plan for Offshore Wind Development, available at: <https://www.energy.ca.gov/data-reports/reports/ab-525-reports-offshore-renewable-energy>.

⁴ For more information about the Bureau of Ocean Energy Management's process and the EA for "Commercial Wind Lease and Grant Issuance, and Site Assessment Activities on the Pacific Outer Continental Shelf Humboldt Wind Energy Area": <https://www.boem.gov/renewable-energy/state-activities/humboldt-wind-energy-area>.

assess the transmission investments and upgrades necessary to support the OSW planning goals for 2030 and 2045.

In Public Resources Code Section 25991.4, AB 525 requires the assessment of the transmission investments and upgrades necessary to meet OSW planning goals, including potential subsea transmission options. The assessment is required to consider all relevant information on the cost of subsea high-voltage transmission and information made available by the CAISO on the cost of network upgrades and the extent to which existing transmission infrastructure and available capacity could support OSW development.

The AB 525 Draft Strategic Plan for Offshore Wind Development (January 2024) identifies the starting points for the planning of offshore wind transmission and acknowledges that targeted analysis of transmission alternatives is necessary to inform infrastructure decisions related to offshore wind. The agencies expect to finalize the AB 525 Strategic Plan later in 2024, after considering public comments.

This corridor evaluation is a companion to the AB 525, Draft Strategic Plan, Chapter 9, Transmission Planning and Interconnection, which recommends:⁵

- Proactive planning and innovative interconnection approaches.
- Landscape level planning for transmission corridors can help future permitting.
- Assessing transmission needs for host communities and other rural communities.

In addition to the AB 525 requirements, meeting the State’s Senate Bill 100 zero-carbon resource goals for 2045 will also require significant transmission infrastructure investments. The CEC, in coordination with CPUC and the California Air Resources Board (CARB), is responsible for evaluating the benefits and impacts of achieving the SB 100 goals and preparing a Joint Agency Report for SB 100 every four years. This corridor evaluation may inform transmission assessment and evaluation components of the future 2025 SB 100 Joint Agency Report.

2.3. Joint Agency Transmission and Resource Planning

The joint transmission and resource planning processes of the Energy Commission, CPUC, and CAISO are guided by the December 2022 Memorandum of Understanding (MOU).⁶ The joint agency MOU describes the linkages between electricity and transmission planning, resource procurement direction, and the interconnection process. Under the MOU, the CPUC provides resource planning information to the CAISO for use in developing its transmission plan, initiating the resulting transmission projects, and communicating to the electricity industry specific to the geographic zones being targeted for transmission projects with details on where transmission capacity exists or is being developed.

As part of the CPUC Integrated Resource Planning (IRP) process, the Energy Commission staff and CPUC staff work together to translate the generation resource portfolios into geographically specific locations by considering specific transmission infrastructure availability and land use criteria in a process called “busbar mapping.”⁷

⁵ AB 525, Draft Strategic Plan, Workshop (March 29, 2024), Primary Presentation Slides (TN 255355): <https://efiling.energy.ca.gov/Lists/DocketLog.aspx?doctetnumber=17-MISC-01>.

⁶ The 2022 Transmission and Resource Planning MOU supersedes the previous 2010 MOU to coordinate renewable generation planning and transmission planning. The MOU between the CPUC, CEC, and California ISO is available at <http://www.caiso.com/Documents/ISO-CEC-and-CPUC-Memorandum-of-Understanding-Dec-2022.pdf>.

⁷ CPUC 2022-2023 IRP Cycle Materials provide detailed information on busbar mapping methodologies: <https://www.cpuc.ca.gov/industries-and-topics/electrical-energy/electric-power-procurement/long-term-procurement-planning/2022-irp-cycle-events-and-materials>.

2.4. CAISO Annual Transmission Planning Process

The CAISO implements an annual transmission planning cycle that involves a set of key stakeholder activities. Each year's transmission planning process identifies potential system limitations as well as opportunities for system reinforcements that improve reliability and efficiency. The CAISO's product is the annual Transmission Plan, which provides an evaluation of the ISO control grid, examines conventional grid reliability requirements and projects, summarizes key collaborative activities and provides details on key study areas and associated findings.⁸

The 2023-2024 transmission planning process is underway; the CAISO released its Draft 2023-2024 Transmission Plan on April 1, 2024. This report and the April 9, 2024 PowerPoint presentation identified the need for the following projects to be evaluated in a competitive solicitation process:⁹

- New Humboldt 500 kV Substation, with a 500/115 kV Transformer, and a 500 kV line to Collinsville (HVDC operated as AC)
- New Humboldt to Fern Road 500 kV Line

The corridors evaluated in this report reflect the potential new transmission line routes that could meet the CAISO's needs as defined and recommended in the April 2024 Draft Plan.

2.5. CAISO 20-Year Transmission Outlook

Recognizing the long lead times needed for planning and developing transmission facilities primarily due to right-of-way (ROW) acquisition and environmental permitting requirements, the CAISO found that a longer-term blueprint is essential to chart the transmission planning horizon beyond the 10-year time-frame that has been used in the past. In May 2022, the California ISO released the *20-Year Transmission Outlook* that presented transmission development alternatives to accommodate substantial growth in renewable resources, including a total of 10 GW of offshore wind development with 4 to 7 GW in the North Coast and 3 to 6 GW off the Central Coast.

Within this scenario, also known as "the SB100 Starting Point scenario," to facilitate the interconnection of 4,000 MW of offshore wind in the North Coast to the CAISO system, the 2022 version of the *20-Year Transmission Outlook* identified the need for two 500 kV AC lines connecting to the planned Fern Road 500 kV substation and a HVDC line to the planned Collinsville 500/230 kV substation.¹⁰ The CAISO is planning to release an updated 2024 *20-Year Transmission Outlook* in April 2024.¹¹

2.6. Northern California/Southern Oregon OSW Transmission Study

Prior study of transmission routing considerations and route feasibility appears in the Northern California and Southern Oregon (NCSO) OSW Transmission Study,¹² prepared by the Schatz Energy Research Center. The Schatz NCSO Study was prepared for the CEC, with funding from the U.S. Department of Defense

⁸ <https://stakeholdercenter.caiso.com/RecurringStakeholderProcesses/2023-2024-Transmission-planning-process>

⁹ <https://www.caiso.com/InitiativeDocuments/Presentation-2023-2024-Transmission-Planning-Process-Apr924.pdf>

¹⁰ California ISO. May 2022. *20-Year Transmission Outlook*. Available at <http://www.caiso.com/InitiativeDocuments/20-Year-TransmissionOutlook-May2022.pdf>.

¹¹ CAISO. Available at: <https://stakeholdercenter.caiso.com/RecurringStakeholderProcesses/20-Year-transmission-outlook-2023-2024>.

¹² The Schatz NCSO Study, Volume 1 (revised): Zoellick, James, Greyson Adams, Ahmed Mustafa, Aubryn Cooperman, et al. 2024. *Northern California and Southern Oregon Offshore Wind Transmission Study*. Schatz Energy Research Center. Available at <https://efiling.energy.ca.gov/GetDocument.aspx?tn=253869&DocumentContentId=89129> (first published in 2023).

(DOD) and examines possible transmission solutions within the region. The Schatz NCSO Study built upon the prior 2020 Schatz and Pacific Gas and Electric Company Study, *California North Coast Offshore Wind Studies, Interconnection Feasibility Study Report*, which was funded by BOEM.

The Schatz NCSO Study examined a wide range of possible transmission alternatives that could accommodate the gigawatt-scale development of OSW power off the North Coast of California. Initial OSW project development is presumed to occur in the Humboldt Wind Energy Area (HWEA), where lessors are currently pursuing development of roughly 2 GW of OSW. The Schatz NCSO Study assesses multiple offshore wind geographic locations and various transmission solutions for regional offshore wind development ranging from 7.2 GW to 25.8 GW.

This analysis builds on the factors defined and studied within the Schatz NCSO Study examining potential transmission corridors for an initial 2 GW of OSW development in the HWEA. This analysis also considers the adaptability of the transmission corridors for meeting future OSW development needs.

2.7. North California and Southern Oregon Study: Environmental Concerns and Permitting Analysis

The Schatz NCSO Study provides an initial set of feasibility rankings for potential transmission routes based on a high-level analysis H. T. Harvey & Associates, conducted for the Schatz Energy Research Center.¹³ The H.T. Harvey and Schatz team examined “notional” transmission routes and identified potential high-level environmental concerns and key permitting/regulatory constraints. The study investigated subsea cable landings, subsea cable corridors, and transmission line corridors by considering land ownership or designation types (e.g., National Parks, Wild and Scenic Rivers, Marine Protected Areas), sensitive marine and terrestrial habitats, and potential for interactions with special-status plants and wildlife (e.g., Federal and State Endangered Species Acts).

For 22 subsea and onshore transmission routes that would connect the OSW resource to the backbone transmission system, feasibility rankings and differentiations were based on severity of potential environmental interactions and ramifications for permitting. Transmission routes from Humboldt Bay to the greater San Francisco Bay Area were ranked with “medium” and “high” barriers to development.¹⁴

2.8. Corridor Zones under SB 1059

The provisions of Senate Bill 1059 (Escutia and Morrow, Chapter 638, Statutes of 2006) authorize the Energy Commission to designate transmission corridor zones (transmission corridors) on non-federal lands to help assure that California can develop a robust and reliable high-voltage transmission system that will meet future electricity needs, reduce congestion costs, integrate renewable resources into the State’s energy mix, and meet the State’s critical energy and environmental policy goals. The transmission corridor designation process is intended to promote public involvement in the transmission planning processes and to link transmission planning processes with transmission permitting to assure the timely permitting and construction of needed transmission facilities.¹⁵

¹³ The Schatz NCSO Study, Volume 2 (revised): Zoellick, James, Greyson Adams, Ahmed Mustafa, Aubryn Cooperman, et al. 2024. Northern California and Southern Oregon Offshore Wind Transmission Study. Schatz Energy Research Center. Vol 2. Available at <https://efiling.energy.ca.gov/GetDocument.aspx?tn=253872&DocumentContentId=89137>.

¹⁴ AB 525, Draft Strategic Plan, Workshop (March 29, 2024), Primary Presentation Slides (TN 255355): <https://efiling.energy.ca.gov/Lists/DocketLog.aspx?docketnumber=17-MISC-01>.

¹⁵ The SB 1059 process, as described in the 2009 *Strategic Transmission Investment Plan* (CEC-700-2009-011-CMF).

Transmission corridors established under SB 1059 would be available in the future to allow for the timely permitting of high-voltage transmission projects. A transmission corridor can be proposed for designation by the Energy Commission or by any person or entity planning to build an electric transmission line in the State. A corridor must be reviewed under CEQA. SB 1059 identifies the Energy Commission as the lead agency responsible for preparing an environmental assessment for transmission corridors proposed for designation. Additionally, any corridor proposed for designation must be consistent with the State's needs and objectives as identified in the latest adopted "*Strategic Plan*" for the State's electric transmission grid.¹⁶ To date, no utility or transmission developer has submitted an application for Energy Commission designation of a transmission corridor.

2.9. Consideration of the "Garamendi Principles"

California has long recognized the value of the electric transmission system and the need for effective long-term transmission corridor planning (Senate Bill 2431, Garamendi, Chapter 1457, Statutes of 1988). The principles for following existing built facilities in the transmission siting process are known as the Garamendi Principles for efficient use of the existing transmission system and right-of-way.¹⁷ These include, in order of preferred use:

- Encouraging the use of existing rights-of-way by upgrading existing transmission facilities where technically and economically justifiable.
- When constructing new transmission lines is required, encourage expansion of existing rights-of-way when technically and economically feasible.
- Provide for the creation of new rights-of-way when justified by environmental, technical, or economic reasons as determined by the appropriate licensing agency.
- Where there is a need to construct additional transmission capacity, seek agreement among all interested utilities on the efficient use of that capacity, thus recognizing the importance of coordinated transmission planning to improve the system efficiency and the environmental performance of the system.

2.10. Transmission Planning and Environmental Review Processes

2.10.1. Process Overview

The corridor evaluation presented in this report is not part of a formal environmental review process. As described in Section 1.2, this report is a very early assessment of potential permitting risk, provided to inform decisionmakers and potential transmission developers. Following are the steps that are expected to occur before any new transmission line could be approved and constructed.

CAISO Transmission Planning Process (2023-2024 cycle)

- Draft 2023-2024 Transmission Plan: posted April 1, 2024 (comments due: April 23, 2024)
- CAISO Board of Governors Meeting in May 2024

¹⁶ An update to the 2009 *Strategic Transmission Investment Plan* appears in the 2017 *Integrated Energy Policy Report* (CEC-100-2017-001-CMF). Prior to the 2010 MOU to coordinate renewable generation planning and transmission planning, the Energy Commission's role in transmission planning was guided by the requirement to adopt a "*Strategic Transmission Investment Plan*" pursuant to Senate Bill 1565 (Bowen, Chapter 692, Statutes of 2004) and section 25324 of the Public Resources Code.

¹⁷ The Garamendi Principles, as described in the 2007 *Strategic Transmission Investment Plan* (CEC-700-2007-018-CMF).

- Developers Submit Competitive Bids for Transmission in Fall 2024
- CAISO Bid Evaluation and Developer Selection: 2024-2025

CAISO Selected Developers Detailed Project Planning

- Complete Preliminary Design
- Prepare Applications for California Environmental Quality Act (CEQA) and National Environmental Policy Act (NEPA) Lead Agencies

State and Federal Lead Agencies Complete Project-Level CEQA and NEPA

- Application Review
- Native American Consultation
- Public Scoping; Development of Alternatives
- Release of Draft EIR/EIS
- Consideration of Public Comments
- Release of Final EIR/EIS
- Agency Decisions

2.10.2. Public Engagement in Transmission Project Review

The CEC and agencies responsible for energy systems planning strive for effective public engagement in the discussions related to development of future transmission projects, the evaluations of project need, and the technical modeling processes that underpin these decisions. The following table provides an overview of prior and anticipated future points of public engagement, as it relates to transmission expansion for the Humboldt WEA.

Table 2 summarizes various prior and future opportunities for public input and identifies the relationship of this corridor evaluation with other OSW planning efforts and the AB 525 Strategic Plan.

Table 2. Offshore Wind Planning Processes and Public Input Opportunities

History or Target Dates	Milestones or Decisions	Opportunities for Public Input
Annually	CAISO Transmission Planning Process, annual transmission planning cycles evaluating transmission requirements for system reliability and efficiency, and availability to meet expected renewable generation portfolios. CAISO relies on the CPUC for its lead role in developing resource forecasts for the 10-year planning horizon and on the CEC for its lead role in forecasting customer load requirements. CAISO <i>2023-2024 Transmission Plan</i> in draft released April 1, 2024.	Study Plan (February) Preliminary Results (Sept., Nov.) Draft Transmission Plan (April)
Recurring, two-year cycles	CPUC Integrated Resource Planning (IRP) process, follows a recurring two-year cycle to specify how California's load serving entities (LSEs) should achieve reliability needs and renewables procurement targets.	Recurring Decisions and Rulings by CPUC

History or Target Dates	Milestones or Decisions	Opportunities for Public Input
	<p>The IRP process includes CPUC decisions and rulings on technical inputs and assumptions for modeling, system-wide procurement plans, and portfolios for the CAISO Transmission Planning Process.</p> <p>CPUC's portfolio for the CAISO 2023-2024 Transmission Planning Process included 1.6 GW of OSW in the Humboldt area. The CPUC recently adjusted the timing for 1.6 GW of Humboldt area OSW to be developed by 2039 with a partial 0.9 GW by 2034 (D.24-02-047, February 15, 2024).</p>	
2018	BOEM, 2018 Call Areas commercial wind energy leases within the proposed areas off central and northern California	Public Comments (2018)
2022, May	CAISO, <i>20-Year Transmission Outlook</i> .	Public Comments (2021-2022)
2022	BOEM, <i>Environmental Assessment for Commercial Wind Energy Lease Issuance and Site Assessment Activities Offshore Humboldt County, California</i> .	Public Comments and Scoping (2021-2022)
2022, August	CEC, <i>Offshore Wind (OSW) Development Maximum Feasible Capacity and Megawatt Planning Goals for 2030 and 2045</i> , set a preliminary planning goal range of 2,000 MW–5,000 MW (2 GW–5 GW) of offshore wind for 2030, and 25 GW by 2045.	Public Comments and Workshops (2022)
2022-2024	CEC and DOD funded Schatz NCSO Study to evaluate transmission alternatives. First published in October 2023, revised in January 2024. Built upon prior 2022 Schatz study: <i>Transmission Alternatives for California North Coast Offshore Wind</i> .	Posted to CEC Docket 17-MISC-01 (2023-2024)
2023, June	BOEM, Leases executed for Humboldt WEA.	---
2023 through 2025	<p>BOEM, <i>Notice of Intent to Prepare a Programmatic Environmental Review of Future Development of California Offshore Wind Leases</i>.</p> <p>Prior to lessees submitting individual plans, BOEM intends to develop a Programmatic Environmental Impact Statement (EIS) to identify, analyze, and adopt potential high-level mitigation measures for California OSW impacts that are not project specific.</p>	Public Review of Programmatic EIS pursuant to NEPA (2023-2025)
2024, January	<p>CEC, <i>Assembly Bill 525 Draft Strategic Plan for Offshore Wind Development</i>.</p> <p>This study is part of this effort: CEC anticipates finalizing the <i>Assembly Bill 525 Strategic Plan for Offshore Wind Development</i> during 2024.</p>	Public Comment (January to April 2024)
2024, April	<p>CAISO releases draft <i>2023-2024 Transmission Plan</i>.</p> <p>CAISO releases an updated <i>20-Year Transmission Outlook</i>.</p> <p>Depending on CAISO Board action, the <i>2023-2024 Transmission Plan</i> may initiate CAISO's competitive solicitation process for prospective developers to build and own new regional transmission facilities identified in the Board-approved plan. CAISO would subsequently select transmission project sponsor(s).</p>	Public Comments (2024)
2025 through 2027	OSW lessees to prepare Construction and Operations Plans (COPs). COPs will define lessee proposals for offshore wind facility design, installation, and siting electric cables to shore. BOEM would initiate project-specific environmental review.	Public Review of Project-Specific COPs pursuant to NEPA

History or Target Dates	Milestones or Decisions	Opportunities for Public Input
2025 through 2027	CEQA and NEPA lead agencies to commence review of transmission projects, after sponsors establish preliminary designs and submit applications for environmental review by CEQA and NEPA lead agencies.	Public Scoping upon initiating CEQA and NEPA
2026 through 2028	CEQA and NEPA lead agencies to assess and disclose environmental impacts of transmission projects and require identification of alternatives to avoid or minimize potential significant environmental impacts.	Public Review of draft environmental documents under CEQA and NEPA
2028 to 2030 and beyond	Developers construct new transmission and interconnection projects concurrent with offshore wind turbine construction and installation.	---

3. TRANSMISSION CORRIDOR DEFINITION

This study defines names and segments of corridors for future projects by following existing built facilities. The corridors defined in Figure 1 are based on the needs defined in CAISO's 2023-2024 Draft Transmission Plan (see Section 2.4).

As defined in Section 2.9 (Garamendi Principles), the process of seeking routes for new overhead transmission lines usually begins with seeking lower impact routes, which most often would follow an existing transmission corridor. Corridors 1, 2B, 3, 4A, and 4B are all centered on existing transmission lines. Corridor 2A (the only underground route studied) is centered on an existing railroad right-of-way (ROW) through Mendocino and Sonoma Counties, then follows roads or river systems.

The study area for each corridor follows a "default width" of 3,500 feet (or slightly larger than 1 kilometer wide) along the centerline of existing transmission facilities between the North Coast and the San Francisco Bay Area. The corridors follow existing 115 kV transmission lines in Corridor 1, 60 kV lines in isolated areas with less existing infrastructure (Corridors 1 and 2B), and 230 kV or 500 kV lines, where they exist. The study area width of 3,500 feet would theoretically allow each corridor to site two new 500 kV AC or new HVDC lines on either side of the existing facilities. As defined by CAISO, new 500 kV transmission could be initially built as HVAC, and then converted to HVDC with the installation of converter stations in the future.

While this report focuses on areas adjacent to existing overhead transmission facilities, for new overhead transmission, one corridor (Corridor 2A) considers the potential for new underground transmission within or adjacent to existing transportation facilities, along railroad ROW and highways, and along a submarine alignment. During the siting process, new transmission projects could eventually be proposed for areas outside of the corridors of this study including previously disturbed or undisturbed lands.

3.1. Study Corridor Names and Descriptions

Six corridors were defined for this study; they are defined in the following paragraphs. It is important to note that developers seeking to build the lines that would connect the substations defined below may propose entirely different routes than those studied here. As described in Section 2, these study corridors were selected based on the presence of other existing transmission lines or railroad rights-of-way.

Corridor 1: Humboldt Bay to Fern Road

This corridor defines two separate routes that would traverse Humboldt, Trinity, and Shasta Counties to connect the Humboldt Bay region to the planned Fern Road substation in the northern Sacramento Valley, northeast of the City of Redding.

Figure 3 illustrates Corridor 1.

Corridor 2A: Humboldt Bay to Collinsville (Coastal Underground)

This corridor connects the Humboldt Bay region to the planned Collinsville Substation, passing through the coastal areas of Humboldt, Mendocino, Sonoma, Napa, and Solano Counties. The northernmost segment (115 miles) would be overhead due to the steep and unstable slopes along the abandoned railroad ROW. South of Longvale, the corridor would be a primarily underground facility, following railroad ROW, roadways, and a submarine alignment. This corridor is unique by including submarine areas of lower Napa River, Napa River Channel, northern San Pablo Bay, Carquinez Strait, and Suisun Bay.

Figure 4 illustrates Corridors 2A and 2B.

Corridor 2B: Humboldt Bay to Collinsville (Coastal Overhead)

This corridor defines a coastal overhead transmission line route by traversing the same counties as would Corridor 2A. It runs primarily along PG&E's existing transmission corridors to connect the Humboldt Bay region to the planned Collinsville Substation (see Figure 4).

Corridor 3: Humboldt Bay to Collinsville (Valley West)

This corridor is an inland option to the coastal Corridors 2A and 2B. New transmission in Corridor 3 would include the southern segment of Corridor 1, then would turn south, passing through the western part of the Sacramento Valley, through Shasta, Tehama, Glenn, Colusa, Yolo, and Solano Counties. It travels from the Humboldt Bay region to the western edge of the Northern Sacramento Valley where it turns south to Collinsville following existing high-voltage lines.

Figure 5 illustrates Corridor 3.

Corridor 4: Fern Road to Collinsville

This corridor includes two options for transmission routing: Corridors 4A and 4B. Corridors 4A and 4B are unique in this study because they are located entirely outside of the Humboldt Bay region. In addition to constructing a new line in either Corridor 4A or 4B, an interconnection to Humboldt Bay's OSW generation would be required, including construction of one of the Corridor 1 options to connect the Humboldt Bay with the Sacramento Valley.

Corridors 4A and 4B are in the eastern Sacramento Valley, and parallel the existing 500 kV system from the planned Fern Road Substation to the planned Collinsville Substation. Corridor 4A would pass nearby and could potentially interconnect with the existing Vaca-Dixon Substation near Vacaville. Corridor 4B stays further east and would separate from Corridor 4A just east of the Sutter Buttes. It would be roughly parallel with the Sacramento River, east of Davis and Woodland, until turning westward near the City of Rio Vista in Solano County.

Figure 6 illustrates Corridors 4A and 4B.

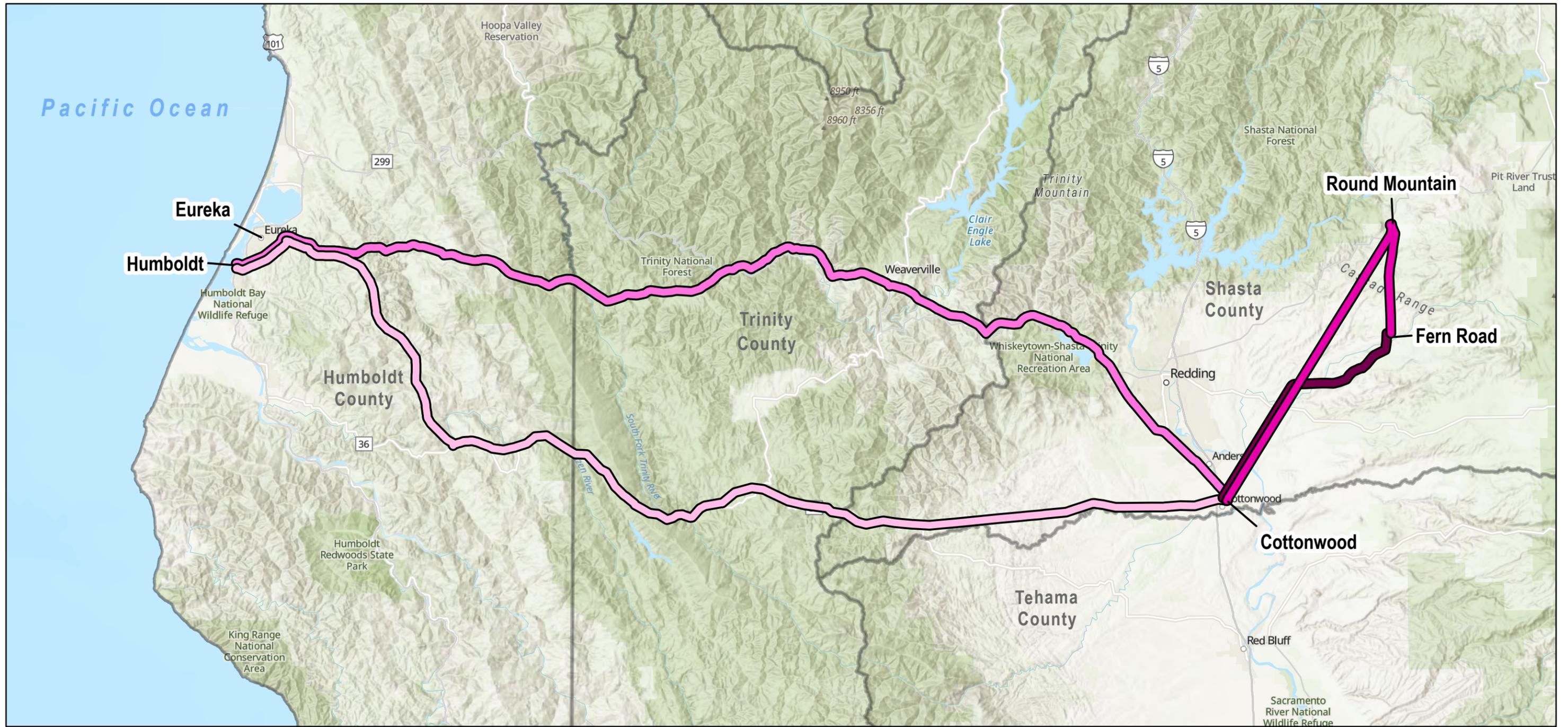
Corridor 5: Clear Lake

The 62-mile Clear Lake Corridor roughly follows SR 20, heading southeast about 7 miles north of Ukiah and ending about 5 miles southwest of Williams. The corridor is centered on an existing overhead PG&E 115 kV transmission line (Mendocino Substation to Cortina Substation). This corridor provides a potential connection between Corridor 2 and Corridor 3. It passes through portions of Mendocino, Lake, and Colusa Counties.

Figure 7 illustrates Corridor 5.

3.2. Corridor and Segment Maps

This section provides area maps for each of the corridors, showing the counties in the areas of study. Corridor 1 appears on Figure 3. Figure 4 illustrates Corridors 2A and 2B. Figure 5 illustrates Corridor 3. Figure 6 illustrates Corridors 4A and 4B, and Figure 7 illustrates Corridor 5.



1:633,600
 1" = 10 miles
 0 10 Miles

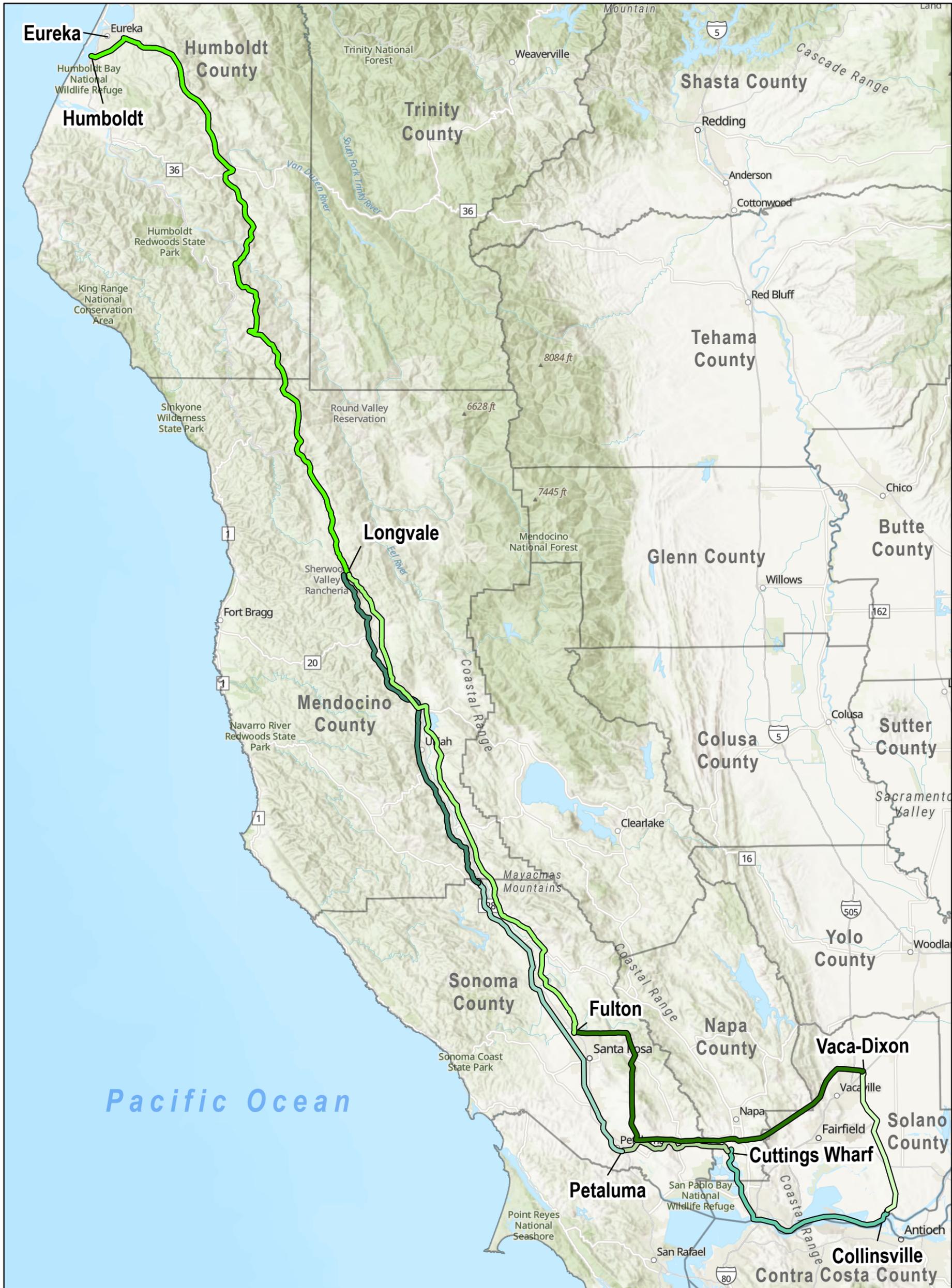
*Corridor width not drawn to scale

**Transmission Corridor Evaluation,
 Humboldt Wind Energy Area**

- Corridor Segments**
- 1: Humboldt Bay-Cottonwood (North)
 - 1: Humboldt Bay-Cottonwood (South)
 - 1: Cottonwood-Millville-Fern Road
 - 1: Cottonwood-Round Mountain-Fern Road

**Figure 3
 Transmission Corridor 1**

Sources: Aspen, 2024; ESRI, 2024.



1:950,400

1" = 15 miles

0 15 Miles

*Corridor width not drawn to scale

**Transmission Corridor Evaluation,
Humboldt Wind Energy Area**

Corridor Segments

- 2A/2B: Humboldt Bay-Longvale (Overhead)
- 2A: Mendocino County (Underground)
- 2A: Sonoma County (Underground)
- 2A: Petaluma-Cuttings Wharf (Underground)
- 2A: Cuttings Wharf-Collinsville (Submarine)
- 2B: Longvale-Fulton (Overhead)
- 2B: Fulton-Vaca-Dixon (Overhead)
- 2B: Vaca-Dixon-Stratton-Collinsville (Overhead)

**Figure 4
Transmission Corridor 2**

Sources: Aspen, 2024; ESRI, 2024.



1:950,400
 1" = 15 miles
 0 15 Miles

*Corridor width not drawn to scale

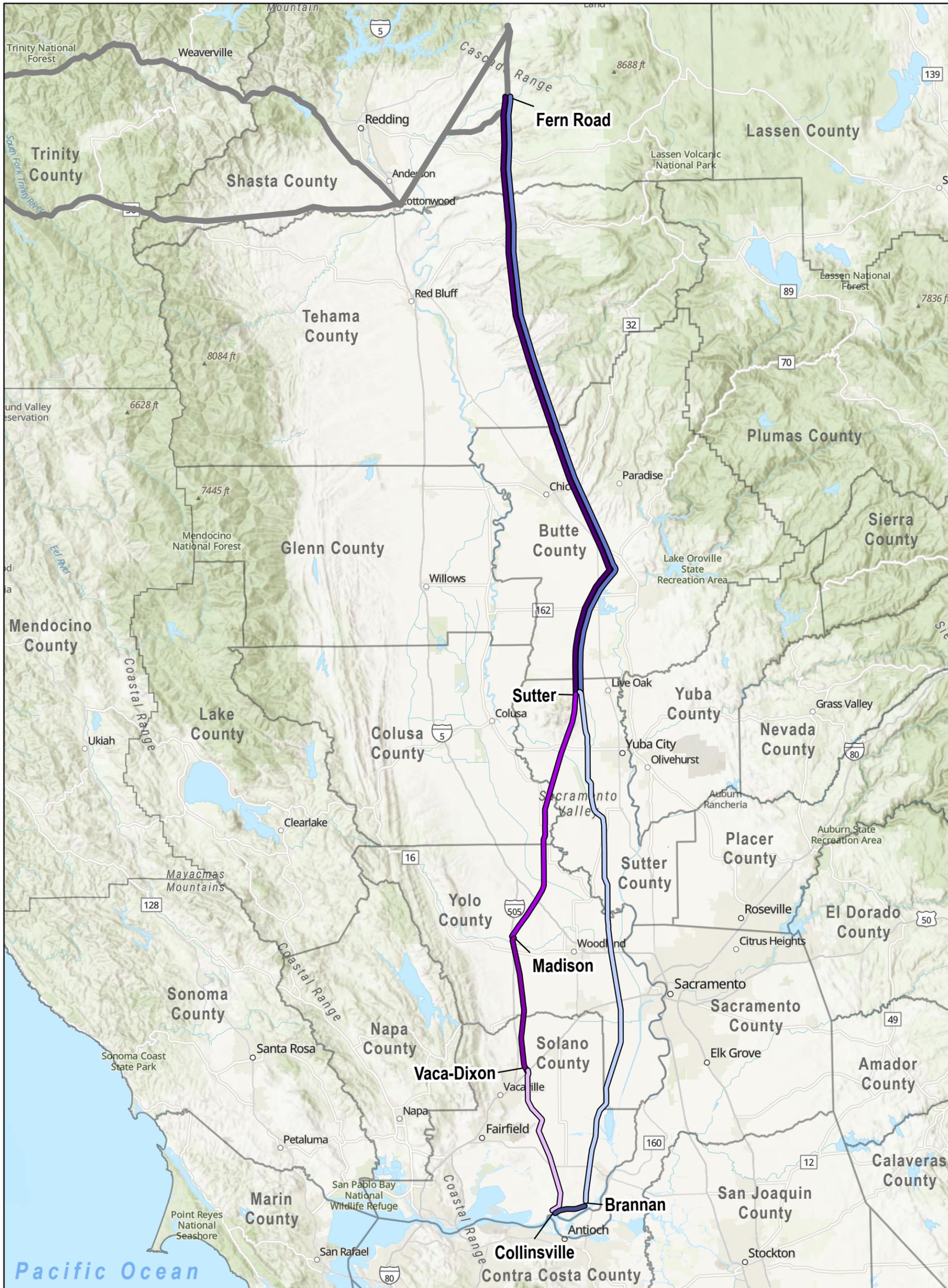
**Transmission Corridor Evaluation,
 Humboldt Wind Energy Area**

Corridor Segments

- 3: Humboldt Bay-Olinda
- 3: Olinda-Madison
- 3: Madison-Vaca-Dixon
- 3: Vaca-Dixon-Collinsville

**Figure 5
 Transmission Corridor 3**

Sources: Aspen, 2024; ESRI, 2024.



1:950,400

1" = 15 miles

0 15 Miles

*Corridor width not drawn to scale

Corridor Segments

- 4A: Fern Road-Sutter
- 4A: Sutter-Madison
- 4A: Madison-Vaca-Dixon
- 4A: Vaca-Dixon-Stratton-Collinsville
- 4B: Fern Road-Sutter
- 4B: Sutter-Brannan
- 4B: Brannan-Stratton-Collinsville
- Corridor 1 and 3

**Transmission Corridor Evaluation,
Humboldt Wind Energy Area**

**Figure 6
Transmission Corridor 4**

Sources: Aspen, 2024; ESRI, 2024.



1:316,800
 1" = 5 miles
 0 5 Miles

*Corridor width not drawn to scale

**Transmission Corridor Evaluation,
 Humboldt Wind Energy Area**

**Figure 7
 Transmission Corridor 5**

- Substation
- Corridor Segments**
- 5: Clearlake
- Corridor 2A, 2B, and 3

Sources: Aspen, 2024; ESRI, 2024.

3.2.1. Corridor Segments

Within each corridor, certain study segments are defined, allowing some segments to be used in combination with others to assemble complete study corridors. Table 3 shows the size of each segment's study area, defined in terms of the area (acres) and length (linear miles).

Table 3. Corridors and Detailed Segments

Corridor and Segment	Area Within Corridor (acres)	Corridor Length (Linear Miles)
Corridor 1: Humboldt Bay to Fern Road		
Humboldt Bay-Cottonwood (North)	51,461	121
Humboldt Bay-Cottonwood (South)	52,151	123
Cottonwood-Round Mountain-Fern Road	18,938	45
Cottonwood-Millville-Fern Road	11,518	27
Corridor 2A: Humboldt Bay to Collinsville (Coastal Underground)		
2A/2B: Humboldt Bay-Longvale (overhead; same as 2B)	48,698	115
2A: Mendocino County Underground	26,290	63
2A: Sonoma County Underground	21,972	51
2A: Petaluma-Cuttings Wharf	8,739	20
2A: Cuttings Wharf-Collinsville	15,957	37
Corridor 2B: Humboldt Bay to Collinsville (Coastal Overhead)		
2A/2B: Humboldt Bay-Longvale (overhead; same as 2A)	48,698	115
2B: Longvale-Fulton	37,838	89
2B: Fulton - Vaca-Dixon	28,718	67
2B: Vaca-Dixon- Collinsville	10,493	24
Corridor 3: Humboldt Bay to Collinsville (Valley West)		
3: Humboldt Bay-Olinda	49,730	117
3: Olinda-Madison	51,346	121
3: Madison-Vaca-Dixon	9,312	21
3: Vaca-Dixon-Collinsville	10,493	24
Corridor 4A: Fern Road to Collinsville (Valley East 1)		
4A/4B: Fern Road-Sutter (same as 4B)	42,258	99
4A: Sutter-Madison	17,581	41
4A: Madison-Vaca-Dixon	9,312	21
4A: Vaca-Dixon- Collinsville	10,493	24
Corridor 4B: Fern Road to Collinsville (Valley East 2)		
4A/4B: Fern Road-Sutter (same as 4A)	42,258	99
4B: Sutter-Brannan	35,257	83
4B: Brannan- Collinsville	2,501	5
Corridor 5: Clear Lake		
5: Clear Lake Corridor	26,220	61

3.3. Transmission System Requirements and Study Assumptions

The transmission lines that are assumed to be installed in the study corridors fall into three types: overhead, underground, and submarine. Within each of those types, lines could be either Alternating Current (AC) or Direct Current (DC). In addition, the transition from AC to DC requires a converter station at each end of the line. Each of these components is briefly described below, as their characteristics relate to the discussion in this report.

3.3.1. Overhead High-Voltage Transmission Lines

All overhead lines assumed to be constructed in the study corridors would be single circuit high-voltage lines. These lines could be initially energized as AC lines (likely at 500 kV) but could later be converted to DC when converter stations are constructed near Eureka and Collinsville.

A 500 kV AC line or a high-voltage DC (HVDC) line would require similar sized transmission tower structures, ranging from 120 to 180 feet in height. Each structure would be separated by 1,000 to 1,500 feet (this is the span length). This would result in the required installation of between 3 and 5 new structures per mile.

Permanent access roads would be required for construction and maintenance. Access roads exist now to serve the PG&E lines in the corridor. Existing roads may require widening for installation of the taller towers required for the new 500 kV or HVDC lines and/or new roads may be required.

A cleared ROW through forested lands currently exists for many of the corridors due to the presence of existing 60 kV, 115 kV, 230 kV, or 500 kV lines. This clearance is maintained for wildfire prevention and control and provides the lines with protection from falling trees and branches, as well as from wildfire spread.

Existing cleared ROW now ranges in width from 150 to 250 feet. An additional cleared area (estimated to be from 150 to 200 feet wide along new line areas) would likely be required for a 500 kV or HVDC line, either expanding the existing cleared path or creating a new, separate cleared path that would be required if new lines were not located immediately adjacent to the existing lines.

In addition to ROW clearing, construction of large new transmission lines requires establishment of large construction laydown areas. These areas must be generally flat, cleared and graded, and have access to paved roadways.

3.3.2. Underground High-Voltage Transmission Lines

Underground high-voltage AC lines exist only for short segments of a few miles due to their high cost and construction requirements for a very wide ROW to allow dissipation of heat between conductors. Therefore, this study considers only underground HVDC lines. The specific placement of an underground transmission line in Corridor 2A would depend primarily on the location and type of other underground utilities and the available space for an underground duct bank.

Underground HVDC lines can be buried in a corridor approximately 5 feet wide by 5 feet deep, with splice vaults approximately every half-mile where a 10-foot-wide trench would be required for vault installation.¹⁸ The line could be buried in the rail ROW (below the adjacent recreational trail) or within roads.

¹⁸ https://nextgenhighways.org/wp-content/uploads/2023/01/NGH_Introduction-Buried-HVDC-Transmission-DOTs.pdf

3.3.3. Submarine High-Voltage Transmission Lines

There is an existing HVDC submarine cable in the San Francisco Bay: the 53-mile long Trans Bay Cable¹⁹ was installed from Pittsburg, California to PG&E's Potrero Substation in San Francisco. Construction began in 2009 and was completed in 2010. Converter stations were constructed in Pittsburg and in San Francisco to allow connection to the AC grid at each location. The cable was installed on the sea floor and is buried 3 to 6 feet deep, with flexible concrete mats placed on top of it to protect the cable.

The CEC's AB 525 studies related to OSW included a transmission technologies assessment that evaluated submarine cable technology.²⁰

3.3.4. Substations and HVDC/HVAC Converter Stations

High voltage AC (HVAC) is the standard transmission system used for long-distance lines in California. However, HVDC transmission is now generally preferred for long-distance high voltage power transmission because HVAC lines have reduced power flow ("line losses") over long distances. However, because DC power must be converted to AC in order to serve load (which uses AC power), converter stations are required.²¹ The high cost of converter stations affects the cost comparison of the systems, resulting in the general need for HVDC lines to be at least 300 miles long.

Converter stations require several acres of land and a location near or adjacent to an AC substation. If an HVDC line is constructed, the HVDC converter station and substation would be located near the landfall of offshore cables, likely south of Eureka and within 1 to 2 miles of Humboldt Bay, where electricity generated from OSW turbines would come ashore. At this time, the location of an HVDC converter station and substation has not been defined.

¹⁹ <https://www.transbaycable.com/company.html>

²⁰ OSW Transmission Technologies Assessment (Guidehouse): <https://efiling.energy.ca.gov/GetDocument.aspx?tn=250520&DocumentContentId=85289>

²¹ A.K. Biswas, S.I. Ahmed, S.K. Akula and H. Salehfar, "High Voltage AC (HVAC) and High Voltage DC (HVDC) Transmission Topologies of Offshore Wind Power and Reliability Analysis," *2021 IEEE Green Technologies Conference (GreenTech)*, Denver, CO, USA, 2021, pp. 271-278, doi: 10.1109/GreenTech48523.2021.00051.

4. METHOD AND APPROACH

4.1. Principles of Corridor Assessment

4.1.1. Planning versus Siting

The function of this corridor assessment is to identify potentially major environmental, siting, and permitting constraints early in the transmission planning process to inform the transmission siting process. At that time, the appropriate engineering and site assessments will be conducted to support the permitting and environmental review processes.

In this analysis, the high-level descriptions of the corridors and aggregate nature of the comparative evaluation lacks site-specific information that would be required for siting level or project-level environmental impact analysis. The initial assessment of the corridors provided in this evaluation do not replace or preclude a more granular transmission siting evaluation and permitting. Section 2.10 presents an overview of the sequencing of this initial assessment with respect to future siting and permitting steps.

No fieldwork was completed for this analysis. All of the data and information gathered for this analysis is drawn from existing publicly available sources as defined in Section 4.2. While the information obtained for cultural and tribal resources is held in State facilities, it is available only to qualified archaeologists and is not available to the general public.

4.1.2. Corridor Evaluation Steps

The corridor assessment follows these steps:

- As defined in Chapter 3, corridors and their respective segments were defined, most with a default width of 3,500 feet; however, underground transmission was assumed to be located within existing railway and roadway ROWs.
- Available geospatial data and information necessary for assessment of the corridors was identified in relation to specific criteria presented in Section 4.2. See Appendix 1 for itemization of all data sources.
- The corridor study areas were overlaid with the geospatial data and other information assembled, and potential environmental and siting concerns and permitting requirements were identified by the criterion for each segment, then the corridor segment data were assembled by corridor (see Section 5).
- The environmental, siting, and permitting constraints for the defined corridors were mapped (see Section 6).

4.2. Data and Approach to Analysis

Section 4.2 explains how each data set was used in the segment/corridor evaluation process (see Appendix 1 for data sources). The length and acreage of each segment/corridor was calculated for analysis purposes.

4.2.1. Land Ownership & Federal Energy Corridors

The following data was considered in the assessment of land ownership. Each corridor segment was assessed for the percentage of federal, State, and private lands included within each segment based on acreage.

- Federal lands (USDA Forest Service, National Park Service, BLM).
- State lands (see 4.2.2, Protected Lands).
- Private lands, including acres of each segment within unincorporated lands and incorporated cities, as well as number of parcels within the segment. Resultant average parcel size and residential density, as well as current other land uses within a segment were used as a proxy for community concerns and development constraints.
- Lands within federal 368 Energy Corridors

4.2.2. Protected Lands

Each corridor segment was assessed for the percentage and extent of protected lands, by type and use based on acreage. The size of protected lands in acreage, their purpose (e.g., wildlife refuge), and how they covered the segment were assessed to summarize possible constraints to transmission siting (i.e., whether there is ample space to span or would these lands be directly impacted).

- National Park Service units, National Register of Historic Places, National Scenic and Historic Trails
- National Wildlife Refuges
- California State refuges, CDFW-owned or operated lands
- California Protected Areas (including city and county parks, preserves, conservation lands)

4.2.3. Tribal Land

The following data was used for the evaluation of tribal lands. Each corridor segment was evaluated for the percentage of tribal lands within the segment or within 5 miles of the segment boundaries by acreage. This information was used to assess possible direct (buried resources) and indirect (cultural landscape) impacts.

- The federal Bureau of Indian Affairs list (with locations via Google Maps)²²
- California Tribal Communities, as identified by the California Courts²³

4.2.4. Cultural Resources

The following confidential data was considered. This information was used to assess possible direct impacts to resources (e.g., from construction disturbance) and indirect impacts to cultural landscapes.

- Native American Heritage Commission sacred lands data²⁴

²² <https://www.bia.gov/sites/default/files/dup/assets/bia/pacreg/Central%20California%20Agency%20Jurisdictional%20Map.pdf>

²³ <https://www.courts.ca.gov/3066.htm>

²⁴ Data for Butte, Glenn, and Contra Costa Counties are included in this report. Data for other counties has not yet been received.

- California Historical Resources Information System (CHRIS) searches within each corridor provided data used to determine the number of eligible sites within each segment and how their locations could affect transmission siting. The following centers provided data:
 - Northwest Information Center (Colusa, Contra Costs, Humboldt, Mendocino, Napa, Solano, Sonoma, and Yolo Counties)
 - Northeast Information Center (Butte, Glenn, Tehama, Trinity, Shasta, and Sutter Counties)
 - North Central Information Center (Sacramento County)

When a transmission line is designed and formally proposed to a lead agency, it would undergo the following process for assessment and mitigation of potential impacts:

- Resources on federal land would be assessed under NEPA and would also require a formal National Historic Preservation Act (NHPA) Section 106 process. Under this process, the State Historic Preservation Officer (SHPO) must concur before project approval.
- Cultural resources located on private land would be subject to CEQA with the CEQA lead agency responsible for Native American consultation under Assembly Bill (AB) 52.

4.2.5. Aesthetics and Visual Sensitivity

The following data was considered in the assessment of how new transmission within a segment could affect viewers both within and outside of segment boundaries:

- Federal and State Wild and Scenic Rivers (linear miles within corridors)
- California Scenic Highways (designated or proposed: linear mile within corridors)
- USDA Forest Service Wilderness (acres within 5 miles of edge of corridor)
- BLM Visual Resource Methodology Classes I and II (available in Corridor 1 only)

4.2.6. Biological Resources

The following data were considered in the assessment of biological resources. Each corridor segment was assessed for the acreage and resultant percentage of critical habitat and other designated habitat areas, combined with California Natural Diversity Database (CNDDDB) occurrences, as described below. Further, required permitting was summarized.

- **U.S. Fish & Wildlife Service (USFWS) Critical Habitat:** Segments were assessed based on 1) the presence of critical habitat in the corridor, and 2) either the absence or presence of the habitat species' CNDDDB occurrence within the corridor or 0.5-mile buffer (either side, approximate 1.6-mile CNDDDB query width).
 - **CNDDDB Wildlife Occurrences:** Both total number of species and total number of special-status wildlife occurrences in the corridor within the past 30 years.
 - **CNDDDB Plant Occurrences:** Both total number of species and total number of special-status plant occurrences over the past 30 years within each segment were considered. Note: Each CNDDDB plant occurrence may represent hundreds or thousands of individual plants, but the occurrence was only counted once.

- **National Marine Fisheries Service (NMFS) Critical Habitat, NOAA Habitat Areas of Particular Concern (HAPC), and National Wetland Inventory (NWI) Aquatic Features:** Segments were assessed based on 1) the presence of these designated habitats within each segment, and 2) either the absence or presence of the habitat species' CNDDDB occurrence within the segment or 0.5-mile buffer.
 - **CNDDDB Fish & Aquatic Species Occurrences:** Both total number of species and total number of special-status fish and aquatic species occurrences in the corridor within the past 30 years.
- **Important Bird Areas (IBAs):** IBAs were considered because of the potential for new transmission infrastructure to cause collisions with birds in flight. Segments were assessed based on 1) the presence of IBA habitat within each segment, and 2) either the absence or presence of the species' CNDDDB occurrence within the segment or 0.5-mile buffer.
 - **CNDDDB Avian Species Occurrences:** Both total number of avian species and total number of special-status avian species occurrences in the corridor within the past 30 years and a 0.5-mile buffer were incorporated.
 - **Bald Eagle:** Although the bald eagle has been de-listed as recovered, bald eagle occurrences would still require a Bald and Golden Eagle Protection Act (BEGEPA) permit from the USFWS. This is in addition to any Section 7 consultation required for other federally listed species.

The following data was not considered, for the reasons defined.

- **Essential Connectivity Areas (ECAs) (CDFW):** These areas were assessed but not incorporated into the analysis because transmission infrastructure would not constitute a barrier bisecting an ECA and would not permanently impede wildlife migration and movement.
- **Migratory Flyways:** The majority of California is within the Pacific Flyway. The extent of the flyway is such that it encompasses almost all of the corridors studied and is therefore not useful for comparison between corridors in the analysis.
- **NOAA Essential Fish Habitat:** These areas were assessed but not incorporated into the analysis because all corridors contain essential fish habitat; therefore, it provides no useful information for comparison of segments.
- **CNDDDB and CalVeg Sensitive Communities:** Data throughout the study area were assessed but were not utilized due to a lack of consistency in coverage, which could provide an inaccurate comparison between segments and corridors.

4.2.7. Cropland and Agricultural Resources

Each corridor segment was assessed for the percentage and extent of agricultural lands, by type and use based on acreage. The continuous nature of agricultural lands was used to summarize possible constraints to transmission siting (i.e., is there ample space to span or would these lands be directly impacted).

- Important farmland including both Prime and Unique Farmland categories (acres within corridors)
- Williamson Act lands (acres under contract within corridors)

4.2.8. Hazards

Each corridor segment was assessed for the percentage and extent of the following potential hazards based on acreage. The continuous nature of each hazard was used to summarize possible constraints to transmission siting (i.e., is there ample space to span, would proper engineering negate the hazard, or do the hazards render construction potentially infeasible).

- Wildfire risk (using both FEMA fire risk mapping and CalFire Fire Hazard Severity Zones): acres within each segment
- Alquist-Priolo Fault Hazard Zones (acres within corridors in active fault zones)
- Landslide Susceptibility (acres within corridors for ranks 9 and 10, most severe)
- EPA Superfund Areas (acres within corridors)

4.2.9. Airports and Airspace Limitations

Each corridor segment was assessed for the percentage and extent of the following airspace and military limitations based on acreage. The size and classification of the airspace and military areas were used to summarize possible safety hazards.

- Class Airspace (≤ 500 feet): Acres within segment by classification.²⁵ Airspace within the corridor segments is either classified as C, D, or E with E being the least restrictive (no Class A or B airports).
- Military Training Routes (≤ 500 feet): Linear feet within segment.
- Airport Locations: Number of airports within 1 mile of segment.
- Special-Use Airspace (≤ 500 feet): Acres within segment.

4.2.10. Disadvantaged Communities

The presence of Disadvantaged Communities (using definitions from CalEnviroScreen per SB 535)²⁶ was assessed based on the acreage of these communities within each corridor segment. CalEnviroScreen defines Disadvantaged Communities using a screening methodology designed to identify areas (1) disproportionately affected by pollution and environmental hazards and (2) with socioeconomic vulnerability. SB 535 states that these communities would include:

- Areas disproportionately affected by environmental pollution and other hazards that can lead to negative public health effects, exposure, or environmental degradation.
- Areas with concentrations of people that are of low income, high unemployment, low levels of home ownership, high rent burden, or low levels of educational attainment.²⁷

Specifically, SB 535 communities are defined as the areas within the 25% highest scoring (most disadvantaged) census tracts in CalEnviroScreen 4.0, census tracts previously identified in the top 25% in CalEnviroScreen 3.0, census tracts with high amounts of pollution and low populations, and federally

²⁵ https://www.faa.gov/air_traffic/publications/atpubs/aim_html/chap3_section_2.html

²⁶ Senate Bill 535 (De Leon, Statutes of 2012): <https://oehha.ca.gov/calenviroscreen/sb535>:

²⁷ https://calepa.ca.gov/wp-content/uploads/sites/6/2022/05/Updated-Disadvantaged-Communities-Designation-DAC-May-2022-Eng.a.hp_-1.pdf

recognized tribal areas as identified by the Census in the 2021 American Indian Areas Related National Geodatabase.²⁸

These communities are identified in this study because transmission line construction and operation contributes to pollution and environmental hazards as follows:

- Construction activities create short-term air emission from vehicles, dust, noise, and increased traffic.
- The presence of transmission facilities after construction can create or intensify the environmental degradation of an area due to the industrial character of the facilities.

²⁸ <https://oehha.ca.gov/calenviroscreen/sb535>

5. CORRIDOR EVALUATION

This section defines the land uses and anticipated environmental constraints and challenges for each corridor, with discussion broken into segments within each corridor. For each segment, discussion addresses the following topics:

- Land ownership and land uses: a description of public and private lands, existing development, and parcel density.
- Challenges or concerns for transmission siting and permitting: the most serious concerns are presented first, followed by less serious issues. Permitting requirements are summarized where these requirements may be especially challenging.
- Conclusions for each dataset (as described in Section 4) are summarized in a table for each corridor segment.
- The challenges and concerns for the corridors as a whole are summarized and presented in a simplified map of each corridor.

5.1. Corridor 1: Humboldt Bay to Fern Road

Corridor 1 evaluates two overland routing options from Humboldt Bay to the Cottonwood Substation (northern and southern segments), and two routes between the existing Cottonwood Substation and the planned Fern Road Substation, as shown in Figure 3. The transmission line assumed to be constructed in this corridor is a single 500 kV AC line (see Section 3.4 for details).

Common to both segments are the following corridors:

- From the Humboldt Bay to Humboldt Substations (about 7 miles), it follows two 115 kV lines along southern boundary of the City of Eureka
- From the Humboldt Substation to the community of Kneeland (about 7 miles), the study corridor follows the two existing 115 kV lines, which separate just east of Kneeland

Humboldt Bay to Cottonwood – North. The northern route (addressed in Section 5.1.1), traverses Humboldt, Trinity, and Shasta Counties. Its components starting east of Kneeland are as follows:

- From Kneeland, the corridor passes through about 25 miles of Humboldt County, then about crosses the South Fork Trinity River, then in Trinity County meets the SR 299 corridor near Big Bar, where it also follows the Trinity River for about 14 miles, then passing south of Weaverville and into Shasta County. The corridor is within the Whiskeytown National Recreation Area (NRA), then continues in a southeasterly direction east of Redding and into the Cottonwood Substation.

Humboldt Bay to Cottonwood – South. The southern 123-mile Humboldt Bay to Cottonwood Segment (discussed in Section 5.1.2) is centered on existing overhead PG&E 115 kV transmission lines:

- From Kneeland to the PG&E Bridgeville Substation (about 24 miles), the corridor follows a single PG&E 115 kV line.
- From Bridgeville Substation to Cottonwood Substation (about 88 miles), the corridor follows a single existing PG&E 115 kV line, meeting SR 299 and the Trinity River just east of Big Bar, and then following parallel to SR 299 to Shasta, then turning southeast to Cottonwood Substation.

Cottonwood to Fern Road. From Cottonwood to Fern Road, two options are evaluated. The northern route (addressed in Section 5.1.3) follows existing 230 kV lines from Cottonwood to Round Mountain, then turns southeast to follow 500 kV lines to the planned Fern Road Substation. The southern option (addressed in Section 5.1.4) follows about 14 miles of the existing 230 kV lines, then turns northeast from the community of Millville, through unincorporated Shasta County, to follow an existing 60 kV line along the hilltops north of Cow Creek Valley.

5.1.1. Humboldt Bay to Cottonwood (North)

From Humboldt Bay to Kneeland, this northern Humboldt Bay to Cottonwood segment follows the same route as for the southern route (see Section 5.1.2) and Corridor 2A (Humboldt to Longvale; see Section 5.2.1). At Kneeland, this segment continues on an easterly path for about 40 miles to Big Bar, where it meets SR 299.

Land Ownership and Land Uses

The westernmost approximately 39 miles of this segment are in Humboldt County, and the central approximately 48 miles are in Trinity County. The easternmost approximately 34 miles would be in Shasta County.

Approximately 20% of this line is on Forest Service lands including the Shasta-Trinity and Six Rivers National Forests. Another approximately 4,500 acres would be within the National Park Service's (NPS) Whiskeytown National Recreation Area (NRA). Between Kneeland and Weaverville, the segment passes through mountainous terrain. From Big Bar to Weaverville, the segment follows the Trinity River.

Challenges or Concerns for Transmission Siting and Permitting

- The existing 115 kV line on which this segment is centered passes through about 9 linear miles of NPS Whiskeytown NRA on the north side of Whiskeytown Lake. Siting an additional high voltage line within this NPS unit would not be acceptable to the NPS, unless no alternatives were available. It appears that an alternative may be to shift the segment about ½ mile to the north, removing it from the NPS jurisdiction.
- There are several residential areas within the existing segment that would create siting and aesthetics challenges. First, as described in Section 5.1.1, the area of southeastern Eureka (around the Humboldt Substation) and at the crossing of Freshwater Road there are many residences. Second, the area south and west of Main Street in Weaverville (e.g., Mountain View Street) has many smaller residential parcels, but a new line south of the existing 115 kV line would avoid most residential areas. Within Shasta County east of Whiskeytown NRA, there are residential areas of varying density where line siting would require careful consideration of residences and views. Approaching the Cottonwood Substation there are other scattered areas of residential neighborhoods. Within the 3,500-foot-wide segment, there are 3,887 private parcels (32 parcels per mile) and the average parcel size is approximately 13 acres.
- This segment is very scenic and has high value for aesthetics. It has 18 miles of California scenic highway within the study area, as well as having 73% of the segment within the BLM Class I and II VRM designations. In addition, over 8,300 acres of USFS Wilderness land is located within 5 miles of the segment, raising additional concerns about visible disturbance required for ROW clearance.
- This segment includes 17 linear miles of federal and State designated Wild and Scenic Rivers (WSRs). Most of this segment follows SR 299 and the Trinity River, but the segment also crosses

the South Fork Trinity River WSR. Crossing design and location would have to be designed to consider viewshed from and of the rivers.

- The presence of critical habitat²⁹ designated by the USFWS or NMFS within a segment may make Endangered Species Act (ESA) permitting and mitigation challenging. Careful siting of towers would be required to minimize impacts to critical habitat, because the habitat itself is protected under the federal ESA.
 - USFWS critical habitat within this segment exists for two federally listed species: marbled murrelet (306 acres, <1%) and northern spotted owl (7,326 acres, 14%), but California Natural Diversity Database (CNDDDB) queries did not identify any occurrences of these species within the segment and/or its buffer (0.5 miles either side).
 - The segment also contains NMFS designated critical habitat for green sturgeon (43 acres, <1%). One occurrence of the species was identified during CNDDDB queries.
- CNDDDB queries identified the following State/federally listed wildlife species (see below for fish and avian species): western pond turtle (9 occurrences) and tidewater goby (2 occurrences). Proper siting of towers would be necessary to minimize impacts to these wildlife species. Permitting with State and federal resource agencies will be complicated, and extensive mitigation is anticipated.
- This segment includes a high percentage of land within high fire risk zones (62% for FEMA risk and 40% for CalFire high risk). To minimize fire risk, vegetation clearing along the transmission line ROW would need to be maintained, further exasperating potential impacts to critical habitat and listed species. Such vegetation clearing would need to avoid marbled murrelet critical habitat and northern spotted owl critical habitat to the extent feasible.
- Cultural resources within this segment include the following:
 - There are 306 historic era cultural resources including 6 large historic mining districts. The majority of these historic age resources relates to mining activity. 44 precontact age resources³⁰ and 19 resources that contain both precontact and historic age resources were identified within this segment. These resources are clustered in the middle of the segment on Trinity National Forest land.
 - Construction of overhead transmission lines can generally avoid impacts to known resources, but effects on large districts with numerous individual resources are more difficult to avoid. Unknown buried resources could be encountered during ground disturbance, but construction monitoring can help to mitigate impacts. Indirect impacts to historic resources and mining districts could occur due to the new presence of a major industrial facility (500 kV transmission line) that is inconsistent with the historic setting.
- The NAHC search of its Sacred Lands File is pending.

²⁹ The USFWS defines critical habitat as lands designed to protect the essential physical and biological features of a landscape and essential areas in the appropriate quantity and spatial arrangement that a species needs to survive and reproduce and ultimately be conserved. Source: <https://www.fws.gov/sites/default/files/documents/critical-habitat-fact-sheet.pdf>

³⁰ Precontact archaeological resources are those that predate Native American contact with Europeans.

Other Less Serious Concerns

- CNDDDB queries identified the following State/federally listed avian species (without critical habitat): bald eagle (2 occurrences). The segment also contains 629 acres (1.2%) of designated important bird areas. Locating a new 500 kV transmission line adjacent to the existing 500 kV line would minimize impacts to birds. A Bald and Golden Eagle Protection Act (BAGEPA) permit would be required from the USFWS.
- CNDDDB queries identified the following State and federally listed fish: steelhead (6 occurrences), coho salmon (3), chinook salmon (2), green sturgeon (1), and longfin smelt (1). In addition, there are 2,493 acres (4.8% of segment) of wetland features defined in the National Wetland Inventory (NWI). Finally, there are 88 acres (<1%) of NOAA Habitat Areas of Particular Concern (HAPC). Proper location of towers would minimize impacts to these aquatic habitats.
- 23% of the segment passes through areas with high landslide susceptibility. This risk can be managed with careful tower siting and appropriate foundation design.
- There is little Important Farmland or Williamson Act land along this segment.

5.1.2. Humboldt Bay to Cottonwood (South)

Land Ownership and Land Uses

Land ownership along the Humboldt Bay to Cottonwood Segment is a mixture of private and public USFS lands. Private lands make up the eastern and western ends of the segment, and USFS lands and a small amount of BLM lands cover the central portion.

Land uses within and along the Humboldt Bay to Cottonwood Segment are as follows:

- From the Humboldt Bay to Humboldt Substation, the segment is in Humboldt County (with a small section in the City of Eureka). It passes through the coastal floodplain of the Elk River, areas of residential development, and wooded coastal hills southeast of Eureka.
- From Humboldt Substation to Bridgeville Substation, the segment passes through the coastal mountains near the communities of Myrtle town and Freshwater Corners (Eureka), Kneeland, Lone Star Junction, Yager Junction, and Bridgeville.
- From Bridgeville Substation and traveling east, the segment generally follows State Route 36 to Platina, traversing primarily private lands to Dinsmore, at which point land ownership along the segment is a mix of private and public lands (USFS and BLM) to Platina.
- From Bridgeville Substation to Cottonwood Substation, over 9,000 acres of the over 11,000 acres within the Trinity National Forest are within a designated Section 368 energy corridor.
- In the 25-mile segment between Platina and Olinda, the segment traverses private lands across the eastern foothills east of the Coast Range.
- From Olinda to Cottonwood (about 6 miles), the segment passes through more densely populated residential neighborhoods (west of I-5) and commercial/residential areas east of I-5, within the unincorporated community of Cottonwood.

Challenges or Concerns for Transmission Siting and Permitting

- Line siting from Eureka to Dinsmore and Platina to Cottonwood Substation would need to avoid residential areas and other sensitive land uses (e.g., schools and parks) in order to minimize

disturbance and views of new towers. Within the 3,500-foot-wide segment, there are 3,590 private parcels (29 parcels per mile) and the average parcel size is approximately 14 acres.

- Construction would be required through critical habitat for two birds listed as endangered and threatened by the USFWS. critical habitat for marbled murrelet (endangered; 141 acres) and northern spotted owl (threatened; 7,728 acres). Marbled murrelet has designated critical habitat in the segment, and 2 recorded occurrences of these birds being present CNDDDB within the segment and/or its buffer (0.5 miles either side). That there are no CNDDDB recorded occurrences of northern spotted owl within the segment or buffer.
- The segment also contains NMFS designated critical habitat for green sturgeon (43 acres, <1%). One occurrence of the species was identified during CNDDDB queries.
- CNDDDB queries identified the following State/federally listed wildlife species (see below for fish and above for avian species): Western pond turtle (9 occurrences), tidewater goby (2), and vernal pool fairy shrimp (1). Proper siting of towers would be necessary to minimize impacts to these wildlife species. Multiple species permitting with State and federal resource agencies will be complicated and extensive mitigation is anticipated.
- This segment includes 4 miles of Wild and Scenic Rivers (Eel River, Van Duzen River), including 2 river crossings. Crossing design and location would have to consider viewshed from and of the rivers.
- The segment includes 34 miles of California Scenic Highways (US 101 south of Eureka and CA 36 west of Bridgeville), affecting 29% of the segment. Tower location and design should consider views from the highway to minimize impacts.
- 45% of the segment is designated by CalFire as very high fire risk. To minimize fire risk, vegetation clearing along the transmission line ROW would need to be maintained, further exasperating potential impacts to critical habitat and listed species. Such vegetation clearing would need to avoid marbled murrelet critical habitat and spotted owl critical habitat, to the extent feasible.
- 22% of this segment is under Williamson Act contracts for primarily grazing lands. Coordination with Humboldt, Trinity, and Shasta Counties would be required to assess whether new transmission is consistent with existing contracts.
- 28% of the segment has high landslide susceptibility, which would require careful tower siting and appropriate foundation design.
- Cultural resources within this segment include the following:
 - There are 111 historic era cultural resources, including 1 large historic mining district. Most of these historic age resources relate to mining activity. There are 53 precontact age resources and 15 resources that contain both precontact and historic age resources were identified within this segment. The majority of these resources are along the north to south trending section of segment to the west and in the far east section of the segment.
 - Construction of overhead transmission lines can generally avoid impacts to known resources, but effects on large districts with numerous individual resources are more difficult to avoid. Unknown buried resources could be encountered during ground disturbance, but construction monitoring can help to mitigate impacts. Indirect impacts to historic resources and mining districts could occur due to the new presence of a major industrial facility (500 kV transmission line) that is inconsistent with the historic setting.

- The NAHC search of its Sacred Lands File is pending.

Other Less Serious Concerns

- CNDDDB queries identified the following State and federally listed fish: steelhead (8 occurrences), coho salmon (3), chinook salmon (1), green sturgeon (1), and longfin smelt (1). In addition, there are 1,576 acres (3.1% of segment) of wetlands (NWI aquatic features). Finally, there are 88 acres (<1%) of NOAA HAPC. Proper siting of towers would avoid impacts to these habitats.
- CNDDDB queries identified 4 occurrences of the western lily (*Lilium occidentale*), a State and federally listed endangered plant. Proper tower siting could avoid impacting this plant species.
- The segment includes two CDFW managed reserves (McClellan Mountain Peatland west of Dinsmore and Elk River Wildlife Area south of Eureka); however, these lands do not cover the entirety of the segment in either location and therefore could be avoided with appropriate tower siting.
- The western 800 acres of the segment (1.6%) would be within 5 miles of tribal lands for a federally-recognized tribe (Table Bluff Reservation), so sacred sites may be affected by the visibility of a new overhead line.
- The Chanchelulla Wilderness is located approximately 3 miles north of the segment by Wildwood. Tower siting should consider the viewshed from this wilderness area.
- Dinsmore Airport is located about 10 miles west of Bridgeville. Proper tower siting could minimize any safety hazards.

5.1.3. Cottonwood to Round Mountain to Fern Road

As illustrated in Figure 3, this 45-mile segment follows existing 230 kV and 500 kV transmission lines through Shasta County.

Land Ownership and Land Uses

There are no incorporated cities or federal lands in this segment, and no protected park or preserve lands.

Challenges or Concerns for Transmission Siting and Permitting

No challenges in this segment appear particularly difficult to overcome.

- Line siting along the length of the segment would need to avoid residential areas and other sensitive land uses (e.g., schools and parks) in order to minimize disturbance and views of new towers. Within the 3,500-foot-wide segment, there are 783 private parcels (17 parcels per mile), and the average parcel size is approximately 24 acres.
- Over 35% of the segment is under Williamson Act contract, requiring consultation with the County to assess whether new transmission is consistent with existing contracts.
- This segment includes 873 acres (4.6%) of critical habitat for slender Orcutt grass, but no CNDDDB occurrences of this plant species are noted. Regardless, because of the critical habitat designation, ESA permitting will be required.
- CNDDDB queries identified the following State/federally listed wildlife species (see below for fish and avian species): western pond turtle (4 occurrences), vernal pool fairy shrimp (2), vernal pool tadpole shrimp (1), and valley elderberry longhorn beetle (1). Proper siting of towers would be

necessary to minimize impacts to these wildlife species. Multi-species permitting with State and federal resource agencies will be complicated, and extensive mitigation is anticipated.

- Over 2,700 acres of tribal land are located within 5 miles of the segment: the Table Bluff Reservation, Montgomery Creek Rancheria, Pit River Trust Land, and Redding Rancheria. Tower siting should consider potential effects on sacred sites. The existing 500 kV lines are of similar tower heights to those that would be required for new 500 kV lines.
- Approximately 79% of the segment is in a very high wildfire severity zone. Since this segment does not generally traverse forested lands, less vegetation clearing for ROW fire management is anticipated.
- Cultural resources within this segment include the following:
 - There are 73 historic era cultural resources. Most of these historic age resources relate to mining activity. There are 67 precontact age resources and 4 resources that contain both precontact and historic age resources were identified within this segment. The majority of these resources are located in the northeast portion of the segment on or near Shasta National Forest land.
 - Construction of overhead transmission lines can generally avoid impacts to known cultural resources, but effects on large districts with numerous individual resources are more difficult to avoid. Unknown buried resources could be encountered during ground disturbance, but construction monitoring can help to mitigate impacts. Indirect impacts to historic resources and mining districts could occur due to the new presence of a major industrial facility (500 kV transmission line) that is inconsistent with the historic setting.
- The NAHC search of its Sacred Lands File is pending.

Other Less Serious Concerns

- CNDDDB queries identified the following State/federally listed avian species: tricolored blackbird (3 occurrences), bank swallow (1), and California black rail (2). The segment contains no designated important bird areas. Locating a new 500 kV transmission line adjacent to the existing 500 kV line would minimize impacts to birds.
- CNDDDB queries identified the following State and federally listed fish: steelhead (2 occurrences), chinook salmon (1), and green sturgeon (1). In addition, there are 737 acres (3.9% of segment) of wetland features defined in the NWI. Proper location of towers would minimize impacts to these aquatic habitats.
- There is one crossing of a State scenic highway (SR 44 east of Millville); however, the existing 500 kV transmission line also crosses this scenic highway within the segment. Locating the new line near the existing line would minimize visual impacts.
- There is one crossing of the historic Nobles Trail; however, the existing 500 kV transmission line also crosses this trail within the segment. Locating the new line near the existing line would minimize visual impacts.

5.1.4. Cottonwood to Millville to Fern Road

Land Ownership and Land Uses

As illustrated in Figure 3, this 27-mile segment follows existing 230 kV and 60 kV transmission lines through Shasta County. This segment is primarily private lands and has only 37 acres (<1%) of BLM-administered federal lands; no incorporated, State, or other federal lands.

Challenges or Concerns for Transmission Siting and Permitting

- Line siting along the length of the segment would need to avoid residential areas and other sensitive land uses (e.g., schools and parks) in order to minimize disturbance and views of new towers. Within the 3,500-foot-wide segment, there are 396 private parcels (15 parcels per mile), and the average parcel size is approximately 29 acres.
- This segment includes 873 acres (4.6%) of critical habitat for Slender Orcutt Grass, but no CNDDDB occurrences of this plant species are noted. Regardless, because of the critical habitat designation, ESA permitting will be required.
- CNDDDB queries identified the following State/federally listed wildlife species (see below for fish and avian species): vernal pool fairy shrimp (2 occurrences), vernal pool tadpole shrimp (1), western pond turtle (1), western spadefoot toad (1), and valley elderberry longhorn beetle (1). Proper siting of towers would be necessary to minimize impacts to these wildlife species. Multi-species permitting with State and federal resource agencies will be complicated, and extensive mitigation is anticipated.
- Approximately 67% of the segment is in a very high wildfire severity zone. Since this segment does not generally traverse forested lands, less vegetation clearing for ROW fire management is anticipated.
- Over 24% of the segment is under Williamson Act contract, requiring consultation with the County as to the validity of contracts. However, the existing transmission lines seem not to have affected these contracts to date.
- Cultural resources within this segment include the following:
 - There are 16 historic era cultural resources; the majority of these historic age resources relates to mining activity. There are 19 precontact age resources and 3 resources that contain both precontact and historic age resources were identified within this segment. The majority of these resources are located in the northeast portion of the segment. The small number of recorded resources in this segment indicates a likelihood that it has not been subject to an intensive pedestrian survey.
 - Construction of overhead transmission lines can generally avoid impacts to known resources. Unknown buried resources could be encountered during ground disturbance, but construction monitoring could mitigate impacts. Indirect impacts to historic resources could occur due to the new presence of a major industrial facility (500 kV transmission line) that is inconsistent with the historic setting.
- The NAHC search of its Sacred Lands File is pending.

Other Less Serious Concerns

- CNDDDB queries identified the following State/federally listed avian species: tricolored blackbird (3 occurrences), bank swallow (1), and California black rail (2). The segment contains no designated important bird areas. Locating a new 500 kV transmission line adjacent to the existing 500 kV line would minimize impacts to birds.
- CNDDDB queries identified the following State and federally listed fish: steelhead (2 occurrences), chinook salmon (1), and green sturgeon (1). In addition, there are 737 acres (3.9% of segment) of wetland features defined in the NWI. Proper location of towers would minimize impacts to these aquatic habitats.
- One area of protected lands exists, in the area south and west of the planned Fern Road Substation – the Cow Creek Demonstration Forest. Given the presence of other transmission lines in the area, this appears not to be a constraint.
- There are no tribal lands within the segment or within 5 miles of the segment.
- There is one crossing of a State scenic highway (SR 44 east of Millville); however, the existing 500 kV transmission line also crosses this highway within the segment. Locating the new line near the existing line would minimize visual impacts.
- There is one crossing of the historic Nobles Trail; however, the existing 500 kV transmission line also crosses this trail within the segment. Locating the new line near the existing line would minimize visual impacts.

5.1.5. Corridor 1: Overall Conclusions Regarding Transmission Feasibility

Table 4 and Figure 8 summarize the concerns about Corridor 1. As shown on Figures 4 and 8, this includes two options for both the western portion and the eastern portion. There are two routes that could connect Humboldt Bay and Cottonwood and two routes that could connect Cottonwood and Fern Road.

Red shaded areas in the table below note the issues of highest concern, followed by issues of medium concern (orange shading), and lastly issues of low concern (yellow shading). The most serious concerns in Corridor 1 include the following:

- The Whiskeytown NRA (along the northern 115 kV route, west of Redding) would likely have to be avoided, requiring consideration of a new corridor north of the National Park Service unit.
- In some segments, residential areas occupy all or most of the study corridors and may drive consideration of routing outside of the study corridors.
- The presence of critical habitat and CNDDDB occurrences for marbled murrelet present exceptional challenges and will require ESA consultation and mitigation development with the USFWS, as would the required BAGEPA permitting. The northern spotted owl and Slender Orcutt grass also have critical habitat along these segments, but individual occurrences were not noted in CNDDDB data.
- There are numerous, clustered areas of historic era cultural resources, the majority related to mining activity. Additionally, there are precontact age resources and resources that contain both precontact and historic age resources throughout this corridor. Section 106 permitting on Forest Service lands and State consultation with Native American tribes would be complicated and mitigation challenging.

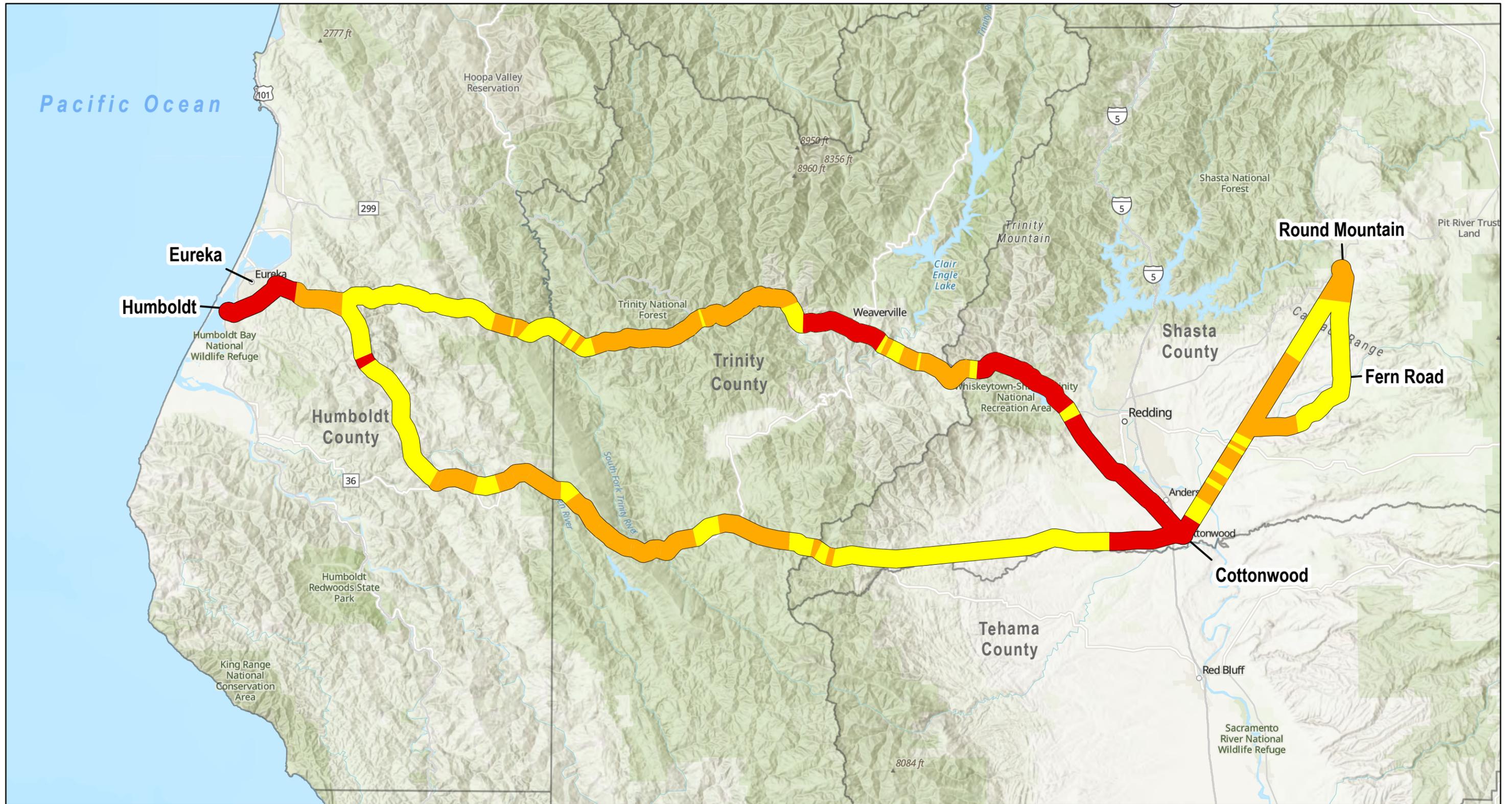
It is also important to note that the southern segment between Humboldt Bay and Cottonwood includes about 9,000 acres of Section 368 Corridors within Forest Service lands. These designations were intended to facilitate energy project permitting, but they apply only to federal lands and not the intervening or adjacent private lands. The 368 Corridor areas are shown on Figure 8 in green (in parallel with the environmental risks that are also illustrated).

Table 4. Corridor 1 (Humboldt Bay to Fern Road) Summary of Issues

CORRIDOR 1 (Humboldt Bay to Fern Road) SUMMARY OF ISSUES	Humboldt Bay to Cottonwood (North)	Humboldt Bay to Cottonwood (South)	Cottonwood Round Mtn Fern Road	Cottonwood Millville Fern Road
Challenge or Concern	121 miles; 51,460 ac	123 miles; 52,151 ac	45 miles; 18,938 ac	27 miles; 12,518 ac
LAND USE & PROTECTED LANDS				
Federal Lands (USFS, NPS, BLM)	41% federal land Whiskeytown National Recreation Area, 4,520 ac (9%)	22% federal land	—	<1% federal land
368 Corridors (Note: this designation denotes an environmental advantage and not a risk)		9,000 acres of Section 368 corridors within USFS lands		
Private Lands	Areas of dense residential land use. 59% private 3,887 parcels 32 parcels/mile 13 ac/parcel avg	Areas of dense residential land use. 78% private 3,590 parcels 29 parcels/mile 14 ac/parcel avg	100% private 783 parcels 17 parcels/mile 24 ac/parcel avg	99% private 396 parcels 15 parcels/mile 29 ac/parcel avg
Incorporated City Lands	3% (Eureka, Anderson, Redding)	<1% (Eureka)		
USFS Wilderness Lands	—	—	—	—
National Wildlife Refuges	—	—	—	—
CDFW Owned & Operated Lands, State Refuges, and California Protected Areas (CPAD)	CDFW: 8 ac CPAD: 508 ac 1% of land	CDFW: 153 CPAD: 153 ac <1% of land	0	CDFW: 0 CPAD: 639 ac 5% of land
BIOLOGICAL RESOURCES				
USFWS & NMFS Critical Habitat & CNDDDB Occurrences	306 ac marbled murrelet, no occurrences 7,326 ac northern spotted owl, no occurrences NMFS: 43 ac (<1%) green sturgeon, 1 occurrence	141 ac marbled murrelet, 2 occurrences 7,728 ac northern spotted owl, no occurrences NMFS: 43 ac (<1%) green sturgeon, 1 occurrence	873 ac (4.6%) slender Orcutt grass, no occurrences	873 ac (4.6%) slender Orcutt grass, no occurrences

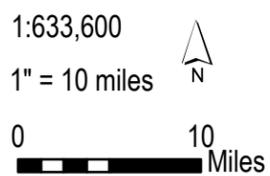
CORRIDOR 1 (Humboldt Bay to Fern Road) SUMMARY OF ISSUES	Humboldt Bay to Cottonwood (North)	Humboldt Bay to Cottonwood (South)	Cottonwood Round Mtn Fern Road	Cottonwood Milville Fern Road
Challenge or Concern	121 miles; 51,460 ac	123 miles; 52,151 ac	45 miles; 18,938 ac	27 miles; 12,518 ac
Other CNDDDB State & Federally Listed Wildlife Observances (corridor & buffer)	western pond turtle (9) tidewater goby (2)	Western pond turtle (9) tidewater goby (2) vernal pool fairy shrimp (1)	western pond turtle (4) vernal pool fairy shrimp (2) vernal pool tadpole shrimp (1) valley elderberry longhorn beetle (1)	vernal pool fairy shrimp (2) vernal pool tadpole shrimp (1) western pond turtle (1) western spadefoot toad (1) valley elderberry longhorn beetle (1)
Other CNDDDB State & Federally Listed Avian Species and Important Bird Areas (IBA)	bald eagle (2) 629 ac (1%) IBA	629 ac IBA (1%)	tricolored blackbird (3) bank swallow (1) California black rail (2)	tricolored blackbird (3) bank swallow (1) California black rail (2)
Other CNDDDB State & Federally List Fish Species and NWI Aquatic Wetland Features	steelhead (6) coho salmon (3) chinook salmon (2) green sturgeon (1) longfin smelt (1). 2,493 ac (4.8%) NWI	steelhead (8) coho salmon (3) chinook salmon (1) longfin smelt (1) 1,576 ac (3.1%) NWI	steelhead (2) chinook salmon (1) green sturgeon (1) 737 acres (3.9%) NWI	steelhead (2) chinook salmon (1) green sturgeon (1) 737 acres (3.9%) NWI
Other CNDDDB State & Federal Listed Plant Observances	—	western lily (4)	—	—
CULTURAL & TRIBAL RESOURCES				
Prehistoric Resources	44	53	67	19
Historic Resources	306	111	73	16
Tribal Lands within Corridor	—	—	—	—
Corridor Acres within 5 Miles of Tribal Lands (federally recognized tribes)	5,340 ac (10%)	805 ac (1%)	3,932 (14%)	—
Tribal Lands and Rancherias within 5 Miles	2 (Table Bluff Reservation, Redding Rancheria)	1 (Table Bluff Rancheria)	2 (Montgomery Creek Rancheria, Pit River Trust Land)	—
AESTHETICS				
Wild & Scenic Rivers	17 miles	4 miles	—	—
Scenic Highways	18 miles	34 miles	1 mile	1 mile
USFS Wilderness Lands within 5 miles	8,349 ac (16% of segment)	1,615 ac (3% of segment)	—	—

CORRIDOR 1 (Humboldt Bay to Fern Road) SUMMARY OF ISSUES	Humboldt Bay to Cottonwood (North)	Humboldt Bay to Cottonwood (South)	Cottonwood Round Mtn Fern Road	Cottonwood Milville Fern Road
Challenge or Concern	121 miles; 51,460 ac	123 miles; 52,151 ac	45 miles; 18,938 ac	27 miles; 12,518 ac
AGRICULTURAL RESOURCES				
Important Farmlands (prime & unique)	120 ac (<1%)	310 ac (<1%)	583 ac (1%)	556 ac (1%)
Williamson Act Lands	291 ac (1%)	11,387 ac (22%)	6,577 ac (35%)	2,719 ac (24%)
HAZARDS				
High Landslide Susceptibility	11,754 ac (23%)	14,751 ac (28%)	975 ac (5%)	657 ac (6%)
Alquist-Priolo Fault Hazard Zones	-	-	-	-
CalFire Very High-Risk Lands	20,739 ac (40%)	23,479 ac (45%)	14,895 ac (79%)	7,714 ac (67%)
EPA Superfund Areas	—	—	—	—
AIRPORTS & AIRSPACE CONSTRAINTS (≤500 Feet)				
Airports & Airspace	3,626 ac	1,447 ac 1 airport	1 ac	1 ac
Special-Use Airspace	—	—	—	—
Military Training Routes	—	—	—	—
ENVIRONMENTAL JUSTICE				
Disadvantaged Communities	—	—	—	—



**Transmission Corridor Evaluation,
Humboldt Wind Energy Area**

**Figure 8
Corridor 1
Siting Constraints**



**Corridor width not drawn to scale*

Sources: Aspen, 2024; ESRI, 2024.

5.2. Corridor 2A: Humboldt Bay to Collinsville (Coastal Underground)

There are 5 analysis segments for the underground HVDC corridor:

- Humboldt to Longvale (overhead, as described below)
- Longvale to Preston (underground in Mendocino County, centered on the abandoned rail ROW)
- Preston to Petaluma (underground in Sonoma County, centered on the SMART ROW)
- Petaluma to Cuttings Wharf (underground in roadways)
- Cuttings Wharf to Collinsville (submarine in the Napa River, Carquinez Strait, Sacramento River)

5.2.1. Humboldt Bay to Longvale (Overhead: Common to Corridors 2A and 2B)

The northernmost segment analyzed (between Humboldt Bay and Longvale) assumes construction of an overhead HVDC line from Humboldt Bay to Longvale. This segment traverses parts of Humboldt and Mendocino Counties.

An underground segment within the Great Redwood Trail (abandoned railroad ROW) was not considered for two reasons. First, this ROW segment between Eureka and Longvale follows the Eel River through an area of very high landslide susceptibility where much of the abandoned rail ROW has been damaged by landslides and erosion along the river. Second, the rail ROW (especially north of Dos Rios and south of US 101 at Dyerville) has extremely limited paved road access, which would make installation of an underground HVDC transmission line exceptionally challenging.

The overhead transmission line assumed to be constructed in this segment is a single circuit high-voltage line that could be initially energized with alternating current (AC) but could later be converted to DC when converter stations are constructed near Eureka and Collinsville (see Section 3.4 for details).

Figure 4 shows the route of this 115-mile segment, which is centered on existing overhead PG&E transmission lines:

- From the Humboldt Bay to Humboldt Substations (about 7 miles), the segment follows two 115 kV lines along southern boundary of the City of Eureka.
- From Humboldt Substation to Bridgeville Substation (about 28 miles), the segment follows a single PG&E 115 kV line.
- From Bridgeville to the community of Longvale (about 80 miles), the segment follows PG&E's 60 kV subtransmission system.

Land Ownership and Land Uses

Land ownership along Segment 2A is primarily private (99%); there are only two isolated areas of BLM-administered federal lands along this segment. Within the 3,500-foot-wide segment, there are 2,599 private parcels (23 parcels/mile) with an average parcel size of 19 acres. Land uses within and along Corridor 2A are as follows:

- From the Humboldt Bay to Humboldt Substations, the segment is in Humboldt County (with a small section in the City of Eureka). It passes through coastal floodplain of the Elk River, areas of residential development, and wooded coastal hills southeast of Eureka.
- From Humboldt to Bridgeville, the segment passes through the coastal mountains or near the communities of Myrtle town and Freshwater Corners (Eureka), Kneeland, and Bridgeville.

- From Bridgeville to Longvale, the segment is in undeveloped lands, mostly between the Eel River and US 101.
- About 11 miles north of the community of Laytonville, the segment meets US 101, which it closely follows (on the east side) for a total of about 20 miles to Longvale. The southern part of this segment of US 101 follows Long Valley Creek. There is a small airport parallel to US 101 just south of Laytonville, and scattered residences along the highway. The segment crosses the eastern part of Laytonville, about ¼ mile east of Laytonville High School.
- At Longvale, the Covelo Road, Outlet Creek, and the abandoned Northwestern Pacific Railroad ROW turn northeast from US 101. From this point south, two segments are studied (Corridor 2A, Longvale to Fulton and Corridor 2B, Mendocino County Underground).

Corridor 2A: Challenges or Concerns for Transmission Siting and Permitting

- Over 5,300 acres of the segment would be within 5 miles of tribal lands for a federally-recognized tribe, so sacred sites may be affected by the visibility of a new overhead line.
- Line siting around Eureka and Laytonville would need to avoid residential areas and other sensitive land uses (e.g., schools and parks) in order to minimize disturbance and views of new towers. In particular, the segment crosses about one mile of the McKay Community Forest (managed by Humboldt County).
- High landslide susceptibility along nearly the entire segment would require careful tower location and appropriate foundations.
- Critical habitat within this segment could make permitting and mitigation challenging.
 - USFWS critical habitat exists for two federally listed species: marbled murrelet (649 acres, 1%) and northern spotted owl (469 acres, 1%). CNBBD queries note two (2) occurrences of marbled murrelet and no occurrences of northern spotted owl.
 - The segment contains NMFS-designated critical habitat for green sturgeon (43 acres, <1%) with no occurrences of the species identified in CNDDDB queries.
- CNDDDB queries identified the following State/federally listed wildlife species (see below for fish and avian species): western pond turtle (2 occurrences) and tidewater goby (2). Proper siting of towers would be necessary to minimize impacts to these wildlife species. Multi-species permitting with State and federal resource agencies will be complicated, and extensive mitigation is anticipated.
- Over 18,000 acres (37% of this segment) is under Williamson Act contracts so coordination with Humboldt and Mendocino counties would be required to assess whether new transmission is consistent with existing contracts.
- Cultural resources within this segment include the following:
 - There are 102 historic era cultural resources including 1 large historic district. The majority of these historic age resources relates to mining activity. There are 115 precontact age resources and 18 resources that contain both precontact and historic age resources were identified within this segment. These resources are spread out throughout the segment and are not clustered in any one specific area.

- Construction of overhead transmission lines can generally avoid impacts to known resources, but effects on large districts with numerous individual resources are more difficult to avoid. Unknown buried resources could be encountered during ground disturbance, but construction monitoring can help to mitigate impacts. Indirect impacts to historic resources and mining districts could occur due to the new presence of a major industrial facility (500 kV transmission line) that is inconsistent with the historic setting.
- The NAHC search of its Sacred Lands File for this segment is pending.

Other Less Serious Concerns

- CNDDDB queries identified the following State and federally listed fish: steelhead (9 occurrences), coho salmon (3), green sturgeon (1), and longfin smelt (1). In addition, there are 1,257 acres (2.5% of segment) of wetland features defined in the NWI. Finally, there are 88 acres (<1%) of NOAA HAPC. Proper tower siting will minimize impacts to aquatic habitats.
- While the segment includes 612 acres (1.3%) of designated important bird areas, CNDDDB queries did not identify any listed avian species within the segment or its buffer (0.5 miles either side).
- CNDDDB queries identified 4 occurrences of the western lily (*Lilium occidentale*), a State and federally listed endangered plant. Proper tower siting could avoid impacting this plant species.
- This segment includes 4 miles of Wild and Scenic Rivers (Eel River and Van Duzen River). Crossing design and location would have to consider viewshed from and of the rivers.
- The segment includes 4 miles of California Scenic Highways (US 101 south of Eureka and CA 36 west of Bridgeville). Tower location and design should consider views from the highway to minimize impacts.
- The segment includes a small portion of the Elk River Wildlife Area (CDFW land south of Eureka); direct effects can likely be avoided with appropriate tower siting.
- A nearly 2-mile segment of the segment between Laytonville and Longvale parallels and is within an active fault zone (Alquist-Priolo Zone) where tower engineering would have to incorporate safety measures for severe ground shaking.

5.2.2. Mendocino County Underground

The Mendocino County segment of the underground HVDC transmission line considered for Corridor 2A is about 63 miles long. Within this segment, the HVDC line could be installed underground within the Great Redwood Trail ROW, managed by the Great Redwood Trail Agency (GRTA). The GRTA replaced the North Coast Railroad Authority as the entity responsible for the rail ROW in 2021. If the underground line is placed within GRTA ROW, the developer will be required to submit a permit application to obtain an easement from GRTA. The area studied for this segment would also allow underground installation within road ROWs.

Land Ownership and Land Uses

- The segment is comprised of all private lands and would pass through the cities of Ukiah and Willits, in areas where there is a significant density of parcels. Within the 3,500-foot-wide segment, there are 6,507 private parcels (103 parcels/mile) with an average parcel size of 4 acres. Between Longvale and Willits, the segment crosses primarily private land, paralleling Outlet Creek and US 101.

- This segment passes through central Willits, where the GRTA ROW crosses US 101 in several places and central Ukiah just east of Main Street.

Challenges or Concerns for Transmission Siting and Permitting

- The northernmost approximately 10 miles of this segment follow Outlet Creek from Longvale to its intersection with US 101 north of Willits. This segment is entirely in a zone of very high landslide susceptibility. While parts of this rail ROW are relatively flat and may safely support an underground line, other segments are along steep slopes that may be unstable and inappropriate for an underground line.
- Access to the rail ROW with large construction equipment and reels of cable would be challenging in this 10-mile segment. While US 101 is nearby, it is on the opposite side of Outlet Creek, and there are few roads providing construction access.
- From the southern edge of Willits to Laughlin (about 8 miles), the landslide susceptibility is also very high, crossing the Ridgewood Summit.
- South of Dawes, there are additional areas with high landslide susceptibility along the Russian River.
- CNDDDB queries identified the following State/federally listed wildlife species: western pond turtle (12 occurrences). Proper mitigation during construction would be necessary to minimize impacts to this wildlife species; once the underground line is installed, no impacts to these species are anticipated. Permitting with State and federal resource agencies will be complicated, and extensive mitigation is anticipated.
- This underground segment is nearly coincident (over 19,000 acres) with a 15-mile stretch of the Maacama active fault zone through downtown Willits and south to Laughlin and northern Ukiah. This is a designated active fault in the Alquist-Priolo Zone. Constructing an underground line parallel to an active fault may create significant feasibility concerns.
- The Longvale to Fulton segment includes 49 acres of Coyote Valley Reservation within the segment. The GRTA ROW is on the opposite (east) side of the Russian River from the tribal land, and there are other roads available for underground installation that would avoid the tribal land.
- Cultural resources within this segment include the following:
 - There are 205 historic era cultural resources including 3 large historic districts, and 64 precontact age resources and 8 resources that contain both precontact and historic age resources. The majority of these resources are located in the northern portion of the segment and in the Ukiah area, and mostly consist of built environment resources.
 - Underground construction is assumed to occur within the existing railroad ROW or paved roads. The extent of impact on cultural resources would depend on previous disturbance within these corridors.
- The NAHC search of its Sacred Lands File is pending.

Other Less Serious Concerns

- CNDDDB queries identified the following State and federally listed fish: steelhead (1 occurrence). In addition, there are 996 acres (3.8% of segment) of wetland features defined in the NWI. Use of directional drilling will minimize impacts to aquatic habitats.

- CNDDDB queries for listed avian species identified the tricolored blackbird (1 occurrence). With the exception of nest monitoring during construction, concerns related to avian species are not relevant to an underground transmission line.
- CNDDDB queries identified the following State and federally listed plants: North Coast semaphore grass (4 occurrences), and Sonoma sunshine (1). Proper underground transmission alignment and the use of direction drilling technology would avoid impacting these plant species.
- Within the 3,500-foot-wide segment, there are 6,507 private parcels (103 parcels/mile) with an average parcel size of 4 acres. However, given the underground location of this line segment, and the likely installation within either rail ROW or roadways, this parcel density is not expected to be a limiting factor.
- The segment includes nearly 25,000 acres where nearby tribal land would have no direct effects but are located within 5 miles. The transmission line in this segment would be underground, so no transmission facilities would be visible.
- This segment includes about 11 miles of California Scenic Highways, but this segment would be installed underground, so not visible.
- This segment passes through about 4,500 acres of high severity wildfire zones; however, once installed, the underground line would not present a fire risk.
- This segment includes over 3,000 acres of Important Farmland and over 8,500 acres of land under Williamson Act contracts, but with an underground line (assumed to be in rail ROW or roadways), effects on agriculture are not anticipated.
- Airspace – nearly 13,000 acres of “Class Airspace” and 3 airports within a mile of the segment; however, an underground line would not present a risk to airspace.

5.2.3. Sonoma County Underground

Land Ownership and Land Uses

This 51-mile segment occupies relatively flat terrain. It starts about 3 miles north of Cloverdale and follows the US 101 corridor and the Russian River valley south to Windsor, then generally parallels the US 101 corridor to central Petaluma. The segment passes through the centers of the cities of Cloverdale, Healdsburg, Windsor, Santa Rosa, Rohnert Park, Cotati, and Petaluma.

This segment is centered on the rail ROW, which in Sonoma County is owned by the SMART District, which was established in 2002.³¹ As described on the SMART website, “More than 80% of all North Bay commercial, residential and educational facilities are located along the SMART corridor.”

As with the Mendocino County underground segment, an underground HVDC line could be installed within the rail ROW (most likely under the adjacent recreational trail) or under paved roads.

The segment is comprised of all private lands and would pass through the cities of Cloverdale, Cotati, Healdsburg, Petaluma, Rohnert Park, Santa Rosa, and Windsor, in areas where there is a significant density of parcels. Within the 3,500-foot-wide segment, there are 24,833 private parcels (486 parcels/mile) with an average parcel size of 0.9 acres.

³¹ <https://www.sonomamarintrain.org/about-district>

Challenges or Concerns for Transmission Siting and Permitting

- About 5% of the segment (focused in the northernmost 2 miles, north of Preston to the Mendocino County line) is in a high landslide susceptibility zone, which is a serious concern for an underground installation. However, in this segment, much of this rail ROW segment is somewhat protected by US 101, which is above and to the west of it. The line would be at risk from erosion by the Russian River, which is less than 100 feet to the east along portions of this area.
- The segment contains NMFS designated critical habitat for green sturgeon (103 acres, 1%). No occurrences of the species were identified during CNDDDB queries. The use of direction drilling would minimize impacts to this habitat. Construction would be constrained based on agency requirements and required disturbance avoidance windows.
- CNDDDB queries identified the following State/federally listed wildlife species (see below for fish and avian species): California tiger salamander (23 occurrences) and western pond turtle (17 occurrences). Proper construction techniques such as directional drilling and mitigation during construction would be necessary to minimize impacts to this wildlife species. Once the underground line is installed, no impacts to these species are anticipated. Permitting with State and federal resource agencies will be complicated, and extensive mitigation is anticipated.
- There is no tribal land within the segment, but nearly 4,000 acres of the segment is within 5 miles of the Dry Creek Rancheria and Off-Reservation Trust Land. The construction of an underground HVDC line could encounter buried cultural and tribal resources.
- Nearly 1,500 acres of the segment are considered Disadvantaged Communities (SB 535 tracts); the areas where these populations are defined include southern Santa Rosa, northern Rohnert Park, and the unincorporated area between those two cities. Short-term construction effects and presence of a new major transmission facility would further degrade the area.
- Cultural resources within this segment include the following:
 - There are 710 historic era cultural resources including 15 large historic districts. The majority of these historic age resources are historic buildings. There are 27 precontact age resources and 8 resources that contain both precontact and historic age resources. The majority of these resources are located in the Penngrove, Santa Rosa, and Petaluma areas.
 - Underground construction is assumed to occur within the existing railroad ROW or paved roads. The extent of impact on cultural resources would depend on previous disturbance within these segments.
- The NAHC search of its Sacred Lands File is pending.

Other Less Serious Concerns

- CNDDDB queries identified the following State and federally listed fish: coho salmon (3 occurrences). In addition, there are 2,493 acres (4.8% of segment) of wetland features defined in the NWI. Use of directional drilling will minimize impacts to aquatic habitats.
- CNDDDB queries for listed avian species identified the California ridgeway rail (1 occurrence). With the exception of nest monitoring during construction, concerns related to avian species are not relevant to an underground transmission line.
- CNDDDB queries identified the following State and federally listed plants: Burke's goldfields (7 occurrences), Sonoma sunshine (3), Sebastopol meadowfoam (2), Pitkin Marsh lily (1), and Sonoma

spineflower (1). Proper underground transmission alignment and the use of direction drilling technology would avoid impacting these plant species.

- Within the 3,500-foot-wide segment, there are 24,833 private parcels (486 parcels/mile) with an average parcel size of 0.9 acres. However, given the underground location of this line segment, and the likely installation within either rail ROW or roadways, this parcel density is not expected to be a limiting factor. Construction through densely populated areas of 7 incorporated cities would likely create short-term traffic, noise, and dust disturbance (especially for installation of splice vaults, which require a wider ROW), but when completed, the underground line would not have any visible components.
- Over 3,000 acres within the segment (14% of it) are Important Farmland, and an additional 2,400 acres are under Williamson Act contract. However, because an underground line is expected to be installed within the rail ROW or in paved roads, no direct effect on agriculture is expected.
- There is one National Historic Site (Healdsburg Memorial Bridge) located within the segment, but it would be unaffected by the installation and operation of an underground HVDC transmission line.
- There are scattered local and regional parks within this segment (e.g., Cloverdale River Park under Sonoma County Regional Parks Department jurisdiction and McNear Peninsula Waterfront Park in the City of Petaluma), but none would be affected by the installation and operation of an underground HVDC transmission line.
- The segment includes 2 miles of scenic highway, but there would be no concerns related to aesthetics given the underground location of the line.
- The location of this segment on valley floors places it in an area with only a small amount (3%) of land in high fire hazards risk zones.
- Over 5,700 acres are in “Class Airspace” within a mile of the segment; however, an underground line would not present a risk to airspace.

5.2.4. Petaluma to Cuttings Wharf

Land Ownership and Land Uses

This 20-mile segment diverges from the rail ROW at the intersection of the rail line and US 101 at the Lakeville Highway exit. Continuing further south in the rail ROW would make it challenging to reach Collinsville, due to the presence of the large San Pablo Bay National Wildlife Refuge and Wildlife Area. Therefore, the segment was designed to leave the rail ROW just east of central Petaluma and follow paved or unpaved roads to Cuttings Wharf.

The segment is comprised of all private lands and would pass through the cities of Petaluma and Napa, in areas where there is a significant density of parcels. Within the 3,500-foot-wide segment, there are 2,616 private parcels (131 parcels/mile) with an average parcel size of 4 acres. The segment passes through an area with high value agricultural lands with vineyards. About 70% of this segment is within the **Los Carneros AVA** is an American Viticultural Area (AVA) that spans across parts of the southern Napa Valley and Sonoma County.³²

³² The Los Carneros AVA was officially recognized as an American Viticultural Area in 1983 and was the first AVA to be purely defined by climate characteristics instead of geographical characteristics. https://napavintners.com/napa_valley/los-carneros-ava/

This segment ends at the Napa River, which is navigable and under the jurisdiction of the California State Lands Commission.

Challenges or Concerns for Transmission Siting and Permitting

- Over 2,408 acres within the segment (28%) are Important Farmland, and 3,500 acres (40%) are under Williamson Act contract. However, because an underground line is expected to be installed within the railroad ROW and/or paved or dirt roads, no long-term direct effect on agriculture is expected. Agricultural activities would be temporarily interrupted during construction.
- The segment contains NMFS designated critical habitat for green sturgeon (103 acres, 1%). No occurrences of the species were identified during CNDDDB queries. Use of directional drilling during construction would minimize impacts to this habitat. Construction would be constrained based on agency requirements and required disturbance avoidance windows.
- CNDDDB queries identified the following State/federally listed wildlife species (see below for fish and avian species): western pond turtle (5 occurrences), California red-legged frog (4), and salt-marsh harvest mouse (2). Proper mitigation during construction would be necessary to minimize impacts to this wildlife species; once the underground line is installed, no impacts to these species are anticipated. Multi-species permitting with State and federal resource agencies will be complicated, and extensive mitigation is anticipated.
- The segment crosses the active Rogers Creek Fault along Stage Gulch Road and the active West Napa Fault near Cuttings Wharf. An underground line crossing an active fault is a significant concern but crossing it in a perpendicular crossing (as would be the case with the Rogers Creek Fault) is the preferred alignment for minimizing damage. The 1.5 miles of the segment within the West Napa Fault zone remain a concern.
- In the same hilly area where the segment crosses the Rogers Creek Fault, passes through an area with high landslide susceptibility. However, with the underground line installed beneath paved roadways the potential damage from landslides is reduced.
- Cultural resources within this segment include the following:
 - There are 23 historic era cultural resources. The majority of these historic age resources are buildings or structures. There are 11 precontact age resources and 1 resource that contain both precontact and historic age resources. The majority of these resources are located in the western half of the segment. The small number of recorded resources in this segment may indicate a likelihood that it has not been subject to an intensive pedestrian survey.
 - Underground construction is assumed to occur within the existing railroad ROW or paved roads. The extent of impact on cultural resources would depend on previous disturbance within these segments.
- The NAHC search of its Sacred Lands File is pending.

Other Less Serious Concerns

- CNDDDB queries identified the following State and federally listed fish: steelhead (2 occurrences) and longfin smelt (1). In addition, there are 397 acres (4.5% of segment) of wetland features defined in the NWI. Finally, there are 37 acres (<1%) of NOAA HAPC. Use of directional drilling will minimize impacts to aquatic habitats.

- CNDDDB queries for listed avian species identified the California black rail (3 occurrences), Swainson’s hawk (2), and California ridgeway rail (1). With the exception of nest monitoring during construction, concerns related to avian species are not relevant to an underground transmission line.
- CNDDDB queries identified the following State and federally listed plants: Sonoma sunshine (2 occurrences), Sonoma spineflower (1), and Contra Costa goldfields (1). Proper underground transmission alignment and the use of direction drilling technology would avoid impacting these plant species.
- The segment traverses private and agricultural lands. However, given the underground location of this line segment, and the likely installation within either rail ROW or roadways, parcel density and existing agricultural lands use are not expected to be limiting factors.
- There is no tribal land within the segment and none within 5 miles.
- Contains 1,650 acres of “Class Airspace” within a mile of the segment; however, an underground line would not present a risk to airspace. No high fire risk areas.
- The segment includes 2 miles of scenic highway, but there would be no concerns related to aesthetics given the underground location of the line.
- There are scattered local and regional parks within the Petaluma segment, but none would be affected by the installation and operation of an underground HVDC transmission line.

5.2.5. Cuttings Wharf to Collinsville

This 37-mile segment would be a submarine HVDC cable, with about 12 miles located in the Napa River and the remaining 25 miles in the Carquinez Strait and Sacramento River. About 19 miles of this segment would follow the approximate route of the existing HVDC submarine cable, the TransBay Cable.³³

The submarine segment would enter the Napa River via a directional drill from the Cuttings Wharf area and again at Collinsville. The Napa River’s channel ranges from 11 to 32 feet of depth.³⁴ The viability of installing a submarine cable in river sediments would require further investigation to ensure that cable-laying vessels could operate in the river. The route would also pass through the 1,500-foot-wide Mare Island Strait Channel where the Napa River separates the City of Vallejo from the Mare Island Naval Shipyard.

Upon reaching the Carquinez Strait (Sacramento River) and turning east, the channel is significantly deeper: 40 to 90 feet in the western portion and 22 to 42 feet in the eastern portion.³⁵

The channel is navigable and is used for commercial and military shipping. Deep water ship traffic bound for both the Port of Sacramento and the Port of Stockton traverse the strait through the Stockton Deepwater Shipping Channel and Sacramento Deep Water Ship Channel.³⁶

³³ <https://www.transbaycable.com/operations.html>

³⁴ <https://www.usharbors.com/harbor/california/napa-ca/map/>

³⁵ <https://www.usharbors.com/harbor/california/napa-ca/map/>

³⁶ https://en.wikipedia.org/wiki/Carquinez_Strait

Land Ownership and Land Uses

The segment passes through or adjacent to the cities of Benicia, Napa, and Vallejo. Waters of the Napa River and Carquinez Strait are under the jurisdiction of the US Army Corps of Engineers, the California State Lands Commission, and the Bay Conservation and Development Commission.

Challenges or Concerns for Transmission Siting and Permitting

- The feasibility of installing a submarine HVDC line in the Napa River requires further investigation due to relatively shallow water depths.
- About 120 acres of the segment are within the Concord Naval Weapons Station Superfund site, which includes two small islands (Ryer and Roe Islands) just north of the channel. Given the remaining width of the navigable channel south of the islands, coordination with the US EPA should allow avoidance of disturbing contaminated sediments.
- Construction would be required through critical habitat designated by the USFWS for the Delta smelt (9,842 acres, 62%, 5 occurrences) and soft bird's beak (59 acres, 0.4%, no occurrences). In addition, the NMFS has defined critical habitat for green sturgeon (11,887 acres, 74%, 1 occurrence) and chinook salmon (9,392 acres, 59%, no occurrences). Finally, the entirety of this submarine segment (15,957 acres) is designated by NOAA as Essential Fish Habitat, 89% of the segment is comprised of NWI wetland aquatic features, and 12,209 acres (77%) as NOAA HAPC. Construction would be constrained based on agency requirements and required disturbance avoidance windows.
- CNDDDB queries identified the following State/federally listed wildlife species (see below for avian species): salt-marsh harvest mouse (13 occurrences), western pond turtle (1), and western snowy plover (1). Proper mitigation during construction would be necessary to minimize impacts to this wildlife species; once the submarine line is installed, no impacts to these species are anticipated. Multi-species permitting with State and federal resource agencies will be complicated, and extensive mitigation is anticipated.
- While this segment would be installed within waterways so would not be visible after its installation, it passes through an area of over 4,500 acres of lands considered Disadvantaged Communities (SB 535 tracts); the areas where these populations are defined include parts of the cities adjacent to the rivers: Vallejo, Martinez, Bay Point, and Pittsburg. Construction emissions, while short-term, would exacerbate existing conditions.
- Cultural resources within this segment include the following:
 - There are 219 historic era cultural resources including 9 large historic districts. The majority of these historic age resources relate to naval shipyards. There are 4 precontact age resources and 1 resource that contains both precontact and historic age resources. The majority of these resources are located in the Mare Island area of the segment.
 - This segment could require an underwater archaeology study. Proper routing and pre-construction testing and monitoring could mitigate impacts.

Other Less Serious Concerns

- CNDDDB queries for listed avian species identified the California black rail (14 occurrences), California ridgeway rail (7), monarch butterfly (wintering) (2), California least tern (1) and Lange's

metalmark butterfly (1). With the exception of nest monitoring during construction, concerns related to avian species are not relevant to an underground transmission line.

- CNDDDB queries identified the following State and federally listed plants: soft salty bird's-beak (1 occurrence). Given submarine installation, impacts to this plant species would be avoided.
- There is no tribal land within the segment and none within 5 miles. There is no agricultural land.
- Contains over 9,000 acres of "Class Airspace" within a mile of the segment; however, a submarine line would not present a risk to airspace.
- No high fire risk areas.
- Shoreline areas include some city and regional parks, but they would not be affected by a submarine line.
- The segment includes 1 mile of scenic highway, but there would be no concerns related to aesthetics given the submarine location of the line.
- The segment crosses the Pony Express National Historic Trail in one location; however, there would be no concerns related to aesthetics given the submarine location of the line.
- The NAHC search of its Sacred Lands File was negative for the presence of recorded sacred resources.

5.2.6. Corridor 2A: Overall Conclusions Regarding Transmission Feasibility

Table 5 and Figure 9 summarize the concerns about Corridor 2A. Red shaded areas in the table below note the issues of highest concern, followed by issues of medium concern (orange shading), and lastly issues of low concern (yellow shading). Red text for each segment indicates the key factors driving the highest risk conclusions indicated in red shading in the summary column.

The most serious concerns in Corridor 2A include the following:

- The presence of USFWS and NMFS critical habitat and CNDDDB occurrences for the following: Delta smelt, soft bird's beak, and green sturgeon. In addition, critical habitat and CNDDDB occurrences for the marbled murrelet. The northern spotted owl has critical habitat along this segment, but individual occurrences were not noted in CNDDDB data. These critical habitats and species present exceptional challenges and will require ESA consultation and mitigation development with the USFWS and NMFS.
- Serious siting and construction restraints with respect to extensive landslide susceptible soils and fault lines within the segment.

Table 5. Corridor 2A (Coastal Underground) – Summary of Issues

CORRIDOR 2A (Coastal Underground) SUMMARY OF ISSUES	Overhead: Humboldt Bay to Longvale	UG RR: Mendocino Co	UG RR: Sonoma Co	UG: Petaluma to Cuttings Wharf	Submarine: Cuttings Wharf to Collinsville	CORRIDOR 2A SUMMARY
Challenge or Concern	115 miles; 48,697 ac	63 miles; 26,290 ac	51 miles; 21,972 ac	20 miles; 10,493 ac	37 miles; 15,957 ac	286 miles. 123,409 acres
LAND USE & PROTECTED LANDS						
Federal Lands (USFS, NPS, BLM)	1% BLM lands	—	—	—	n/a (submarine)	Minimal federal lands to traverse.
Private Lands	99% private 2,599 parcels 23 parcels/mile 19 ac/parcel avg	100% private 6,507 parcels 103 parcels/mile 4 ac/parcel avg	100% private 24,833 parcels 486 parcels/mile 0.9 ac/parcel avg	100% private 2,616 parcels 131 parcels/mile 4 ac/parcel avg	n/a (submarine)	Nearly all private land, but underground would be in RR or roadway ROWs so minimal impact.
Incorporated City Lands	<1% (Eureka)	8% (Ukiah, Willits)	46% (Cloverdale, Cotati, Healdsburg, Petaluma, Rohnert Park, Santa Rosa, Windsor)	11% (Napa, Petaluma)	6% (Benicia, Napa, Vallejo), but submarine	High % in incorporated cities in Sonoma Co. but underground so minimal concern
USFS Wilderness Lands	—	—	—	—		
National Wildlife Refuges	—	—	—	—		
CDFW Owned & Operated Lands, State Refuges, and California Protected Areas (CPAD)	CDFW: 8 ac CPAD: 269 ac <1% of land	CDFW: 0 CPAD: 111 ac 0.4% of land	CDFW: 16 ac CPAD: 483 ac 2% of land	CDFW 61 ac CPAD: 99 ac 2% of land	CDFW: 1,074 ac CPAD: 613 ac 11% of land	Underground would be in disturbed land (road or RR) so minimal impact
BIOLOGICAL RESOURCES						
USFWS & NMFS Critical Habitat & CNDDB Occurrences	649 ac (1.3%) marbled murrelet, 2 occurrences 469 ac (1.0%) northern spotted owl, no occurrences	—	NMFS: 60 ac (<1%) green sturgeon, no occurrences	NMFS: 103 ac (1%) green sturgeon, no occurrences	USFWS: 9,842 ac (62%) Delta smelt (5) USFWS: (59 ac, <1%) soft bird's beak (0) NMFS: 11,887 ac (74%) green sturgeon (1) NMFS: 9,392 ac (59%) chinook salmon (0)	Overhead & submarine segment permitting through critical habitat will be complicated and mitigation challenging

CORRIDOR 2A (Coastal Underground) SUMMARY OF ISSUES	Overhead: Humboldt Bay to Longvale	UG RR: Mendocino Co	UG RR: Sonoma Co	UG: Petaluma to Cuttings Wharf	Submarine: Cuttings Wharf to Collinsville	CORRIDOR 2A SUMMARY
Challenge or Concern	115 miles; 48,697 ac	63 miles; 26,290 ac	51 miles; 21,972 ac	20 miles; 10,493 ac	37 miles; 15,957 ac	286 miles. 123,409 acres
Other CNDDDB State & Federally Listed Wildlife Observances (corridor & buffer)	western pond turtle (2) tidewater goby (2)	western pond turtle (12)	California tiger salamander (23) western pond turtle (17)	western pond turtle (5) CA red-legged frog (4) salt-marsh harvest mouse (2)	salt-marsh harvest mouse (13) western pond turtle (1) western snowy plover (1)	Construction monitoring; once UG line installed, no impacts. Site overhead near existing lines.
Other CNDDDB State & Federally Listed Avian Species and Important Bird Areas	612 ac IBA (1%)	tricolored blackbird (1)	CA ridgeway rail (1)	CA black rail (3) Swainson's hawk (2) CA ridgeway rail (1)	CA black rail (14) CA ridgeway rail (7) monarch butterfly (wintering) (2), CA least tern (1) Lange's metalmark butterfly (1)	Construction nest monitoring; once UG line installed, no impacts. Site overhead near existing lines.
Other CNDDDB State & Federally List Fish Species, NWI Aquatic Wetland Features	steelhead (9) coho salmon (3) green sturgeon (1) longfin smelt (1) 1,257 ac (2.5%) NWI	steelhead (1) 996 ac (3.8%) NWI	coho salmon (3) 2,493 ac (4.8%) NWI	steelhead (2) longfin smelt (1) 397 ac (4.5%) NWI	14,216 ac (89%) NWI	Waterways can be spanned or crossed using directional drilling. Proper siting of overhead towers and submarine route, and directional drilling for underground would minimize impacts
Other CNDDDB State & Federal Listed Plant Observances	western lily (4)	North Coast semaphore grass (4) Sonoma sunshine (1)	Burke's goldfields (7) Sonoma sunshine (3) Sebastopol meadowfoam (2) Pitkin Marsh lily (1) Sonoma spineflower (1)	Sonoma sunshine (2) Sonoma spineflower (1) Contra Costa goldfields (1)	soft bird's beak (1)	Minimal plant populations. Proper siting of overhead towers and directional drilling for underground would minimize impacts

CORRIDOR 2A (Coastal Underground) SUMMARY OF ISSUES	Overhead: Humboldt Bay to Longvale	UG RR: Mendocino Co	UG RR: Sonoma Co	UG: Petaluma to Cuttings Wharf	Submarine: Cuttings Wharf to Collinsville	CORRIDOR 2A SUMMARY
Challenge or Concern	115 miles; 48,697 ac	63 miles; 26,290 ac	51 miles; 21,972 ac	20 miles; 10,493 ac	37 miles; 15,957 ac	286 miles. 123,409 acres
CULTURAL & TRIBAL RESOURCES						
Prehistoric Resources	115	64	27	11	4	Proper siting of overhead towers would minimize impacts. Tower foundation excavation and underground construction could impact unknown, buried Native American sites. Permitting would be complicated & mitigation challenging.
Historic Resources	102	205	110	23	219	Foundation excavation & underground could impact buried historic resources. Direct and indirect impacts would need to be analyzed for overhead and submarine, particularly for historic districts. Permitting would be complicated & mitigation challenging.
Tribal Lands within Corridor	—	—	—	—	—	—

CORRIDOR 2A (Coastal Underground) SUMMARY OF ISSUES	Overhead: Humboldt Bay to Longvale	UG RR: Mendocino Co	UG RR: Sonoma Co	UG: Petaluma to Cuttings Wharf	Submarine: Cuttings Wharf to Collinsville	CORRIDOR 2A SUMMARY
Challenge or Concern	115 miles; 48,697 ac	63 miles; 26,290 ac	51 miles; 21,972 ac	20 miles; 10,493 ac	37 miles; 15,957 ac	286 miles. 123,409 acres
Corridor Acres within 5 Miles of Tribal Lands (federally recognized tribes)	7,140 ac (15%)	21,345 ac (81%)	3,932 (18%)	—	—	15% of overhead segment could be visible from tribal lands. Underground not a visual issue.
Number of tribal lands and rancherias within 5 miles	3 (Table Bluff Reservation, Sherwood Valley Rancheria and Off-Reservation Trust Land, Laytonville Rancheria)	7 (Cloverdale Rancheria, Coyote Valley Reservation, Guidiville Rancheria and Off-Reservation Trust Land, Hopland Rancheria, Pinoleville Rancheria, Redwood Valley)	4 (Dry Creek Rancheria and Off-Reservation Trust Land, Cloverdale Rancheria, Graton Rancheria, Graton Resort & Casino)	0	0	Numerous tribal areas in Mendocino & Sonoma Counties. Buried resources could be affected by underground construction.
AESTHETICS						
Wild & Scenic Rivers	3 miles	—	—	—	—	Tower siting required overhead only; UG no issues
Scenic Highways	4 miles	11 miles	2 miles	2 miles	1 mile	Tower siting required in Overhead segment only; UG no issues
USFS Wilderness Lands within 5 miles	—	—	—	—	—	
AGRICULTURAL RESOURCES						
Important Farmlands (prime & unique)	—	3,029 ac 12%	3,159 ac 14%	2,408 ac 28%	35 ac <1%	Underground would be in disturbed land (road or RR) so minimal impact
Williamson Act Lands	37%	32%				

CORRIDOR 2A (Coastal Underground) SUMMARY OF ISSUES	Overhead: Humboldt Bay to Longvale	UG RR: Mendocino Co	UG RR: Sonoma Co	UG: Petaluma to Cuttings Wharf	Submarine: Cuttings Wharf to Collinsville	CORRIDOR 2A SUMMARY
Challenge or Concern	115 miles; 48,697 ac	63 miles; 26,290 ac	51 miles; 21,972 ac	20 miles; 10,493 ac	37 miles; 15,957 ac	286 miles. 123,409 acres
HAZARDS						
High Landslide Susceptibility	55%	31%	5%	8%	<1%	Continuous areas of high susceptibility create serious concern for underground
Alquist-Priolo Fault Hazard Zones	-	7%		4%	4%	Long stretches of Maacama Fault parallel to the corridor create serious concern for underground
CalFire Very High-Risk Lands	34%	17%				Proper O&M management for overhead. Not relevant for UG
EPA Superfund Areas	—	—	—	—	—	
AIRPORTS & AIRSPACE CONSTRAINTS (≤500 Feet)						
Airports & Airspace	—	—	—	—	—	
Special-Use Airspace	—	—	—	—	—	
Military Training Routes	—	—	—	—	—	
ENVIRONMENTAL JUSTICE						
Disadvantaged Communities	—	—	1,461 ac 7%		4,589 ac 27%	UG & submarine installations would not be visible after installation but would create short-term construction impacts



**Transmission Corridor Evaluation,
Humboldt Wind Energy Area**

**Figure 9
Corridor 2A (Coastal Underground)
Siting Constraints**

1:950,400

1" = 15 miles



0 15 Miles

Risk Categories

- High
- Medium
- Low

**Corridor width not drawn to scale*

Sources: Aspen, 2024; ESRI, 2024.

5.3. Corridor 2B: Humboldt Bay to Collinsville (Coastal Overhead)

Corridor 2B would include an overhead 500 kV transmission line that follows existing PG&E 115 kV, 60 kV and 230 kV transmission lines. These existing lines have access roads to or near most tower structures, and most (but not all) have ROWs cleared of vegetation. Cleared ROWs vary in width from 80 to 150 feet, depending on line voltage and terrain.

5.3.1. Humboldt Bay to Longvale (Shared with Corridor 2A)

See section 5.2.1 above.

5.3.2. Fulton to Vaca-Dixon

Land Ownership and Land Uses

This 69-mile segment would start at the Fulton Substation (north of Santa Rosa). It would follow existing PG&E 230 kV transmission lines for about 26 miles to the Lakeville Substation (east of Petaluma), then turn east following the Lakeville-Vaca-Dixon 230 kV lines for 41 miles to the PG&E Vaca-Dixon Substation. This segment follows the western slopes of the Mayacamas Mountains and crosses the southern ends of the Sonoma and Napa County wine country.

The segment is located in Sonoma and Solano counties and is comprised of all private lands, including parcels within the cities of Napa, Santa Rosa, and Vacaville. Within the 3,500-foot-wide segment, there are 4,127 private parcels (62 parcels/mile) with an average parcel size of 5 acres.

This segment would pass through two areas of the City of Santa Rosa (and all along its northern boundary), then turn south through the communities of Oakmont and Lawndale. It would pass west of Jack London State Historic Park and Mount Sonoma, paralleling the Sonoma Valley about 4 miles to the west of the valley center. The Petaluma Substation is located adjacent to Petaluma Adobe State Historic Park; at this point, the segment would turn east, passing about 3 miles south of central Sonoma and crossing Sonoma Creek near Broadway, paralleling SR 12 (Sonoma Highway), passing through the areas of Schellville Colony and entering Napa County.

The segment crosses SR 29 (Napa-Vallejo Highway) at the Napa River and within the Napa city limits. The segment passes into Solano County northwest of Green Valley and the City of Fairfield, through a corner of southeast Napa County, then to the town of Bucktown and City of Vacaville. In Solano County (the easternmost 11 miles of the segment), the segment is west and north of Vacaville, with about 800 acres within the city limits.

Challenges or Concerns for Transmission Siting and Permitting

- The segment crosses through several suburban neighborhoods of Santa Rosa and its northern suburbs. Given the density of development in this area, space for a new high-voltage line may be difficult to find.
- The area northeast of Santa Rosa includes nearly 1,600 acres of high fire hazard zones, and recent wildfires in this area have caused loss of life and extensive property loss.
- There are many large parks and preserves in the hills east of Rohnert Park and west of Glen Ellen, including Vineyard Lake, Saddle Mountain Open Space Preserve, Trione-Annadel State Park, Fairfield Osborn Preserve, Napa City Riverfront Green, Skyline Wilderness Park, Suscol Headwaters Preserve.

- There are many private parcels within the study segment. This segment would include over 4,100 private parcels, indicating a likely high level of public concern about siting of a nearby major overhead transmission line.
- USFWS critical habitat within this segment exists for three federally listed species: California red legged frog (1,672 acres, 5.8%), California tiger salamander (158 acres, 0.6%), and Contra Costa goldfield (259 acres, 0.9%). CNBBD queries note 14 occurrences of California red legged frog, no occurrences of California tiger salamander, and one occurrence of Contra Costa goldfield. In addition, the segment contains NMFS designated critical habitat for green sturgeon (64 acres, <1%). No occurrences of the species were identified during CNDDDB queries. As a result of the critical habitat, permitting and mitigation may be challenging.
- CNDDDB queries identified the following State/federally listed wildlife species (see below for fish and avian species): western pond turtle (9 occurrences), vernal pool fairy shrimp (3), and valley elderberry longhorn beetle (1). Proper siting of towers would be necessary to minimize impacts to these wildlife species. Permitting with State and federal resource agencies will be complicated, and extensive mitigation is anticipated.
- There is no land of federally-recognized tribes within the segment or within 5 miles of it, but many tribal rancherias and communities are shown on the BIA map (e.g., Laytonville Rancheria, Dry Creek, Hopland Reservation, Cloverdale Rancheria, Guidiville Rancheria, Pinoleville Rancheria, Coyote Valley Reservation and Casino are just north of the overhead HVDC segment in Redwood Valley, about 7 miles south of Willits).³⁷

Over 13% of the segment is Important Farmland (Prime and Unique), and over 9,000 acres (nearly one-third of the segment) are under Williamson Act contract. Some of this is grazing land, but much of it is the high value vineyards across the southern Sonoma and Napa Valleys. The existing 230 kV line traverses these agricultural areas, but each County would have to determine the acceptability of new transmission structures within Williamson Act lands. Proper tower siting would minimize impacts to these agricultural lands.

- Because this segment crosses about 17 miles of the southern Sonoma and Napa Valleys, it would be located within “wine country” with high value agricultural land, high-end hotels, and a high level of tourism.
- Within the segment are 4 miles of CA Scenic Highways, including Sonoma Highway where the segment crosses it west of Lawndale, the Schellville area of SR 12 or Broadway (3 miles south of the center of the city of Sonoma), and the Napa Vallejo Highway about 3 miles south of the center of the city of Napa). This indicates a likely high level of public concern about retaining existing viewsheds.
- The Sonoma Skypark (airport) is located about 1,700 feet north of the corridor. The existing 230 kV line is parallel to the runway.
- Cultural resources within this segment include the following:
 - There are 143 historic era cultural resources, including 6 large historic districts and 73 precontact age resources, as well as 9 resources that contain both precontact and historic age

³⁷ <https://www.bia.gov/sites/default/files/dup/assets/bia/pacreg/Central%20California%20Agency%20Jurisdictional%20Map.pdf>

resources. The majority of these resources are located in the northwest third and far eastern area of the segment.

- Construction of overhead transmission lines can generally avoid impacts to known resources, but effects on large districts with numerous individual resources are more difficult to avoid. Unknown buried resources could be encountered during ground disturbance, but construction monitoring can help to mitigate impacts. Indirect impacts to historic resources and mining districts could occur due to the new presence of a major industrial facility (500 kV transmission line) that is inconsistent with the historic setting.
- The NAHC search of its Sacred Lands File is pending.

Other Less Serious Concerns

- CNDDDB queries identified the following State and federally listed fish: steelhead (2 occurrences), coho salmon (1), and longfin smelt (1). In addition, there are 853 acres (3.0% of segment) of wetland features defined in the NWI. Finally, there are 58 acres (<1%) of NOAA HAPC. Proper tower siting will minimize impacts to aquatic habitats.
- CNDDDB queries identified the following State and federally listed plant species: Clara Hunt's milkvetch (2), Calistoga popcorn flower (2), Pitkin Marsh lily (1), Sonoma Alopecurus (1), and Sonoma sunshine (1). Proper tower siting would avoid impacting this plant species.
- This segment crosses 3 active faults, but engineering for an overhead transmission line can accommodate anticipated ground shaking. There are also over 7,400 acres (26% of the segment) with high landslide susceptibility, but as with faults, appropriate engineering and tower siting can ensure safe transmission lines.
- The segment crosses the Pony Express National Historic Trail in one location; however, the existing 500 kV transmission line also crosses this trail within the segment. Locating the new line near the existing line would minimize visual impacts.

5.3.3. Longvale to Fulton

Land Ownership and Land Uses

This 89-mile segment includes about 60 miles in Mendocino County and 29 miles in Sonoma County. No federal lands would be crossed. This segment primarily follows a system of existing PG&E 60 kV sub-transmission lines that serve communities along the US 101 corridor, including Willits, Ukiah, Hopland, Cloverdale, Geyserville, Healdsburg, and Windsor. The segment passes within the city limits of Healdsburg and Windsor.

The segment is comprised of all private lands and would pass through the cities of Healdsburg and Windsor, in areas where there is a significant density of parcels. Within the 3,500-foot-wide segment, there are 5,142 private parcels (58 parcels/mile) with an average parcel size of 5 acres. There are no historic sites or trails.

Challenges or Concerns for Transmission Siting and Permitting

- This overhead HVDC line would follow smaller 60 kV lines, but due to the taller towers and the need to clear vegetation from a wider ROW, it would likely be highly visible along the east side of the Russian River Valley. The segment includes nearly 25,000 acres that would be within 5 miles of

federally-recognized tribal land, raising a concern that views of sacred sites may be altered by the transmission infrastructure.

- The segment also includes 13 miles of California Scenic Highways (the most of any segment), indicating a potential high level of public concern about retaining existing viewsheds.
- This segment would include over 5,100 private parcels, indicating a likely high level of public concern about siting of a major overhead transmission line.
- USFWS critical habitat within this segment exists for the California tiger salamander (163 acres, 0.4%). CNBBD queries note no occurrences of this species. Construction would be constrained based on agency requirements and required disturbance avoidance windows. As a result of the critical habitat, permitting and mitigation may be challenging.
- CNDDDB queries identified the following State/federally listed wildlife species (see below for fish and avian species): western pond turtle (10 occurrences). Proper siting of towers would be necessary to minimize impacts to this wildlife species. Permitting with State and federal resource agencies will be complicated, and extensive mitigation is anticipated.
- Nearly 8,500 acres within high fire hazard severity lands.
- Cultural resources within this segment include the following:
 - There are 71 historic era cultural resources including 3 large historic districts. There are 56 precontact age resources and 3 resources that contain both precontact and historic age resources. Resources are not clustered in any particular area of the segment
 - Construction of overhead transmission lines can generally avoid impacts to known resources, but effects on large districts with numerous individual resources are more difficult to avoid. Unknown buried resources could be encountered during ground disturbance, but construction monitoring can help to mitigate impacts. Indirect impacts to historic resources and mining districts could occur due to the new presence of a major industrial facility (500 kV transmission line) that is inconsistent with the historic setting.
 - The NAHC search of its Sacred Lands File is pending.
- There are many parks, preserves, and trust lands within the segment and several of these would be difficult to avoid given their extent across the segment. Permitting through parks and preserves requires investigation into the permitted uses of each area and its management entity. Examples of protected lands that this segment would cross:
 - Pacific Forest Trust (Outlet Creek Ranch) (covering the northeastern half of segment)
 - Lake Mendocino Land (covering the eastern half of the segment)
 - Healdsburg Ridge Open Space Preserve (spanning nearly all of the ROW)
 - Fitch Mountain Open Space Preserve (spanning nearly all of the ROW)
 - Foothill Regional Park and Shiloh Ranch Regional Park (occupying large areas of the segment east of Windsor)
 - Maddux Ranch Regional Park (in the center of the segment north of the Fulton Substation)

Other Less Serious Concerns

- CNDDDB queries identified the following State and federally listed fish: coho salmon (1 occurrence) and steelhead (1). In addition, there are 1,125 acres (3.0% of segment) of wetland features defined in the NWI. Proper tower siting will minimize impacts to aquatic habitats.
- CNDDDB queries identified the following State and federally listed plant species: North Coast semaphore grass (2), Pitkin Marsh lily (1), Burke's goldfields (1), and Sonoma sunshine (1). Proper tower siting could avoid impacting this plant species.
- There are geologic hazards that would need to be addressed by tower design. Over 13,000 acres of high landslide susceptibility (36% of the segment) indicate a concern about tower stability.
- This overhead segment is parallel to (and includes over 2,200 acres of segment) with a 25-mile stretch of the Maacama active fault zone. This is a designated active fault in the Alquist-Priolo Zone. Constructing an overhead line parallel to an active fault can be done safely if tower design incorporates the potential for high levels of ground shaking.
- There are over 4,700 acres of Important Farmland (prime and unique) within this segment, as well as over 17,000 acres of land (46% of this segment) under Williamson Act contracts. The existing 60 kV line traverses these agricultural areas, but each County would have to determine the acceptability of new transmission structures within Williamson Act lands. Proper tower siting would minimize impacts to these agricultural lands.
- Over 17,000 acres of the segment within Class Airspace (Class E2 near Ukiah and Class D near Santa Rosa). Proper tower placement and FAA coordination would reduce the risk to aviation activities.

5.3.4. Vaca-Dixon to Collinsville

Land Ownership and Land Uses

As illustrated in Figure 4, the 24-mile Vaca-Dixon to Collinsville Segment is centered on an existing overhead PG&E 230 kV and 500 kV transmission lines that traverses important agricultural (prime and unique) and grazing lands in Solano County. To reach the planned Collinsville Substation, a new segment of 500 kV transmission ROW would be required for the southernmost approximately 1.5 miles.

The Vaca-Dixon to Collinsville Segment traverses Solano County and is comprised of all private lands, including parcels within the City of Vacaville. Within the 3,500-foot-wide segment, there are 947 private parcels (39 parcels/mile) with an average parcel size of 11 acres. The segment generally traverses agricultural lands, including important farmlands (prime and unique) and grazing lands.

Challenges or Concerns for Transmission Siting and Permitting

- Line siting along the length of the Vaca-Dixon to Collinsville Segment would need to avoid residential areas and other sensitive land uses (e.g., schools and parks) in order to minimize disturbance and views of new towers. The segment includes nearly 600 acres of the City of Vacaville (just west of Elmira) and includes a densely developed residential area. Private parcel density is approximately 35 parcels per mile, and average parcel size of 12 acres.
- Approximately 23% of the segment is comprised of important farmland (prime or unique). Many areas of important farmlands are continuous so cannot be spanned; therefore, proper siting of towers will be required to minimize impacts to these lands.

- The entire width of the segment east of Travis AFB includes the Wilcox Ranch of the Solano Land Trust (498 ac, 4.7%), a California Protected Area. The installation of additional transmission within this protected land would depend on land rights of the trust.
- Almost 52% of this segment is under Williamson Act contracts. Coordination with Solano County would be required to assess whether adding new transmission is consistent with existing contracts.
- USFWS critical habitat within this segment exists for Delta smelt (359 acres, 3.4%). CNBBD queries note no occurrences of this species. As a result of the critical habitat, permitting and mitigation may be challenging.
- CNDDDB queries identified the following State/federally listed wildlife species (see below for fish and avian species): California tiger salamander (12 occurrences), vernal pool tadpole shrimp (7), conservancy fairy shrimp (5), vernal pool fairy shrimp (3), Delta green ground beetle (3), salt-marsh harvest mouse (2), western pond turtle (2), and Lange's metalmark butterfly (1). Proper siting of towers would be necessary to minimize impacts to these wildlife species. Multi-species permitting with State and federal resource agencies will be complicated and extensive mitigation is anticipated.
- CNDDDB queries identified the following State/federally listed avian species: Swainson's hawk (17 occurrences), California least tern (1), tricolored blackbird (1), and western snowy plover (1). In addition, approximately 31.5% of the segment traverses important bird areas. Locating a new 500 kV transmission line ROW adjacent to the existing 500 kV line ROW, would minimize impacts to birds, including Swainson's hawk.
- Cultural resources within this segment include the following:
 - There are 14 historic era cultural resources including 3 historic districts. There is 1 precontact age resource was identified within this segment. The majority of these resources are located in the northern half of the segment.
 - Construction of overhead transmission lines can generally avoid impacts to known resources, but effects on large districts with numerous individual resources are more difficult to avoid. Unknown buried resources could be encountered during ground disturbance, but construction monitoring can help to mitigate impacts. Indirect impacts to historic resources and mining districts could occur due to the new presence of a major industrial facility (500 kV transmission line) that is inconsistent with the historic setting.
- The NAHC search of its Sacred Lands File is pending.

Other Less Serious Concerns

- CNDDDB queries identified the following State and federally listed fish: green sturgeon (1 occurrence) and longfin smelt (1). In addition, there are 478 acres (4.6% of segment) of NWI aquatic features. Finally, there are 3 acres (<1%) of NOAA HAPC. Proper siting of towers would avoid impacts to these fish species and their habitat.
- CNDDDB queries identified 1 occurrence of the San Joaquin Valley orcutt grass (*Orcuttia inaequalis*), a federally listed threatened and State listed endangered plant. Proper tower siting could avoid impacting this plant species.

- 38% of the segment is located in the Fairfield Class D airspace (≤ 500 feet). Given that towers would likely be less than 200 feet, minimal impact to airspace operations is anticipated. Siting a new transmission line near the existing 500 kV line would further minimize this safety risk.
- Almost 69% of the segment is located in the Travis Air Force Base special-use airspace (≤ 500 feet). Given that towers would likely be less than 200 feet, minimal impact to airspace operations is anticipated. Siting new transmission facilities near the existing 500 kV line would further minimize this safety risk.
- The segment crosses the Pony Express National Historic Trail in one location; however, the existing 500 kV transmission line also crosses this trail within the segment. Locating the new line near the existing line would minimize visual impacts.

5.3.5. Corridor 2B: Overall Conclusions Regarding Transmission Feasibility

Table 6 and Figure 10 summarize the overall conclusions for Corridor 2B. Red shaded areas in Table 6 identify the issues of highest concern, followed by issues of medium concern (orange shading), and lastly issues of low concern (yellow shading). Red text for each segment indicates the key factors driving the highest risk conclusions indicated in red shading in the summary column.

The most serious concerns in Corridor 2B include the following:

- Given that private land with areas of high density of population occupy most of the segment, routing outside of the segment may be required in certain areas (e.g., areas within and around the City of Santa Rosa, and parts of Napa and Vacaville).
- The segment also includes 13 miles of California Scenic Highways (the most of any segment) between Ukiah and Willits (Mendocino County) and also through Sonoma and Napa County's wine country, indicating a potential high level of public concern about retaining existing viewsheds.
- The presence of critical habitat and CNDDDB occurrences for marbled murrelet, California red legged frog, and Contra Costa goldfield present exceptional challenges and will require ESA consultation and mitigation development with the USFWS. The northern spotted owl, California tiger salamander, green sturgeon, and Delta smelt also have critical habitat along this segment, but individual occurrences were not noted in CNDDDB data.
- Large extents of the overhead segments within Mendocino and Sonoma Counties could be visible from tribal lands.

Table 6. Corridor 2B (Coastal Overhead) – Summary of Issues

CORRIDOR 2B (Coastal OVERHEAD) SUMMARY OF ISSUES	Overhead Humboldt Bay to Longvale	Overhead Longvale to Fulton	Overhead Fulton to Vaca Dixon	Overhead Vaca Dixon to Collinsville	CORRIDOR 2A SUMMARY
Challenge or Concern	115 miles; 48,697 ac	89 miles; 37,837 ac	67 miles; 28,718 ac	24 miles; 10,493 ac	295 miles; 125,745 acres
LAND USE & PROTECTED LANDS					
Federal Lands (USFS, NPS, BLM)	1% BLM lands	—	—	—	Minimal federal lands to traverse
Private Lands	99% private 2,599 parcels 23 parcels/mile (Eureka area) 19 ac/ parcel avg	100% private 5,142 parcels 58 parcels/mile (Windsor/Santa Rosa) 5 ac/parcel avg	100% private 4,127 parcels 62 parcels/mile (Santa Rosa) 5 ac/parcel avg	100% private 947 parcels 39 parcels/mile (Vacaville) 11 ac/parcel avg	Private land with high density of population; very challenging siting within and near incorporated areas
Incorporated City Lands	<1% (Eureka)	2% (Healdsburg, Windsor)	9% (Santa Rosa, Napa, Vacaville)	5% (Vacaville)	See above (private, parcels)
USFS Wilderness Lands	—	—	—	—	—
National Wildlife Refuges	—	—	—	—	—
CDFW Owned & Operated Lands, State Refuges, and California Protected Areas (CPAD)	CDFW: 8 ac CPAD: 269 ac <1% of land	CDFW: 0 CPAD: 1,159 ac 3% of land	CDFW: 2 ac CPAD: 2,983 ac 10% of land	CDFW: 0 CPAD: 498 ac 5% of land	Existing transmission lines have ROW through these protected lands
BIOLOGICAL RESOURCES					
USFWS & NMFS Critical Habitat & CNDDDB Occurrences	649 ac (1.3%) marbled murrelet, 2 occurrences 469 ac (1.0%) northern spotted owl, no occurrences 43 ac (<1%) green sturgeon, 1 occurrence	163 ac (0.4%) CA tiger salamander, no occurrences	1,672 ac (5.8%) CA red legged frog, 14 occurrences 158 ac (<1%) CA tiger salamander, no occurrences 259 acres (<1%) Contra Costa goldfield, 1 occurrence NMFS: 64 ac (<1%) green sturgeon, no occurrences	359 ac (3%) Delta smelt (no occurrences)	OH Segment: Permitting through critical habitat will be complicated and mitigation challenging

CORRIDOR 2B (Coastal OVERHEAD) SUMMARY OF ISSUES	Overhead Humboldt Bay to Longvale	Overhead Longvale to Fulton	Overhead Fulton to Vaca Dixon	Overhead Vaca Dixon to Collinsville	CORRIDOR 2A SUMMARY
Challenge or Concern	115 miles; 48,697 ac	89 miles; 37,837 ac	67 miles; 28,718 ac	24 miles; 10,493 ac	295 miles; 125,745 acres
Other CNDDDB State & Federally Listed Wildlife Observances (corridor & buffer)	western pond turtle (2) tidewater goby (2)	western pond turtle (10)	western pond turtle (9) vernal pool fairy shrimp (3) valley elderberry longhorn beetle (1)	CA tiger salamander (12) Cons fairy shrimp (5) Vernal pool fairy shrimp (3) Delta green beetle (3) Salt-marsh harvest mouse Western pond turtle (2) Lange's metalmark BF (1)	Proper tower siting and construction monitoring will minimize impacts to these wildlife species. No impacts anticipated during operations.
Other CNDDDB State & Federally Listed Avian Species and Important Bird Areas	612 ac IBA (1%)	—	Swainson's hawk (15) 493 ac (1.7%) important bird areas	Swainson's hawk (17) CA least tern (1) Tricolored blackbird (1) Western snowy plover (1) 32% important bird areas	Siting of towers near existing transmission and nest monitoring during construction will minimize impacts.
Other CNDDDB State & Federally List Fish Species and NWI Aquatic Wetland Features	steelhead (9) coho salmon (3) green sturgeon (1) longfin smelt (1) 1,257 ac (2.5%) NWI	coho salmon (1) steelhead (1) 1,125 ac (3.0%) NWI	steelhead (2) coho salmon (1) longfin smelt (1) 853 ac (3.0%) NWI	green sturgeon (1) longfin smelt (1) 478 ac (5%) NWI	Waterways can be spanned. Proper tower siting and construction monitoring will minimize impacts to these aquatic habitats. No impacts anticipated during operations.
Other CNDDDB State & Federal Listed Plant Observances	western lily (4)	North Coast semaphore grass (2) Pitkin Marsh lily (1) Burke's goldfields (1) Sonoma sunshine (1)	Clara Hunt's milkvetch (2) Calistoga popcorn flower (2) Pitkin Marsh lily (1) Sonoma Alopecurus (1) Sonoma sunshine (1)	San Joaquin Valley Orcutt grass (1)	Minimal plant populations. Proper tower siting and construction monitoring will minimize impacts to these plant species. No impacts anticipated during operations.

CORRIDOR 2B (Coastal OVERHEAD) SUMMARY OF ISSUES	Overhead Humboldt Bay to Longvale	Overhead Longvale to Fulton	Overhead Fulton to Vaca Dixon	Overhead Vaca Dixon to Collinsville	CORRIDOR 2A SUMMARY
Challenge or Concern	115 miles; 48,697 ac	89 miles; 37,837 ac	67 miles; 28,718 ac	24 miles; 10,493 ac	295 miles; 125,745 acres
CULTURAL & TRIBAL RESOURCES					
Prehistoric Resources	115	71	143	14	Proper tower siting could minimize impacts to known prehistoric sites, but unknown buried sites could be encountered. Monitoring would minimize impacts. Permitting would be complicated & mitigation challenging.
Historic Resources	102	56	73	1	Proper tower siting could minimize impacts to known historic sites, but unknown buried sites could be encountered. Monitoring would minimize impacts. Permitting would be complicated & mitigation challenging.
Tribal Lands within Corridor	—	—	—	—	
Corridor Acres within 5 Miles of Tribal Lands (federally recognized tribes)	7,140 ac (15%)	21,345 ac (81%)	3,932 (18%)	—	Potentially visible from tribal lands

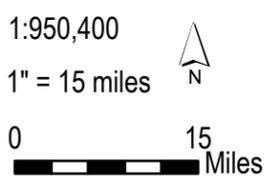
CORRIDOR 2B (Coastal OVERHEAD) SUMMARY OF ISSUES	Overhead Humboldt Bay to Longvale	Overhead Longvale to Fulton	Overhead Fulton to Vaca Dixon	Overhead Vaca Dixon to Collinsville	CORRIDOR 2A SUMMARY
Challenge or Concern	115 miles; 48,697 ac	89 miles; 37,837 ac	67 miles; 28,718 ac	24 miles; 10,493 ac	295 miles; 125,745 acres
Tribal Lands and Rancherias within 5 Miles	3 (Table Bluff Reservation, Sherwood Valley Rancheria and Off-Reservation Trust Land, Laytonville Rancheria)	8 (Cloverdale Reservation, Dry Creek Rancheria and Off- Reservation Trust Land, Guidiville Rancheria and Off-Reservation Trust Land, Hopland Rancheria, Pinoleville Rancheria, Redwood Valley Rancheria, Sherwood Valley Rancheria and Off- Reservation Trust Land, Coyote Valley Reservation)	—	—	Much of the overhead segments within Mendocino and Sonoma Counties could be visible from tribal lands
AESTHETICS					
Wild & Scenic Rivers	4 miles	—	—	—	
Scenic Highways	4 miles	13 miles	4 miles	—	Scenic highways and high value tourist industry in vineyard areas likely to drive significant opposition
USFS Wilderness Lands within 5 miles	—	—	—	—	
AGRICULTURAL RESOURCES					
Important Farmlands (prime & unique)	—	4,747 ac 13%	3,653 ac 13%	2,415 ac 23%	Proper tower siting could minimize impacts to agricultural lands, but Sonoma and Napa County wine country has exceptionally high value

CORRIDOR 2B (Coastal OVERHEAD) SUMMARY OF ISSUES	Overhead Humboldt Bay to Longvale	Overhead Longvale to Fulton	Overhead Fulton to Vaca Dixon	Overhead Vaca Dixon to Collinsville	CORRIDOR 2A SUMMARY
Challenge or Concern	115 miles; 48,697 ac	89 miles; 37,837 ac	67 miles; 28,718 ac	24 miles; 10,493 ac	295 miles; 125,745 acres
Williamson Act Lands	37%	46%	32%	52%	Proper tower siting would minimize impacts to Williamson Act lands
HAZARDS					
High Landslide Susceptibility	55%	36%	26%	2%	Implementation of proper engineering solutions
Alquist-Priolo Fault Hazard Zones	—	6%	3%	—	See above
CalFire Very High-Risk Lands	34%	22%	6%	—	Proper fire risk management during O&M
EPA Superfund Areas	—	—	—	—	—
AIRPORTS & AIRSPACE CONSTRAINTS (≤500 Feet)					
Airports & Airspace	—	17,060 ac (65%) Ukiah Class E2; Santa Rosa Class D	—	—	Proper tower placement and coordination
Special-Use Airspace	—	—	—	—	
Military Training Routes	4,169 (9%)	—	—	—	Proper tower placement and coordination
ENVIRONMENTAL JUSTICE					
Disadvantaged Communities	—	—	—	7,653 ac (73%)	Short-term construction effects and presence of new major transmission facility would further degrade area



**Transmission Corridor Evaluation,
Humboldt Wind Energy Area**

**Figure 10
Corridor 2B (Coastal Overhead)
Siting Constraints**



Risk Categories

- High
- Medium
- Low

**Corridor width not drawn to scale*

Sources: Aspen, 2024; ESRI, 2024.

5.4. Corridor 3: Humboldt Bay to Collinsville (Valley West)

There are 4 analysis segments for this overhead 500 kV corridor:

- Humboldt Bay to Olinda
- Olinda to Madison
- Madison to Vaca-Dixon
- Vaca-Dixon to Collinsville

5.4.1. Humboldt Bay to Olinda

Land Ownership and Land Uses

As illustrated in Figure 3 (Corridor 1), the 117-mile Humboldt Bay to Olinda Segment is centered on existing overhead PG&E 115 kV transmission lines:

- From the Humboldt Bay to Humboldt Substations (about 7 miles), the segment follows two 115 kV lines along southern boundary of the City of Eureka.
- From Humboldt Substation to Bridgeville Substation (about 28 miles), the segment follows a single PG&E 115 kV line.
- From Bridgeville Substation to Olinda Substation (about 82 miles), the segment follows a single PG&E 115 kV line.

Land ownership along the Humboldt Bay to Olinda Segment is a mixture of private and public USFS lands. Private lands make up the eastern and western ends of the segment, and USFS lands and a small amount of BLM lands cover the central portion. A small portion of the segment is located within the City of Eureka (163 ac, 0.3%).

Land uses within and along the Humboldt Bay to Olinda Segment are as follows:

- From the Humboldt Bay to Humboldt Substation, the segment is in Humboldt County (with a small section in the City of Eureka). It passes through the coastal floodplain of the Elk River, areas of residential development, and wooded coastal hills southeast of Eureka.
- From Humboldt Substation to Bridgeville Substation, the segment passes through the coastal mountains near the communities of Myrtle town and Freshwater Corners (Eureka), Kneeland, Lone Star Junction, Yager Junction, and Bridgeville.
- From Bridgeville Substation and traveling east, the segment generally follows State Route 36 to Platina, traversing primarily private lands to Dinsmore, at which point land ownership along the segment is a mix of private and public lands (USFS and BLM) to Platina.
- From Platina to Olinda Substation, the segment traverses private lands across the eastern foothills of the North Coast mountain range.
- From Bridgeville Substation to Olinda Substation, the public lands within the segment are part of a designated federal 368 energy corridor.

Challenges or Concerns for Transmission Siting and Permitting

- Line siting from Eureka to Dinsmore and Platina to Olinda Substation would need to avoid residential areas and other sensitive land uses (e.g., schools and parks) in order to minimize disturbance and views of new towers. There are 2,574 private parcels (21 parcels per mile) and the average parcel size is approximately 19 acres.
- This segment includes 141 acres of marbled murrelet USFWS designated critical habitat (0.3% of segment) and 7,728 acres of spotted owl critical habitat (15.5% of segment). CNDDDB queries identified two (2) occurrences of marbled murrelet and no occurrences of spotted owl. Further, approximately 1.2% of the segment traverses important bird areas. Locating a new 500 kV transmission line adjacent to the existing 115 kV line would minimize impacts to birds.³⁸ In addition, the segment contains NMFS designated critical habitat for green sturgeon (43 acres, <1%). One occurrence of the species was identified during CNDDDB queries. Proper siting of towers would minimize habitat impacts. Multi-species permitting with State and federal resource agencies will be complicated and extensive mitigation is anticipated.
- CNDDDB queries identified the following State/federally listed wildlife species (see below for fish and above for avian species): Western pond turtle (9 occurrences), tidewater goby (2), and vernal pool fairy shrimp (1). Multiple species permitting with State and federal resource agencies will be complicated and extensive mitigation is anticipated.
- This segment includes 4 miles of Wild and Scenic Rivers (Eel River, Van Duzen River), including 2 crossings that cannot be avoided. Crossing design and location would have to consider viewshed from and of the rivers.
- The segment includes 34 miles of California Scenic Highways (US 101 south of Eureka and CA 36 west of Bridgeville) affecting 29% of the segment. Tower location and design should consider views from the highway to minimize impacts.
- 45% of the segment is designated by CalFire as very high fire risk. To minimize fire risk, vegetation clearing along the transmission line ROW would need to be maintained, further exacerbating potential impacts to critical habitat and listed species. Such vegetation clearing would need to avoid marbled murrelet critical habitat and spotted owl critical habitat to the extent feasible.
- 23% of this segment is under Williamson Act contracts for primarily grazing lands. Coordination with Humboldt, Trinity, and Shasta Counties would be required to assess whether transmission is consistent with existing contracts.
- 29% of the segment has high landslide susceptibility which would require careful tower siting and appropriate foundations.
- Cultural resources within this segment include the following:
 - There are 91 historic era cultural resources including 1 large historic district. There are 46 precontact age resources and 14 resources that contain both precontact and historic age resources. Resources are located throughout the segment and are not clustered in one location.
 - Construction of overhead transmission lines can generally avoid impacts to known resources, but effects on large districts with numerous individual resources are more difficult to avoid.

³⁸ <https://media.audubon.org/2023-08/BirdsAndTransmissionReport.pdf>

Unknown buried resources could be encountered during ground disturbance, but construction monitoring can help to mitigate impacts. Indirect impacts to historic resources and mining districts could occur due to the new presence of a major industrial facility (500 kV transmission line) that is inconsistent with the historic setting.

- The NAHC search of its Sacred Lands File is pending.

Other Less Serious Concerns

- CNDDDB queries identified the following State and federally listed fish: steelhead (8 occurrence) coho salmon (3), chinook salmon (1), green sturgeon (1), and longfin smelt (1). In addition, there are 1,576 acres (3.1% of segment) of wetlands (NWI aquatic features). Proper siting of towers would avoid impacts to these habitats.
- CNDDDB queries identified 4 occurrences of the western lily (*Lilium occidentale*), a State and federally listed endangered plant. Proper tower siting could avoid impacting this plant species.
- CNDDDB queries did not identify any State or federally listed avian species, but 612 acres of the segment (1.2%) is designated as important bird areas.
- The segment includes 153 acres (0.3%) of CDFW managed McClellan Mountain Peatland west of Dinsmore and Elk River Wildlife Area south of Eureka; however, these lands do not cover the entirety of the segment in either location. In addition, the segment includes 253 acres (0.5%) of California Protected Areas (CPAD), including Eureka Municipal Golf Course, Freshwater Farms Reserve, Freshwater Park, Humboldt State University Forest, McKay Community Forest, other State 18, and other State 43 which are primarily spread across the western end of the segment. Therefore, these CDFW and CPAD lands should be avoidable with appropriate tower siting.
- The western 800 acres of the segment (1.6%) would be within 5 miles of tribal lands for a federally-recognized tribe (Table Bluff Reservation), so sacred sites may be affected by the visibility of a new overhead line.
- 1,615 acres of the Chanchelulla Wilderness is located approximately 3 miles north of the segment by Wildwood. Tower siting should consider the viewshed from this wilderness area.
- Dinsmore Airport is located within the segment. Proper tower siting could minimize any safety hazards.

5.4.2. Olinda to Madison

Land Ownership and Land Uses

As illustrated in Figure 5, the 121-mile Olinda to Madison Segment is centered on an existing overhead Western Area Power Administration 500 kV transmission line that parallels Highway 5 from the Olinda (Vic Fazio) Substation to the area of PG&E's Madison Substation, near Esparto, California, unincorporated Yolo County. In general, the segment is approximately 3 to 4.5 miles west of Highway 5 at the base of the North Coast Range foothills.

The Olinda to Madison Segment is comprised of private land and does not include any incorporated city, State, or federal lands. The segment traverses Tehama, Glenn, and Colusa counties. The segment generally traverses agricultural lands, including important farmlands (prime and unique) and grazing lands.

Challenges or Concerns for Transmission Siting and Permitting

- Line siting along the length of the Olinda to Madison Segment would need to avoid residential areas and other sensitive land uses (e.g., schools and parks) in order to minimize disturbance and views of new towers. Private parcel density is approximately 12 parcels per mile and the average parcel size is approximately 35 acres.
- Over 34% of the segment is comprised of important farmland (prime or unique). Many areas of important farmlands are continuous so cannot be spanned; therefore, proper siting of towers will be required to minimize impacts to these lands.
- 63% of this segment is under Williamson Act contracts. Coordination with Tehama, Glenn, and Colusa counties would be required to assess whether adding new transmission is consistent with existing contracts.
- USFWS critical habitat within this segment exists for the vernal pool fairy shrimp (6,376 ac, 12.4%), and six (6) occurrences of these species are noted in the CNDDDB. As a result of the critical habitat, permitting and mitigation may be challenging.
- CNDDDB queries identified the following State/federally listed wildlife species (see below for fish and avian species): giant garter snake (1 occurrence) and western spadefoot toad (1). Proper siting of towers would be necessary to minimize impacts to these wildlife species. Permitting with State and federal resource agencies will be complicated, and extensive mitigation is anticipated.
- Over 4,600 acres of the segment (9%) would be within 5 miles of tribal lands for a federally-recognized tribe (Paskenta Rancheria), so sacred sites may be affected by the visibility of a new overhead line.
- Cultural resources within this segment include the following:
 - There are 14 historic era cultural resources including 1 historic district, mostly related to historic transmission lines and transportation routes. The majority of these resources are located near Orland. The small number of recorded resources in this segment indicates a likelihood that it has not been subject to an intensive pedestrian survey.
 - Construction of overhead transmission lines can generally avoid impacts to known resources, but effects on large districts with numerous individual resources are more difficult to avoid. Unknown buried resources could be encountered during ground disturbance, but construction monitoring can help to mitigate impacts. Indirect impacts to historic resources and districts could occur due to the new presence of an additional 500 kV transmission line if it is found to be inconsistent with the historic setting.
- The NAHC search of its Sacred Lands File was positive for the presence of recorded sacred resources; specific information cannot be disclosed.

Other Less Serious Concerns

- CNDDDB queries identified the following State/federally listed avian species: Swainson's hawk (10). The segment contains no designated important bird areas. Locating a new 500 kV transmission line adjacent to the existing 500 kV line would minimize impacts to birds.
- CNDDDB queries identified the following State and federally listed fish: steelhead (2 occurrences). In addition, there are 1,257 acres (2.5% of segment) of wetland features defined in the NWE.

- 13% of the segment is designated by CalFire as very high fire risk. To minimize fire risk, vegetation clearing along the transmission line ROW would need to be maintained. Such vegetation clearing would need to minimize impacts to fairy shrimp critical habitat.
- 12% of the segment is located in the Red Bluff Class E2 airspace (≤ 500 feet). Given that towers would likely be less than 200 feet, minimal impact to airspace operations is anticipated. Siting a new transmission line near the existing 500 kV line would further minimize this safety risk.
- There are sparse landslide susceptibility areas on north and southern ends of segment (1.9%) which in general could be avoided with careful tower siting and appropriate foundations.

Conclusions Regarding Transmission Feasibility

The Olinda to Madison Segment will require strategic tower siting and agency coordination to minimize impacts to biological and agricultural resources, including Williamson Act contracting, as well as residences.

5.4.3. Madison to Vaca-Dixon

Land Ownership and Land Uses

As illustrated in Figure 5, the 21-mile Madison to Vaca-Dixon Segment is centered on an existing overhead PG&E 500 kV transmission line (the southern portion of Table Mountain to Vaca-Dixon) and along lower voltage (60 kV) lines that are parallel to and generally east of Highway 505 in Yolo and Solano counties.

The Madison to Vaca-Dixon Segment is comprised primarily of private county lands and a small portion of the segment is located with Vacaville (0.6% of the segment); no State or federal lands traversed. The segment traverses Yolo and Solano counties. The segment generally traverses agricultural lands, including important farmlands (prime and unique) and grazing lands.

Challenges or Concerns for Transmission Siting and Permitting

- Line siting along the length of the Madison to Vaca-Dixon Segment would need to avoid residential areas and other sensitive land uses (e.g., schools and parks) in order to minimize disturbance and views of new towers. There are 1,456 private parcels (15 parcels per mile) and the average parcel size is approximately 29 acres.
- Over 81% of the segment is comprised of important farmland (prime or unique). Many areas of important farmlands are continuous so cannot be spanned; therefore, proper siting of towers will be required to minimize impacts to these lands.
- Almost 65% of this segment is under Williamson Act contracts. Coordination with Yolo and Solano counties would be required to assess whether adding new transmission is consistent with existing contracts.
- CNDDDB queries identified the following State/federally listed wildlife species (see below for fish and avian species): Vernal pool fairy shrimp (1 occurrence). Proper siting of towers would be necessary to minimize impacts to this species. Permitting with State and federal resource agencies will be required.
- CNDDDB queries identified the following State/federally listed avian species: Swainson's hawk (31) and tricolored blackbird (1); however, the segment contains no designated important bird areas.

Locating a new 500 kV transmission line adjacent to the existing 500 kV line, would minimize impacts to birds.

- Cultural resources within this segment include the following:
 - There are 9 historic era cultural resources including 1 historic district, and there is 1 precontact age resource. The majority of these resources are located near the northern portion of the segment. The small number of recorded resources in this segment indicates a likelihood that it has not been subject to an intensive pedestrian survey.
 - Construction of overhead transmission lines can generally avoid impacts to known resources, but effects on large districts with numerous individual resources are more difficult to avoid. Unknown buried resources could be encountered during ground disturbance, but construction monitoring can help to mitigate impacts. Indirect impacts to historic resources and districts could occur due to the new presence of an additional major industrial facility that may be inconsistent with the historic setting.
- The NAHC search of its Sacred Lands File is pending.

Other Less Serious Concerns

- CNDDDB queries did not identify any State/federal listed fish species; however, the segment contains 145 acres (1.6% of segment) of NWI aquatic features. Proper tower siting would minimize impacts to aquatic habitat.
- The segment crosses the Pony Express National Historic Trail in one location; however, the existing 500 kV transmission line also crosses this trail within the segment. Locating the new line near the existing line would minimize visual impacts.
- The very southern end of the segment is located in the Travis Air Force Base special-use airspace (≤ 500 feet). Given that towers would likely be less than 200 feet, minimal impact to airspace operations is anticipated.

5.4.4. Vaca-Dixon to Collinsville

The area within the Vaca-Dixon to Collinsville segment is described as part of Corridor 2B. See Section 5.3.4.

5.4.5. Corridor 3: Overall Conclusions Regarding Transmission Feasibility

Table 7 and Figure 11 present summaries of conclusions about Corridor 3. Red shaded areas in the table below note the issues of highest concern, followed by issues of medium concern (orange shading), and lastly issues of low concern (yellow shading). Red text for each segment indicates the key factors driving the highest risk conclusions indicated in red shading in the summary column.

The most serious concern in Corridor 3 includes the following:

- The presence of critical habitat and CNDDDB occurrences for marbled murrelet, green sturgeon, and vernal pool fairy shrimp present exceptional challenges and will require ESA consultation and mitigation development with the USFWS. The northern spotted owl and Delta smelt also have critical habitat along this segment, but individual occurrences were not noted in CNDDDB data.

Table 7. Corridor 3 (Valley West) – Summary of Issues

CORRIDOR 3 (Valley West) SUMMARY OF ISSUES	Humboldt Bay to Olinda	Olinda to Madison	Madison to Vaca Dixon	Vaca Dixon to Collinsville	CORRIDOR 3 SUMMARY
Challenge or Concern	117 miles; 49,730 ac	121 miles; 51,346 ac	21 miles; 9,312 ac	24 miles; 10,493 ac	283 miles; 120,881 ac
LAND USE & PROTECTED LANDS					
Federal Lands (USFS, BLM)	23% federal (USFS & BLM)	—	—	—	Permitting with USFS & BLM required. Project consistent with federal directive
Private Lands	77% private 2,574 parcels (Eureka) 21 parcels/mile 19 ac/parcel avg	100% private 1,456 parcels 12 parcels/mile 35 ac/parcel avg	>99% private 320 parcels (Vacaville) 15 parcels/mile 29 ac/parcel avg	95% private 847 parcels (Vacaville) 35 parcels/mile 12 ac/parcel avg	Small areas of high density population. Proper tower siting and land acquisition /property owner negotiations required.
Incorporated City Lands	<1% (Eureka)	—	60 ac (1%)(Vacaville)	573 ac (5%)(Vacaville)	See above
USFS Wilderness Lands	—	—	—	—	
National Wildlife Refuges	—	—	—	—	
CDFW Owned & Operated Lands, State Refuges, and California Protected Areas (CPAD)	CDFW: 153 ac (<1%) CPAD: 253 ac (<1%)	—	1 National Historic Trail crossing	CPAD: 498 ac (5%) 1 National Historic Trail crossing	Existing transmission lines have ROW through some of these protected lands
BIOLOGICAL RESOURCES					
USFWS & NMFS Critical Habitat & CNDDDB Occurrences	141 ac (<1%) marbled murrelet (2 occurrences) 7,728 ac (15%) spotted own (no occurrences) NMFS: 43 ac (<1%) green sturgeon, 1 occurrence	6,376 ac (12%) vernal pool fairy shrimp (6 occurrences)	—	359 ac (3%) Delta smelt (no occurrences)	Permitting through critical habitat will be complicated, including required mitigation

CORRIDOR 3 (Valley West) SUMMARY OF ISSUES	Humboldt Bay to Olinda	Olinda to Madison	Madison to Vaca Dixon	Vaca Dixon to Collinsville	CORRIDOR 3 SUMMARY
Challenge or Concern	117 miles; 49,730 ac	121 miles; 51,346 ac	21 miles; 9,312 ac	24 miles; 10,493 ac	283 miles; 120,881 ac
Other CNDDDB State & Federally Listed Wildlife Observances (corridor & buffer)	western pond turtle (9) Tidewater goby (2) Vernal pool fairy shrimp (1)	giant garter snake (1) western spadefoot toad (1)	Vernal pool fairy shrimp (1 occurrence)	CA tiger salamander (12) Cons fairy shrimp (5) Vernal pool fairy shrimp (3) Delta green beetle (3) Salt-marsh harvest mouse Western pond turtle (2) Lange's metalmark BF (1)	Proper tower siting and construction monitoring will minimize impacts to these wildlife species. No impacts anticipated during operations.
Other CNDDDB State & Federally Listed Avian Species and Important Bird Areas	No avian species 612 ac (1%) important bird areas	Swainson's hawk (10) No important bird areas	Swainson's hawk (31) Tricolored blackbird (1) No important bird areas	Swainson's hawk (17) CA least tern (1) Tricolored blackbird (1) Western snowy plover (1) 32% important bird areas	Siting of towers near existing transmission and nest monitoring during construction will minimize impacts.
Other CNDDDB State & Federally List Fish Species and NWI Aquatic Wetland Features	steelhead (8) coho salmon (3) chinook salmon (1) green sturgeon (1) longfin smelt (1) 1,576 ac (3%) NWI	steelhead (2) 1,257 ac (2%) NWI	No CNDDDB species 145 ac (1.6% NWI)	green sturgeon (1) longfin smelt (1) 478 ac (5%) NWI	Waterways can be spanned. Proper tower siting and construction monitoring will minimize impacts to these aquatic habitats. No impacts anticipated during operations.
Other CNDDDB State & Federal Listed Plant Observances	Western lily (4)	—	—	San Joaquin Valley Orcutt grass (1)	Minimal plant populations. Proper tower siting and construction monitoring will minimize impacts to these plant species. No impacts anticipated during operations.

CORRIDOR 3 (Valley West) SUMMARY OF ISSUES	Humboldt Bay to Olinda	Olinda to Madison	Madison to Vaca Dixon	Vaca Dixon to Collinsville	CORRIDOR 3 SUMMARY
Challenge or Concern	117 miles; 49,730 ac	121 miles; 51,346 ac	21 miles; 9,312 ac	24 miles; 10,493 ac	283 miles; 120,881 ac
CULTURAL & TRIBAL RESOURCES					
Prehistoric Resources	46	One NAHC sacred lands result	1	1	Proper tower siting could minimize impacts to known prehistoric sites, but unknown buried sites could be encountered. Monitoring would minimize impacts. Tribal Cultural Resources could be a concern. Permitting would be complicated & mitigation challenging.
Historic Resources, including Trails	91	14	9	14	Proper tower siting could minimize impacts to known historic sites, but unknown buried sites could be encountered. Monitoring would minimize impacts. Permitting would be complicated & mitigation challenging.
Tribal Lands within Corridor	—	—	—	—	—
Corridor Acres within 5 miles of Tribal Lands (federally recognized tribes)	805 (2%)	4,600 ac (9%)	—	—	Portions of corridor could be visible from tribal lands which could be minimized with proper tower siting.
Tribal Lands and Rancherias within 5 miles	1 (Table Bluff)	1 (Paskenta)	—	—	Proper tower siting would avoid buried resources.
AESTHETICS					
Wild & Scenic Rivers	4 linear miles	—	—	—	Proper tower siting required to minimize visual impact.
Scenic Highways	34 linear miles	—	—	—	See above
USFS Wilderness Lands within 5 miles	1,615 ac (3%)	—	—	—	See above

CORRIDOR 3 (Valley West) SUMMARY OF ISSUES	Humboldt Bay to Olinda	Olinda to Madison	Madison to Vaca Dixon	Vaca Dixon to Collinsville	CORRIDOR 3 SUMMARY
Challenge or Concern	117 miles; 49,730 ac	121 miles; 51,346 ac	21 miles; 9,312 ac	24 miles; 10,493 ac	283 miles; 120,881 ac
AGRICULTURAL RESOURCES					
Important Farmlands (prime & unique)	129 ac (<1%)	17,673 ac (34%)	7,523 ac (81%)	2,425 ac (23%)	Proper tower siting would minimize impacts to agricultural lands. Existing transmission.
Williamson Act Lands	11,364 ac (23%)	32,331 ac (63%)	6,089 ac (65%)	5,425 ac (52%)	Proper tower siting would minimize impacts to Williamson Act lands. Existing transmission
HAZARDS					
High Landslide Susceptibility	14,644 ac (29%)	951 ac (2%)	—	—	Implementation of proper engineering solutions
Alquist-Priolo Fault Hazard Zones	—	—	—	—	—
CalFire Very High-Risk Lands	22,360 ac (45%)	6,584 ac (13%)	—	—	Proper fire risk management during O&M
EPA Superfund Areas	—	—	—	—	—
AIRPORTS & AIRSPACE CONSTRAINTS					
Airports & Airspace (\leq 500 feet)	1 airport	12% Red Bluff Class E2	—	38% Fairfield Class D	Proper tower placement and coordination
Special-Use Airspace (\leq 500 feet)	—	—	1% Travis AFB	69% Travis AFB	Proper tower placement and coordination
Military Training Routes (\leq 500 feet)	—	—	—	—	—
ENVIRONMENTAL JUSTICE					
Disadvantaged Communities	—	—	—	72%	Short-term construction effects and presence of new major transmission facility would further degrade area



**Transmission Corridor Evaluation,
Humboldt Wind Energy Area**

**Figure 11
Corridor 3
Siting Constraints**

1:950,400

1" = 15 miles

0 15 Miles



Risk Categories

■ High

■ Medium

■ Low

**Corridor width not drawn to scale*

Sources: Aspen, 2024; ESRI, 2024.

5.5. Corridor 4A: Fern Road to Collinsville (Valley East 1)

Corridors 4A and 4B are unique in this study because they are outside of the Humboldt Bay region. New transmission in this corridor would bolster the 500 kV system in the Sacramento Valley from the planned Fern Road Substation to the planned Collinsville Substation. Corridors 4A and 4B would complement Corridor 1 by connecting Fern Road to Collinsville through the Sacramento Valley.

Corridors 4A is illustrated on Figure 6 and includes the following segments:

- Fern Road to Sutter
- Sutter to Madison
- Madison to Vaca-Dixon
- Vaca-Dixon to Collinsville

5.5.1. Fern Road to Sutter (Common to Corridors 4A and 4B)

Land Ownership and Land Uses

The Fern Road to Sutter segment of this study is common to Corridors 4A and 4B. As illustrated in Figure 6, the 99-mile Fern Road to Sutter Segment is centered on existing overhead PG&E 500 kV transmission lines between PG&E's Round Mountain Substation and Table Mountain Substation in the eastern Sacramento Valley:

- The segment traverses the lower foothills of the Cascade Mountain range from the Fern Road Substation to the PG&E Table Mountain Substation just northwest of Oroville.
- From the area of Table Mountain Substation, the existing 500 kV transmission lines and this segment turn southwest traversing agricultural lands to a point named Sutter, north of Yuba City and the Sutter Energy Center, where the existing 500 kV transmission lines diverge, one route heading in the direction of the western edge of the Sacramento Valley for Corridor 4A (Valley East 1) and the other along the eastern side of the Sacramento Valley for Corridor 4B (Valley East 2).

The Fern Road to Sutter Segment traverses Shasta, Tehama, Butte, and Sutter counties. With the exception of 155 acres of BLM lands (0.37% of the segment), 5,261 acres of CDFW owned lands (12.4% of the segment), and 731 acres of incorporated City of Chico lands (1.7% of the segment), all remaining lands are county lands. Land uses are primarily agricultural, including important farmlands (prime and unique), grazing lands, and open space/undeveloped.

Challenges or Concerns for Transmission Siting and Permitting

- Line siting along the length of the segment would need to avoid residential areas and other sensitive land uses (e.g., schools and parks) in order to minimize disturbance and views of new towers. There are 852 private parcels (9 parcels per mile), and the average parcel size is approximately 50 acres.
- USFWS critical habitat within this segment exists for the vernal pool fairy shrimp (104 ac, 0.2%) and vernal pool tadpole shrimp (1,908 ac, 4.5%). Four occurrences of vernal pool fairy shrimp and 4 occurrences of vernal pool tadpole shrimp are noted in the CNDDDB. Further, the segment includes 2,179 acres of Butte County meadowfoam critical habitat (5.2% of segment), and one CNDDDB occurrence of this plant species. As a result of the critical habitat, permitting and mitigation may be challenging.

- CNDDDB queries identified the following State/federally listed wildlife species (see below for fish and avian species): foothill yellow legged frog (3 occurrences), giant garter snake (2), and western pond turtle (1). Proper siting of towers would be necessary to minimize impacts to these species. Multi-species permitting with State and federal resource agencies will be complicated and extensive mitigation is anticipated.
- Over 43% of the segment is designated by CalFire as very high fire risk. To minimize fire risk, vegetation clearing along the transmission line ROW would need to be maintained. Such vegetation clearing would need to minimize impacts to designated critical habitat.
- Over 26% of the segment is comprised of important farmland (prime and unique). The southern portion of the segment includes important farmlands that are continuous so cannot be spanned; therefore, proper siting of towers will be required to minimize impacts to these lands.
- 47% of this segment is under Williamson Act contracts for important farmland (prime and unique) and grazing lands. Coordination with Shasta, Tehama, Butte, and Sutter counties would be required to assess whether addition of new transmission is consistent with existing contracts.
- The northern portion of the segment includes the CDFW-managed Tehama Wildlife area (4,630 acres, 11.0% of segment), as well as the Musty Buck Ridge Conservation Easement (554.5 acres, 1.3%) and Butter Creek Canyon Ecological Reserve (76.5 acres, 0.18%) that are located within the central portion of the segment. In addition, the segment includes 1,984 acres of California Protected Areas (CPAD), including Bidwell Park, Cow Creek Demonstration State Forest, Gray Davis Dye Creek Preserve, and an unnamed Butte County site which are spread across the length of the segment. Given the extent of some of these managed lands within the segment, strategic tower placement and coordination with land managers would be required to minimize impacts. Siting a new transmission line in near proximity to the existing 500 kV transmission line would minimize impacts (wildlife, visual and recreation) to these CDFW and CPAD managed lands.
- Just east of Chico, 3,956 acres of the segment (9.4%) would be within 5 miles of tribal lands for a federally-recognized tribe (Mechoopda TDSA), so sacred sites may be affected by the visibility of a new overhead line.
- 23% of the segment has high landslide susceptibility which would require careful tower siting and appropriate foundations.
- Almost 7.9% of the segment is within an area designated as a disadvantaged community within Butte County. Short-term construction effects and presence of a new major transmission facility would further degrade the area.
- Cultural resources within this segment include the following:
 - There are 76 historic era cultural resources including 4 historic districts. In addition, there are 118 precontact age resource with 2 districts, and 8 resources have both a precontact and historic age component were identified within this segment. The majority of these resources are located near the center of the segment.
 - Overhead lines may be able to avoid known resources. Unknown buried resources could be encountered during ground disturbance, but monitoring could mitigate impacts. Indirect impacts to historic resources and districts could occur.
- The NAHC search of its Sacred Lands File was positive for the presence of recorded sacred resources, but specific information cannot be disclosed.

Other Less Serious Concerns

- CNDDDB queries identified the following State/federally listed avian species: Bald eagle (2 occurrences), tricolor blackbird (2), and Swainson's hawk (1). The segment contains no designated important bird areas. Separate BEGEPA permitting will be required, in addition to resource agency permitting. Locating a new 500 kV transmission line adjacent to the existing 500 kV line, would minimize impacts to birds.
- CNDDDB queries identified the following State and federally listed fish: steelhead (7 occurrences) and chinook salmon (2). In addition, there are 2,818 acres (6.7% of segment) of NWI aquatic features. Proper siting of towers would avoid impacts to these fish species and aquatic habitat.
- CNDDDB queries identified the following State/federally listed plants: Green's tuctoria (1 occurrence). Proper tower siting would be required to avoid impacting this plant species.
- This segment is crossed by designated Wild and Scenic Rivers in two separate locations. These rivers are crossed by the existing 500 kV transmission lines, so no additional impact is anticipated.
- The segment crosses a scenic highway, Route 89, in one location. This scenic highway is crossed by the existing 500 kV transmission lines, so no additional impact is anticipated.
- The historic Nobles Trail and Lassen Trail cross the segment, as does the existing 500 kV transmission line. No additional impacts anticipated.
- The Ishi Wilderness boundaries are located approximately 1 to 2.75 miles east of the central portion of the segment. Tower siting should consider the viewshed from this wilderness area. Siting a new transmission line near the existing 500 kV transmission line would minimize this potential visual impact.
- 4.2% of the segment is located in the Chico Airport Class D airspace (≤ 500 feet). Given that towers would likely be less than 200 feet, minimal impact to airspace operations is anticipated. Siting a new transmission line near the existing 500 kV line would further minimize this safety risk.

5.5.2. Sutter to Madison

Land Ownership and Land Uses

As illustrated in Figure 6, the 41-mile Sutter to Madison Segment is centered on an existing overhead PG&E 500 kV transmission line (Table Mountain to Vaca-Dixon) that traverses important agricultural (prime and unique) and grazing lands in Sutter and Yolo counties.

With the exception of 105 acres of CDFW owned lands (0.6%), the Sutter to Madison Segment is comprised of private county lands; no incorporated, other State or federal lands traversed. The segment traverses Sutter and Yolo counties. The segment generally traverses agricultural lands, including important farmlands (prime and unique) and grazing lands.

Challenges or Concerns for Transmission Siting and Permitting

- Line siting along the length of the Sutter to Madison Segment would need to avoid residential areas and other sensitive land uses (e.g., schools and parks) in order to minimize disturbance and views of new towers. There are 322 private parcels (8 parcels per mile), and the average parcel size is approximately 55 acres.

- Approximately 64% of the segment is comprised of important farmland (prime or unique). Many areas of important farmlands are continuous so cannot be spanned; therefore, proper siting of towers will be required to minimize impacts to these lands.
- Almost 52% of this segment is under Williamson Act contracts. Coordination with Sutter and Yolo counties would be required to assess whether adding new transmission is consistent with existing contracts.
- The segment contains NMFS designated critical habitat for green sturgeon (299 acres, 1.7%). One occurrence of the species was identified during CNDDDB queries.
- CNDDDB queries identified the following State/federally listed wildlife species (see below for fish and avian species): Giant garter snake (6 occurrences) and conservancy fairy shrimp (1). Proper siting of towers would be necessary to minimize impacts to these species. Multi-species permitting with State and federal resource agencies will be required.
- CNDDDB queries identified the following State/federally listed avian species: Swainson’s hawk (17), bank swallow (2), and tricolor blackbird (1). In addition, 56% of the segment traverses designated important bird areas. Locating a new 500 kV transmission line adjacent to the existing 500 kV line, would minimize impacts to birds.
- Cultural resources within this segment include the following:
 - There are 13 historic era cultural resources including 2 historic districts. The majority of these resources are located near the northern portion of the segment. The small number of recorded resources in this segment indicates a likelihood that it has not been subject to an intensive pedestrian survey. Potential resources may include historic agricultural fields and irrigation canals.
 - Construction of overhead transmission lines can generally avoid impacts to known resources, but effects on historic districts with numerous individual resources are more difficult to avoid. Unknown buried resources could be encountered during ground disturbance, but construction monitoring can help to mitigate impacts. Indirect impacts to historic resources and mining districts could occur due to the new presence of an additional 500 kV transmission line that may be considered inconsistent with the historic setting.
- The NAHC search of its Sacred Lands File is pending.

Other Less Serious Concerns

- CNDDDB queries identified the following State and federally listed fish (non-critical habitat): steelhead (1 occurrence). In addition, there are 411 acres (2.3% of segment) of NWI aquatic features. Proper siting of towers would avoid impacts to these fish species and aquatic habitat.
- The northern and southern ends of the segment (4.8% of the segment total) have high landslide susceptibility which would require careful tower siting and appropriate foundations.

5.5.3. Madison to Vaca Dixon

The area within the Madison to Vaca Dixon segment is described as part of Corridor 3. See Section 5.4.3.

5.5.4. Corridor 4A: Overall Conclusions Regarding Transmission Feasibility

The area within the Vaca-Dixon to Collinsville segment is described as part of Corridor 3. For conclusions regarding this segment, see Section 5.4.4 (Corridor 4: Overall Conclusions Regarding Transmission Feasibility).

Table 8 and Figure 12 present summaries of conclusions about Corridor 4A. Red shaded areas in the table below note the issues of highest concern, followed by issues of medium concern (orange shading), and lastly issues of low concern (yellow shading). Red text for each segment indicates the key factors driving the highest risk conclusions indicated in red shading in the summary column.

The most serious concern in Corridor 4A includes the following:

- The presence of critical habitat and CNDDDB occurrences for vernal pool fairy shrimp, vernal pool tad-pole shrimp, Butte County meadow foam, and green sturgeon present exceptional challenges and will require ESA consultation and mitigation development with the USFWS. The Delta smelt also has critical habitat along this segment, but individual occurrences were not noted in CNDDDB data.
- 13,224 acres of the segment (17%) traverses designated important bird areas.
- The segment includes a clustered area of historic age cultural resources. The majority of these historic age resources relate to agricultural activity. Additionally, there are precontact age resources and resources that contain both precontact and historic age resources throughout this segment. Permitting would be complicated and mitigation challenging.

Table 8. Corridor 4A (Valley East 1) – Summary of Issues

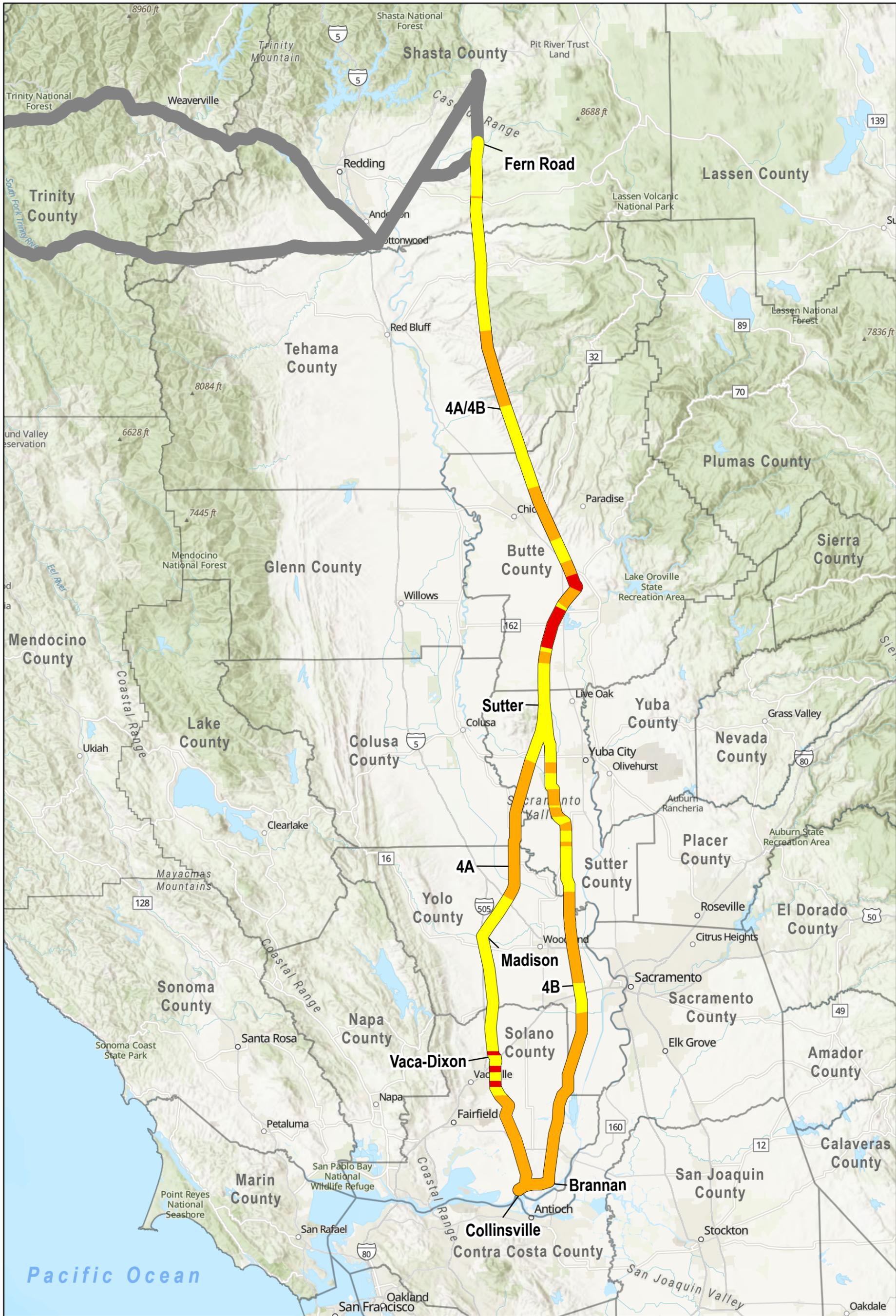
Corridor 4A (Valley West) Summary of Issues	Fern Rd Sutter	Sutter to Madison	Madison to Vaca Dixon	Vaca Dixon to Collinsville	CORRIDOR 4A SUMMARY
Challenge or Concern	99 miles; 42,258 ac	41 miles; 17,582 ac	21 miles; 9,312 ac	24 miles; 10,493 ac	185 miles; 79,645 ac
LAND USE & PROTECTED LANDS					
Federal Lands (USFS, NPS, BLM)	155 ac (<1%) BLM	—	—	—	Minimal federal lands to traverse.
Private Lands	83% private 852 parcels 9 parcels/mile 50 ac/parcel avg	>99% private 322 parcels 8 parcels/mile 55 ac/parcel avg	>99% private 320 parcels (Vacaville) 15 parcels/mile 29 ac/parcel avg	95% private 847 parcels (Vacaville) 35 parcels/mile 12 ac/parcel avg	Small areas of high density population. Proper tower siting and land acquisition/ property owner negotiations required.
Incorporated City Lands	731 ac (2%) (Chico)	—	60 ac (1%) (Vacaville)	573 ac (5%) (Vacaville)	See above
USFS Wilderness Lands	—	—	—	—	
National Wildlife Refuges	—	—	—	—	
CDFW Owned & Operated Lands, State Refuges, and California Protected Areas (CPAD)	CDFW: 5,261 ac (12%) CPAD: 1,984 ac (5%) 2 State Historic Trail crossings	CDFW: 105 ac (<1%) CPAD: 0 ac	1 National Historic Trail crossing	CPAD: 498 ac (5%) 1 National Historic Trail crossing	Existing transmission lines have ROWs through some of these protected lands
BIOLOGICAL RESOURCES					
USFWS & NMFS Critical Habitat & CNDDDB Occurrences	104 ac (<1%) vernal pool fairy shrimp (4 occurrences) 1,908 ac (4.5%) vernal pool tadpole shrimp (4) 2,179 ac (5.2%) Butte County meadowfoam (1)	NMFS: 299 ac (1.7%) green sturgeon, 1 occurrence	—	359 ac (3%) Delta smelt (no occurrences)	Permitting through critical habitat will be complicated, including required mitigation
Other CNDDDB State & Federally Listed Wildlife Observances (corridor & buffer)	foothill yellow legged frog (3) giant garter snake (2) western pond turtle (1)	giant garter snake (6) conservancy fairy shrimp (1)	Vernal pool fairy shrimp (1 occurrence)	CA tiger salamander (12) Cons fairy shrimp (5) Vernal pool fairy shrimp (3) Delta green beetle (3) Salt-marsh harvest mouse	Proper tower siting and construction monitoring will minimize impacts to these wildlife species. No impacts anticipated during operations.

Corridor 4A (Valley West) Summary of Issues	Fern Rd Sutter	Sutter to Madison	Madison to Vaca Dixon	Vaca Dixon to Collinsville	CORRIDOR 4A SUMMARY
Challenge or Concern	99 miles; 42,258 ac	41 miles; 17,582 ac	21 miles; 9,312 ac	24 miles; 10,493 ac	185 miles; 79,645 ac
				Western pond turtle (2) Lange's metalmark BF (1)	
Other CNDDDB State & Federally Listed Avian Species and Important Bird Areas	Bald eagle (2) tricolor blackbird (2) Swainson's hawk (1)	Swainson's hawk (17) bank swallow (2) tricolor blackbird (1) 56% important bird areas	Swainson's hawk (31) Tricolored blackbird (1) No important bird areas	Swainson's hawk (17) CA least tern (1) Tricolored blackbird (1) Western snowy plover (1) 32% important bird areas	Siting of towers near existing transmission and nest monitoring during construction will minimize impacts.
Other CNDDDB State & Federally List Fish Species and NWI Aquatic Wetland Features	steelhead (7) chinook salmon (2) 2,818 ac (6.7%) NWI	steelhead (1) green sturgeon (1) 411 ac (2.3%) NWI	No CNDDDB species 145 ac (1.6% NWI)	green sturgeon (1) longfin smelt (1) 478 ac (5%) NWI	Waterways can be spanned. Proper tower siting and construction monitoring will minimize impacts to these aquatic habitats. No impacts anticipated during operations.
Other CNDDDB State & Federal Listed Plant Observances	Green's tuctoria (1)	—	—	San Joaquin Valley Orcutt grass (1)	Minimal plant populations. Proper tower siting and construction monitoring will minimize impacts to these plant species. No impacts anticipated during operations.
CULTURAL & TRIBAL RESOURCES					
Prehistoric Resources	118 One NAHC sacred land site	-	1	1	Proper tower siting could minimize impacts to known prehistoric sites, but unknown buried sites could be encountered. Monitoring would minimize impacts. Tribal Cultural Resources could be an issue requiring additional mitigation. Permitting would be

Corridor 4A (Valley West) Summary of Issues	Fern Rd Sutter	Sutter to Madison	Madison to Vaca Dixon	Vaca Dixon to Collinsville	CORRIDOR 4A SUMMARY
Challenge or Concern	99 miles; 42,258 ac	41 miles; 17,582 ac	21 miles; 9,312 ac	24 miles; 10,493 ac	185 miles; 79,645 ac
					complicated & mitigation challenging.
Historic Resources	76	13	9	14	Proper tower siting could minimize impacts to known historic sites, but unknown buried sites could be encountered. Indirect impacts to historic resources including districts would need to be analyzed. Monitoring could mitigate impacts to buried resources. Permitting would be complicated & mitigation challenging.
Tribal Lands within Corridor (federally recognized tribes)	—	—	—	—	—
Corridor Acres within 5 miles of Tribal Lands	3,956 ac (9%)	—	—	—	Portion of corridor could be visible from tribal lands which could be minimized with proper tower siting.
Tribal Lands and Rancherias within 5 miles	1 (Mechoopda TDSA)	—	—	—	Proper tower siting would avoid buried resources.
AESTHETICS					
Wild & Scenic Rivers	1 mi	—	—	—	Proper tower siting required to minimize visual impact.
Scenic Highways	1 mi	—	—	—	See above
USFS Wilderness Lands within 5 miles	10,345 ac (24%)	—	—	—	Portion of corridor could be visible from Wilderness land which could be minimized with proper tower siting.

Corridor 4A (Valley West) Summary of Issues	Fern Rd Sutter	Sutter to Madison	Madison to Vaca Dixon	Vaca Dixon to Collinsville	CORRIDOR 4A SUMMARY
Challenge or Concern	99 miles; 42,258 ac	41 miles; 17,582 ac	21 miles; 9,312 ac	24 miles; 10,493 ac	185 miles; 79,645 ac
AGRICULTURAL RESOURCES					
Important Farmlands (prime & unique)	6,899 ac (16%)	11,316 ac (64%)	6,759 ac (73%)	1,646 ac (16%)	Proper tower siting would minimize impacts to agricultural lands. Existing transmission.
Williamson Act Lands	19,866 ac (47%)	9,075 ac (52%)	6,089 ac (65%)	5,425 ac (52%)	Proper tower siting would minimize impacts to Williamson Act lands. Existing transmission
HAZARDS					
High Landslide Susceptibility	9,834 ac (23%)	836 ac (5%)	—	199 ac (2%)	Implementation of proper engineering solutions
Alquist-Priolo Fault Hazard Zones	—	—	—	—	-
CalFire Very High-Risk Lands	18,317 ac (43%)	—	—	—	Proper fire risk management during O&M
EPA Superfund Areas	-	—	—	—	-
AIRPORTS & AIRSPACE CONSTRAINTS (≤500 FEET)					
Airports & Airspace	1,773 ac (4%)	—	—	—	Proper tower placement and coordination
Special-Use Airspace	—	—	94 ac (1%)	—	Proper tower placement and coordination
Military Training Routes	—	—	—	—	—
ENVIRONMENTAL JUSTICE					
Disadvantaged Communities	3,333 ac (8%)	—	—	—	Short-term construction effects and presence of new major transmission facility would further degrade area.

*Historic Pony Express Trail crossing.



**Transmission Corridor Evaluation,
Humboldt Wind Energy Area**

**Figure 12
Corridor 4
Siting Constraints**

1:950,400

1" = 15 miles



Risk Categories

High

Medium

Low

Corridor 1 and 3

**Corridor width not drawn to scale*

Sources: Aspen, 2024; ESRI, 2024.

5.6. Corridor 4B: Fern Road to Collinsville (Valley East 2)

Corridor 4B includes the following segments:

- Fern Road to Sutter (common with Corridor 4A; see Section 5.5.1)
- Sutter to Brannan
- Brannan to Collinsville

5.6.1. Sutter to Brannan

Land Ownership and Land Uses

As illustrated in Figure 6 (Corridors 4A and 4B), the 83-mile Sutter to Brannan Segment is centered on an existing overhead PG&E 500 kV transmission line (Table Mountain to Tesla) that traverses important agricultural (prime and unique) and grazing lands in Sutter, Yolo, and Solano Counties.

With the exception of 2,149 acres of CDFW owned lands (6.1%) and 430 acres of National Wildlife Refuge (1.2%), the Sutter to Brannan Segment is comprised of private county lands; no incorporated, or other State or federal lands traversed. The segment generally traverses agricultural lands, including important farmlands (prime and unique) and grazing lands.

Challenges or Concerns for Transmission Siting and Permitting

- Line siting along the length of the Sutter to Brannan Segment would need to avoid residential areas and other sensitive land uses (e.g., schools and parks) in order to minimize disturbance and views of new towers. There are 560 private parcels (7 parcels per mile), and the average parcel size is approximately 63 acres.
- Approximately 43% of the segment (15,313 acres) is comprised of important farmland (prime or unique). Many areas of important farmlands are continuous so cannot be spanned; therefore, proper siting of towers will be required to minimize impacts to these lands.
- Almost 48% of this segment (17,010 acres) is under Williamson Act contracts. Coordination with Sutter, Solano, and Yolo Counties would be required to assess whether adding new transmission is consistent with existing contracts.
- USFWS critical habitat within this segment exists for the Delta smelt (9,219 ac, 26%). No occurrences of the species are noted in the CNDDDB. In addition, the segment contains NMFS designated critical habitat for green sturgeon (6,259 acres, 18%). One occurrence of the species was identified during CNDDDB queries. As a result of the critical habitat, permitting and mitigation may be challenging.
- CNDDDB queries identified the following State/federally listed wildlife species (see below for fish and avian species): Giant garter snake (37 occurrences), western pond turtle (4), vernal pool tadpole shrimp (3), vernal pool fairy shrimp (2), Lange's metalmark butterfly (1), and conservancy fairy shrimp (1). Proper siting of towers would be necessary to minimize impacts to these species. Multi-species permitting with State and federal resource agencies will be complicated given the multiple species and extensive mitigation is anticipated.
- CNDDDB queries identified the following State/federally listed avian species: Swainson's hawk (30), bank swallow (2), tricolor blackbird (2), and California black rail (1). In addition, 34% of the segment

traverses designated important bird areas. Locating a new 500 kV transmission line adjacent to the existing 500 kV line would minimize impacts to birds.

- 16% of the segment (5,679 acres) is within an area designated as a disadvantaged community. Short-term construction effects and presence of a new major transmission facility would further degrade the area.
- Cultural resources within this segment include the following:
 - There are 31 historic era cultural resources including 3 historic districts, primarily related to agriculture and canals. The majority of these resources are located in heavy agricultural land within the segment. There is 1 precontact site.
 - Construction of overhead transmission lines can generally avoid impacts to known resources, but effects on historic districts with numerous individual resources may be more difficult to avoid. Unknown buried resources could be encountered during ground disturbance, but construction monitoring can help to mitigate impacts. Indirect impacts to historic resources and districts could occur due to the new presence of an additional 500 kV transmission line if it is found to be inconsistent with the historic setting.
- The NAHC search of its Sacred Lands File is pending.

Other Less Serious Concerns

- 6.1% (2,149 acres) of the segment are CDFW managed lands, including the Sutter Bypass Wildlife Area (346.3 acres, 1.0%, undesignated conservation easements (318.3 acres, 0.9%), the Saxon Conservation Easement (23.4 acres, 0.07%), and Yolo Bypass Wildlife Area (1,461 acres, 4.1%). These CDFW lands are scattered throughout the segment. In addition, the segment includes 2,416 (6.9%) acres of California Protected Areas (CPAD), including City of Davis, Howatt/Clayton Ranch, Lookout Slough, Lower Yolo Ranch, and Wildlands Inc. conservation lands which are concentrated on the southern half of the segment. Given the extent of some of these managed lands within the segment, strategic tower placement and coordination with land managers would be required to minimize impacts. Siting a new transmission line in near proximity to the existing 500 kV transmission line would minimize impacts (wildlife, visual and recreation) to these CDFW and CPAD managed lands.
- CNDDDB queries identified the following State and federally listed fish (non-critical habitat): longfin smelt (1 occurrence), steelhead (1), and eulachon (1). In addition, the segment includes 5,524 acres (15.7%) of NWI aquatic features. Proper siting of towers would avoid impacts to these fish species and aquatic habitat.
- The northern and southern ends of the segment (403 acres, 1.1% of the segment total) have high landslide susceptibility which would require careful tower siting and appropriate foundations.
- The segment crosses the Pony Express National Historic Trail in two locations; however, the existing 500 kV transmission line also crosses this trail within the segment. Locating the new line near the existing line would minimize visual impacts
- Almost 8.5% of the segment (2,984 acres) is located in the Sacramento Airport Class C airspace (≤ 500 feet). Given that towers would likely be less than 200 feet, minimal impact to airspace operations is anticipated. Siting a new transmission line near the existing 500 kV line would further minimize this safety risk.

- 9.9% of the segment (3,502 acres) is located in the Travis Air Force Base special-use airspace (≤ 500 feet). Given that towers would likely be less than 200 feet, minimal impact to airspace operations is anticipated.

5.6.2. Brannan to Collinsville

Land Ownership and Land Uses

As illustrated in Figure 6, the 5-mile Brannan to Collinsville Segment diverges from the existing overhead PG&E 500 kV transmission line (Table Mountain to Tesla) at a point near Brannan Island, prior to crossing the Sacramento River, and this relatively short segment traverses grazing and open space/undeveloped lands in Solano County.

All lands within the Brannan to Collinsville Segment are within Solano County and are comprised of private lands; no incorporated cities, State lands, or federal lands are traversed. The segment generally traverses grazing lands and open space/undeveloped lands.

Challenges or Concerns for Transmission Siting and Permitting

- Line siting along the length of the Brannan to Collinsville Segment would need to avoid residences in order to minimize disturbance and views of new towers. There are 49 private parcels (10 parcels per mile), and the average parcel size is approximately 51 acres.
- Almost 33% of this segment (824 acres) is under Williamson Act contracts. Coordination with Solano County would be required to assess whether adding new transmission is consistent with existing contracts.
- USFWS critical habitat within this segment exists for the Delta smelt (359 ac, 14%). No occurrences of the species are noted in the CNDDDB. As a result of the critical habitat, permitting and mitigation may be challenging.
- CNDDDB queries identified the following State/federally listed wildlife species (see below for fish and avian species): Salt-marsh harvest mouse (2 occurrences) and Lange's metalmark butterfly (1). Proper siting of towers would be necessary to minimize impacts to these species. Multi-species permitting with State and federal resource agencies will be required.
- The entire length of the segment is within an area designated as a disadvantaged community. Short-term construction effects and presence of a new major transmission facility would further degrade the area.
- Cultural resources within this segment include the following:
 - There are 4 historic era cultural resources and 1 precontact resource. The majority of these resources are located near the northern portion of the segment. The small number of recorded resources in this segment indicates a likelihood that it has not been subject to an intensive pedestrian survey.
 - Construction of overhead transmission lines can generally avoid impacts to known resources, but effects on large districts with numerous individual resources are more difficult to avoid. Unknown buried resources could be encountered during ground disturbance, but construction monitoring can help to mitigate impacts. Indirect impacts to historic resources could occur

due to the new presence of an additional major 500 kV transmission line that may be found to be inconsistent with the historic setting.

- The NAHC's search of their Sacred Lands File is pending.

Other Less Serious Concerns

- CNDDDB queries identified the following State/federally listed avian species: California least tern (1) and western snowy plover (1). In addition, 3.7% of the segment traverses designated important bird areas. Locating a new 500 kV transmission line adjacent to the existing 500 kV line, would minimize impacts to birds.
- CNDDDB queries identified the following State and federally listed fish (non-critical habitat): longfin smelt (1 occurrence). In addition, the segment includes 77 acres (3.1%) of NWI aquatic features. Proper siting of towers would avoid impacts to these fish species and aquatic habitat.
- Almost 6.7% of the segment total has high landslide susceptibility which would require careful tower siting and appropriate foundations.

5.6.3. Corridor 4B: Overall Conclusions Regarding Transmission Feasibility

Table 9 and Figure 12 present summaries of conclusions about Corridor 4B. Red shaded areas in the table below note the issues of highest concern, followed by issues of medium concern (orange shading), and lastly issues of low concern (yellow shading). Red text for each segment indicates the key factors driving the highest risk conclusions indicated in red shading in the summary column.

The most serious concerns in Corridor 4B include the following:

- The presence of critical habitat and CNDDDB occurrences for vernal pool fairy shrimp, vernal pool tadpole shrimp, Butte County meadow foam, and green sturgeon present exceptional challenges and will require ESA consultation and mitigation development with the USFWS. The Delta smelt also has critical habitat along this corridor, but individual occurrences were not noted in CNDDDB data.
- 12,161 acres of the corridor (15%) traverses designated important bird areas.
- The corridor includes a clustered area of historic era cultural resources. The majority of these historic age resources relates to agricultural activity. Additionally, there are precontact age resources and resources that contain both precontact and historic age resources throughout this corridor. Permitting would be complicated and mitigation challenging.

Table 9. Corridor 4B (Valley East 2) – Summary of Issues

CORRIDOR 4B (Valley East) SUMMARY OF ISSUES	Fern Rd Sutter	Sutter to Brannan	Brannan to Collinsville	CORRIDOR 4B SUMMARY
Challenge or Concern	99 miles; 42,258 ac	83 miles; 35,257 ac	5 miles; 2,501 ac	187 miles; 80,016 ac
LAND USE & PROTECTED LANDS				
Federal Lands (USFS, NPS, BLM)	155 ac (<1%) BLM	—	—	Minimal federal lands to traverse.
Private Lands	83% private 852 parcels 9 parcels/mile 50 ac avg	93% private 560 parcels 7 parcels/mile 63 ac avg	100% private lands 49 parcels 10 parcels/mile 51 ac avg	Proper tower siting and land acquisition /property owner negotiations required.
Incorporated City Lands	731 acres (2%) (Chico)	—	—	See above
USFS Wilderness Lands	—	—	—	
National Wildlife Refuges	—	430 ac (1.2%)	—	Existing transmission lines have ROW through these protected lands.
CDFW Owned & Operated Lands, State Refuges, and California Protected Areas (CPAD)	CDFW: 5,261 ac (12%) CPAD: 1,984 ac (5%) 2 State Historic Trail crossings	CDFW: 2,149 ac (6.1%)	—	Existing transmission lines have ROW through some of these protected lands
BIOLOGICAL RESOURCES				
USFWS & NMFS Critical Habitat & CNDDDB Occurrences	104 ac (<1%) vernal pool fairy shrimp (4 occurrences) 1,908 ac (4.5%) vernal pool tadpole shrimp (4) 2,179 ac (5.2%) Butte County meadowfoam (1)	9,219 ac, (26%) Delta smelt, no occurrences NMFS: 6,259 ac (18%) green sturgeon, 2 occurrences	359 ac, (14%) Delta smelt, no occurrences	Permitting through critical habitat will be complicated, including required mitigation
Other CNDDDB State & Federally Listed Wildlife Observances (corridor & buffer)	foothill yellow legged frog (3) giant garter snake (2) western pond turtle (1)	Giant garter snake (37) western pond turtle (4) vernal pool tadpole shrimp (3) vernal pool fairy shrimp (2) Lange's metalmark BF (1) conservancy fairy shrimp (1)	Salt-marsh harvest mouse (2) Lange's metalmark BF (1)	Proper tower siting and construction monitoring will minimize impacts to these wildlife species. No impacts anticipated during operations.

CORRIDOR 4B (Valley East) SUMMARY OF ISSUES	Fern Rd Sutter	Sutter to Brannan	Brannan to Collinsville	CORRIDOR 4B SUMMARY
Challenge or Concern	99 miles; 42,258 ac	83 miles; 35,257 ac	5 miles; 2,501 ac	187 miles; 80,016 ac
Other CNDDDB State & Federally Listed Avian Species and Important Bird Areas	Bald eagle (2) tricolor blackbird (2) Swainson's hawk (1)	Swainson's hawk (30) bank swallow (2) tricolor blackbird (2) California black rail (1) 34% important bird areas	California least tern (1) western snowy plover (1) 3.7% important bird areas	Siting of towers near existing transmission and nest monitoring during construction will minimize impacts.
Other CNDDDB State & Federally List Fish Species and NWI Aquatic Wetland Features	steelhead (7) chinook salmon (2) 2,818 ac (6.7%) NWI	longfin smelt (1) steelhead (1) eulachon (1). 5,524 acres (16%) NWI	Green sturgeon (1) longfin smelt (1) 77 acres (3.1%) NWI	Waterways can be spanned. Proper tower siting and construction monitoring will minimize impacts to these aquatic habitats. No impacts anticipated during operations.
Other CNDDDB State & Federal Listed Plant Observances	Green's tuctoria (1)	—	—	Minimal plant populations. Proper tower siting and construction monitoring will minimize impacts to these plant species. No impacts anticipated during operations.
CULTURAL & TRIBAL RESOURCES				
Prehistoric Resources	118 One NAHC sacred lands result	1	1	Proper tower siting could minimize impacts to know prehistoric resources but buried resources are a real possibility. Monitoring could reduce impacts. Tribal Cultural Resources is a possibility within this corridor. Permitting would be complicated & mitigation challenging.
Historic Resources, including Trails	76	31	4	Proper tower siting could minimize impacts to know historic resources but buried resources are a possibility. Monitoring could reduce impacts. Permitting would be complicated & mitigation challenging.
Tribal Lands within Corridor	—	—	—	

CORRIDOR 4B (Valley East) SUMMARY OF ISSUES	Fern Rd Sutter	Sutter to Brannan	Brannan to Collinsville	CORRIDOR 4B SUMMARY
Challenge or Concern	99 miles; 42,258 ac	83 miles; 35,257 ac	5 miles; 2,501 ac	187 miles; 80,016 ac
Corridor Acres within 5 miles of Tribal Lands (federally recognized tribes)	3,956 ac (9%)	—	—	Portion of corridor could be visible from tribal lands which could be minimized with proper tower siting.
Tribal Lands and Rancherias w/i 5 miles	1 (Mechoopda TDSA)	—	—	Proper tower siting would avoid buried resources.
AESTHETICS				
Wild & Scenic Rivers	1 mi	—	—	Proper tower siting required to minimize visual impact.
Scenic Highways	1 mi	—	—	See above
USFS Wilderness Lands within 5 miles	10,345 ac (24%)	—	—	Portion of corridor could be visible from Wilderness land which could be minimized with proper tower siting.
AGRICULTURAL RESOURCES				
Important Farmlands (prime & unique)	6,899 ac (16%)	15,313 ac (43%)	—	Proper tower siting would minimize impacts to agricultural lands. Existing transmission.
Williamson Act Lands	19,866 ac (47%)	17,010 ac (48%)	824 ac (33%)	Proper tower siting would minimize impacts to Williamson Act lands. Existing transmission
HAZARDS				
High Landslide Susceptibility	9,834 ac (23%)	403 ac (1.1%)	167 ac (6.7%)	Implementation of proper engineering solutions
Alquist-Priolo Fault Hazard Zones	—	—	—	-
CalFire Very High-Risk Lands	18,317 ac (43%)	—	—	Proper fire risk management during O&M
EPA Superfund Areas	—	—	—	—
AIRPORTS & AIRSPACE CONSTRAINTS (≤500 Feet)				
Airports & Airspace	1,773 ac (4%)	2,984 ac (8.5%) Sacramento Airport Class C	—	Proper tower placement and coordination

CORRIDOR 4B (Valley East) SUMMARY OF ISSUES	Fern Rd Sutter	Sutter to Brannan	Brannan to Collinsville	CORRIDOR 4B SUMMARY
Challenge or Concern	99 miles; 42,258 ac	83 miles; 35,257 ac	5 miles; 2,501 ac	187 miles; 80,016 ac
Special-Use Airspace	—	3,502 ac (9.9%)	—	Proper tower placement and coordination
Military Training Routes	—	—	—	
ENVIRONMENTAL JUSTICE				
Disadvantaged Communities	3,333 ac (8%)	5,679 ac (16%)	2,501 ac (100%)	Short-term construction effects and presence of new major transmission facility would further degrade area.

5.7. Corridor 5: Clear Lake

5.7.1. Land Ownership and Land Uses

As illustrated in Figure 7, the 62-mile Clear Lake Corridor roughly follows SR 20, heading southeast about 7 miles north of Ukiah and ending about 5 miles southwest of Williams. The corridor is centered on an existing overhead PG&E 115 kV transmission line (Mendocino Substation to Cortina Substation). This corridor provides a potential connection between Corridor 2 and Corridor 3. It passes through portions of Mendocino, Lake, and Colusa Counties. About 14 miles of Corridor 5 parallels the north shore of Clear Lake, through and north of the communities of Nice, Lucerne and Clearlake Oaks.

Corridor 5 includes less than 4% federal lands and is primarily privately owned. There are no incorporated cities along the corridor, but many of the lands along the north shore of Clear Lake have been subdivided into small residential parcels. The eastern 15-mile of the segment traverses grazing and agricultural lands under Williamson Act contracts (in Colusa County).

East of Clear Lake, this corridor passes through an approximately 7-mile segment of the Berryessa Snow Mountain National Monument (just north of the BLM Cache Creek Wilderness). The monument was established in 2015, and includes more than 330,000 acres, including 133,000 acres of BLM land. While 7 linear miles of the corridor pass through the monument boundaries, the majority of the land within the study corridor inside the monument is private land.

On May 2, 2024, President Biden issued a proclamation expanding the Berryessa Snow Mountain National Monument.³⁹ This proclamation added nearly 14,000 acres to the monument, extending the length of this corridor within the monument boundary by nearly 1 additional mile (to 8 miles total). The formal map and boundaries of the monument expansion have not been published, so the acreage calculations used for this report are based on the 2015 monument boundaries. The implications of the monument designation to a potential future new transmission line are not known at this time; they will depend on the specifics of monument designation and the plan that is developed to manage and permit utility rights-of-way within monument boundaries.

5.7.2. Challenges or Concerns for Transmission Siting and Permitting

Cultural resources and sacred lands data is not yet available for Corridor 5.

- Three communities along the north shore of Clear Lake have a very high density of private parcels, and while many are not currently developed, they are zoned for residential use. Siting in the northern edge of the corridor would maximize distance from residences.
- 6,609 acres of the corridor (25%), also along Clear Lake, traverses designated important bird areas. Clear Lake is known as one of the best bird watching areas in the State.⁴⁰
- Nearly 32 linear miles of the 40-mile corridor between Ukiah and Clearlake Oaks are within 5 miles of tribal lands, indicating the potential for viewshed impacts of sacred sites.
- Over 160 acres of the corridor includes BLM's Cache Creek Wilderness Area. This is within the Berryessa Snow Mountain National Monument; about 7 linear miles of the corridor is within the monument boundaries. As defined in the Presidential Proclamation, the monument has been

³⁹ <https://www.whitehouse.gov/briefing-room/presidential-actions/2024/05/02/a-proclamation-on-expanding-the-berryessa-snow-mountain-national-monument-2024/>

⁴⁰ <https://www.pressdemocrat.com/article/lifestyle/clear-lake-in-lake-county-is-a-bird-lovers-dream/>

expanded to include "... a striking 11-mile north-to-south ridgeline that is sacred to the Patwin people." The southern end of this expansion area would be crossed by Corridor 5, so research into Native American priorities and concerns would be important for a potential new transmission line.

- Over 25% of this corridor (6,544 acres) is under Williamson Act contracts. Coordination with Colusa County would be required to assess whether adding new transmission is consistent with existing contracts. This corridor also includes nearly 3,000 acres (11%) that are in conservation easements. The Bear Valley Conservation Easement is the largest, and it overlaps with the Williamson Act contract lands in Colusa County.
- SR 20, which is eligible for State Scenic Highway designation, crosses most of northern California (from Fort Bragg to Grass Valley to Yuba Pass). The highway's scenic segment parallels this corridor for about 46 of its 62 linear miles.
- CNDDDB queries identified the following State/federally listed wildlife species: western pond turtle (one occurrence). Proper siting of towers would be necessary to minimize impacts to this species.

Other Less Serious Concerns

- CNDDDB queries did not identify any State/federally listed avian species; however, 25% of the corridor is designated Important Bird Areas.
- CNDDDB queries did not identify any State and federally listed fish species (non-critical habitat); however, the corridor includes 637 acres (2.4%) of NWI aquatic features. Proper siting of towers would avoid impacts to this aquatic habitat.
- Over 43% of the corridor has high landslide susceptibility which would require careful tower siting and appropriate foundations.

5.7.3. Corridor 5: Overall Conclusions

Table 10 and Figure 13 present summaries of conclusions about Corridor 5. Red shaded areas in the table below note the issues of highest concern, followed by issues of medium concern (orange shading), and lastly issues of low concern (yellow shading). Red text for each segment indicates the key factors driving the highest risk conclusions indicated in red shading in the summary column.

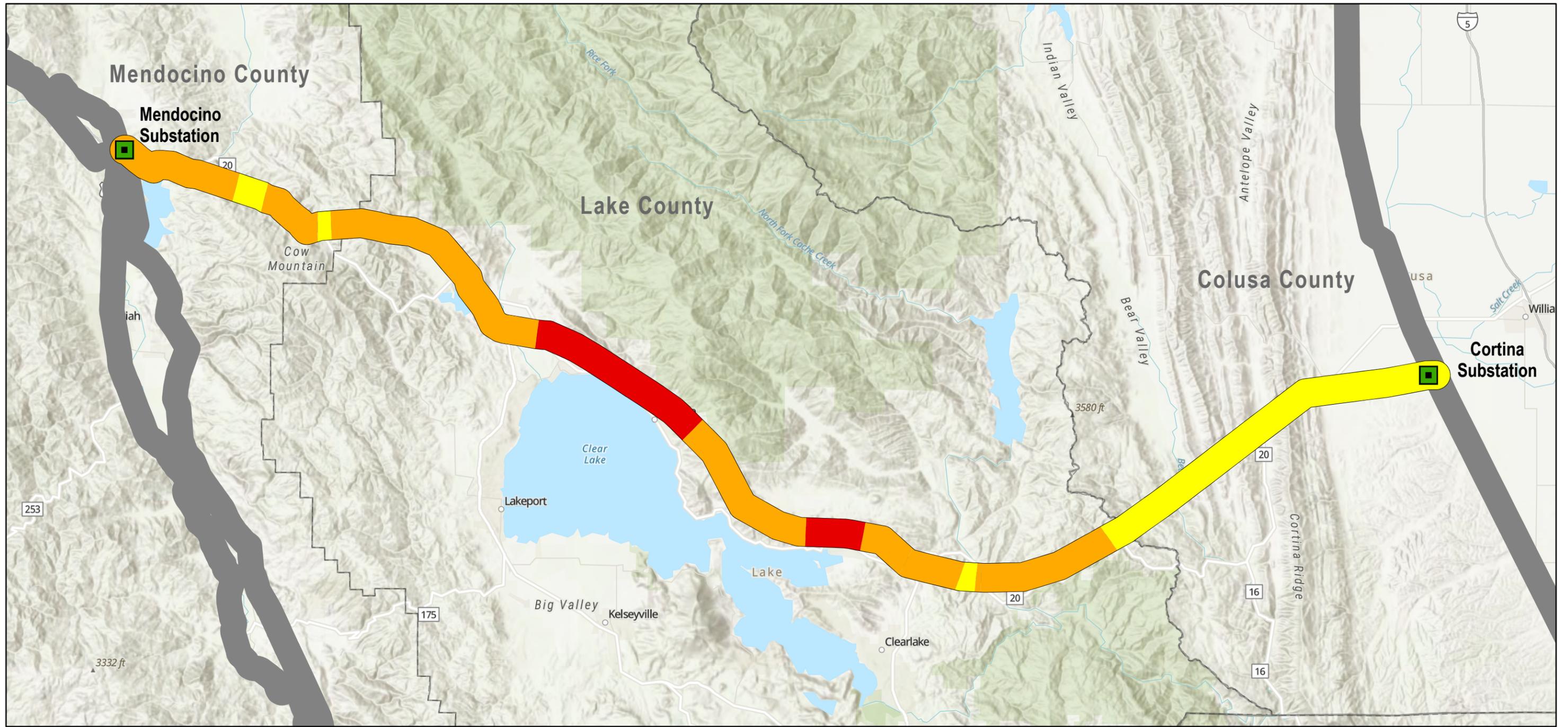
The most serious concerns in Corridor 5 includes the following:

- High density of private lands along the north shore of Clear Lake

Table 10. Corridor 5 (Clear Lake) – Summary of Issues

CORRIDOR 5 (Clear Lake) SUMMARY OF ISSUES	Clear Lake Corridor	CORRIDOR 5 SUMMARY
Challenge or Concern	61.7 miles; 26,220 acres	
FEDERAL and STATE LANDS		
Federal Lands (USFS, NPS, BLM)	1,079 ac (4%)	Minimal federal lands to traverse, but corridor crosses BLM lands within Berryessa Snow Mountain Nat'l Monument
Private Lands	9,067 parcels 147 parcels/mile 3 ac avg size	Communities of Nice, Lucerne, and Clearlake Oaks (north short of Clear Lake) are subdivided into numerous small parcels, but many are undeveloped
Incorporated City Lands	—	—
USFS or BLM Wilderness Lands	163 ac (<1%)	Cache Creek Wilderness is immediately south of SR 20 and within the Monument
National Wildlife Refuges	—	—
CDFW Owned & Operated Lands, State Refuges, and California Protected Areas (CPAD)	CDFW: 14 ac (<1%) CPAD: 268 ac (1%)	Very small areas; likely avoidable with proper siting.
BIOLOGICAL RESOURCES		
USFWS & NMFS Critical Habitat & CNDDDB Occurrences	—	No critical habitat
Other CNDDDB State & Federally Listed Wildlife Observances (corridor & buffer)	western pond turtle (1 occurrence)	Proper tower siting would minimize impacts.
Other CNDDDB State & Federally Listed Avian Species and Important Bird Areas	17 miles Important Bird Area along north shore of Clear Lake	Clear Lake is designated by the National Audubon Society as an IBA
Other CNDDDB State & Federally List Fish Species and NWI Aquatic Wetland Features	637 ac (2%) NWI	Waterways can be spanned. Proper tower siting and construction monitoring will minimize impacts to aquatic habitats. No impacts anticipated during operations.
Other CNDDDB State & Federal Listed Plant Observances	—	—
CULTURAL & TRIBAL RESOURCES		
Prehistoric Resources		Pending data
Historic Resources, including Trails		Pending data
Tribal Lands within Corridor	112 ac	Robinson Rancheria and Off-Reservation Trust Land is within the southern half of the corridor just northwest of the community of Nice
Corridor Acres within 5 miles of Tribal Lands (federally recognized tribes)	13,650 ac (52% of corridor)	Many tribal lands within 5 miles of this corridor with potential for viewshed effects
Tribal Lands and Rancherias w/i 5 miles	Redwood Valley Rancheria, Robinson Rancheria, Pinoleville Rancheria, Sulphur Bank Rancheria, Upper Lake Rancheria, Coyote Valley rancheria, Guidiville Rancheria and Off-Reservation Trust Land, Cortina Indian Rancheria	See above

CORRIDOR 5 (Clear Lake) SUMMARY OF ISSUES	Clear Lake Corridor	CORRIDOR 5 SUMMARY
Challenge or Concern	61.7 miles; 26,220 acres	
AESTHETICS		
Wild & Scenic Rivers	—	—
Scenic Highways	16 miles	SR 20 Ukiah to Corvina
USFS or BLM Wilderness Lands within 5 miles	21,997 ac	Cache Creek Wilderness is immediately south of SR 20 within the Monument
AGRICULTURAL RESOURCES		
Important Farmlands (prime & unique)	2,641 ac (10%)	Proper tower siting would minimize impacts to agricultural lands. Existing transmission.
Williamson Act Lands	6,544 ac (25%)	Proper tower siting would minimize impacts to Williamson Act lands. Existing transmission
HAZARDS		
High Landslide Susceptibility	11,310 ac (43%)	Implementation of proper engineering solutions minimizes risk to structures
Alquist-Priolo Fault Hazard Zones	—	—
CalFire Very High-Risk Lands	8,423 ac (32%)	Proper fire risk management during O&M reduces hazard
EPA Superfund Areas	4 ac	Sulphur Creek Superfund site includes all of Clear Lake itself; no effect on transmission
AIRPORTS & AIRSPACE CONSTRAINTS (<500 Feet)		
Airports & Airspace	1,438 ac	Class E2 Airspace north of Lake Mendocino at west end of corridor
Special-Use Airspace	—	—
Military Training Routes	—	—
ENVIRONMENTAL JUSTICE		
Disadvantaged Communities	—	—



1:316,800
 1" = 5 miles
 0 5 Miles

*Corridor width not drawn to scale

**Transmission Corridor Evaluation,
 Humboldt Wind Energy Area**

- Substation
- Corridor 2A, 2B, and 3
- Risk Categories**
- High
- Medium
- Low

**Figure 13
 Corridor 5
 Siting Constraints**

Sources: Aspen, 2024; ESRI, 2024.