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SUBSTATION PLANNING EVALUATION

Humboldt Wind Energy Area

Addendum to Transmission Corridor Evaluation

Prepared for



**CALIFORNIA
ENERGY COMMISSION**

Prepared by:



With assistance from:



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**Schatz
Energy
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FORWARD

The California Energy Commission funded this substation planning evaluation to provide preliminary information and rankings of land-use and environmental constraints associated with developing onshore transmission infrastructure primarily in unincorporated Humboldt County to access offshore wind resource from the Humboldt Wind Energy 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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1. EXECUTIVE SUMMARY

1.1. Introduction

Aspen Environmental Group (Aspen) prepared this high-level study of potential substation sites in response to a request from the California Energy Commission 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 in the Bureau of Ocean Energy Management (BOEM) Humboldt Wind Energy Area (WEA).

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).

The first component of this effort was a Transmission Corridor Evaluation Report, posted in May 2024 and updated in July 2024, in the California Offshore Renewable Energy docket:¹

[Transmission Corridor Evaluation Humboldt Wind Area Volume 1: Report](#)
[Transmission Corridor Evaluation Humboldt Wind Area Volume 2: Appendices](#)

This substation evaluation report supplements the information provided in the Transmission Corridor Evaluation Report.

1.2. Purpose and Scope

The function of this study is to identify potentially major environmental siting and permitting constraints early in the transmission and substation planning process. While no new transmission routes or substation locations have been proposed, the CAISO has issued a Board Approved 2023-2024 Transmission Plan that determined the need for a 500 kV substation and two new high voltage transmission lines to serve the Humboldt Area and accommodate offshore wind generation from the BOEM-designated Humboldt WEA. In addition, the CAISO has initiated a Competitive Solicitation process² for these recommended infrastructure upgrades. The CAISO has not specified locations for this infrastructure; siting is the responsibility of the selected developer. The CAISO's competitive process began with a June 2023 meeting³ in which the process was explained. The bid window for these competitive projects is currently open and closes on October 7, 2024.

This report describes two potential substation study areas that could accommodate a new 500/115 kilovolt (kV) alternating current (AC) substation and a new converter station for AC to direct current (DC) conversion. The study areas are evaluated to identify potential locations where development and

¹ <https://efiling.energy.ca.gov/Lists/DocketLog.aspx?docketnumber=17-MISC-01>

² Competitive process definition: <https://www.caiso.com/notices/2023-2024-transmission-planning-process-phase-3-competitive-solicitation-bid-window-open-and-informational-call>

Key selection factors: <https://www.caiso.com/notices/2023-2024-transmission-planning-process-competitive-solicitation-key-selection-factors-posted>

³ <https://stakeholdercenter.caiso.com/InitiativeDocuments/2023%E2%80%932024-Transmission-Planning-Process-Phase-3-Competitive-Solicitation-jun-26-2024.pdf>

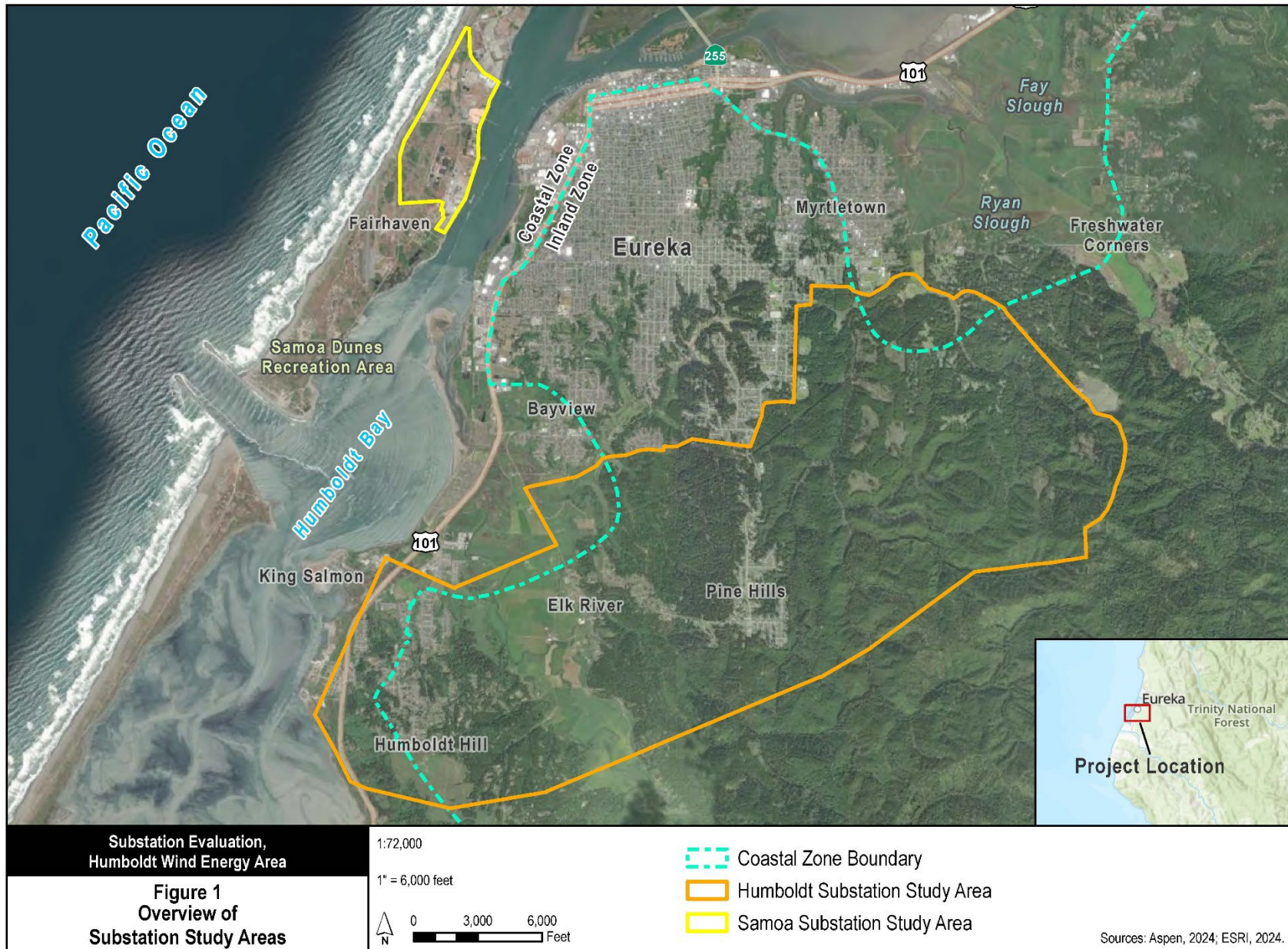
permitting the required sites may be more feasible. Figure 1 provides an overview of the two study areas for transmission facilities:

- Humboldt Study Area (south and east of the City of Eureka)
- Samoa Study Area (Samoa Peninsula)

The goal of the study is to identify locations within each study area 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.

This study differs from the Transmission Corridor Evaluation study in its goals and process. The corridor study evaluated a set of defined corridors and identified areas within each corridor of great and lesser environmental and permitting risk. This substation study defines **Avoidance Areas** and **Potentially Feasible Areas**. Avoidance areas are considered to be inappropriate for substation siting for a variety of reasons and potentially feasible areas may be more appropriate for future substation development, as explained in Chapter 5.

Figure 1. Overview of Substation Study Areas



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 substation locations. 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
- Hazards: Tsunami risk, flooding, wildfire risk, active fault zone, landslide susceptibility, contaminated lands
- 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 Preservation
- 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
- Airspace: Airports, military, and special-use airspace

1.4. Intended Use of this Report

The purpose of this report is to provide early-stage information to the public, including communities, agency decisionmakers, and transmission or substation developers, as described in Section 1.2. This report summarizes publicly available information that may inform siting decisions for a potential substation serving to connect the offshore Humboldt WEA with onshore transmission systems. Neither the offshore nor the onshore transmission lines serving the Humboldt WEA have been sited, so the locations studied in this report are speculative, and narrowed based on land uses and other constraints.

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 an aggregation of data indicating where comparatively greater challenges may exist. The conclusions rely on the professional judgment of the preparers, gained through the environmental review and construction monitoring of transmission projects across the western United States. Professional judgment is by its nature subjective, and different experts may interpret data differently and arrive at different conclusions.

The process of developing a new transmission or substation project requires detailed studies, including consideration of alternatives, and identifying site specific environmental and engineering concerns. Specific proposals to develop each project would need to go through the applicable environmental review processes (i.e., California Environmental Quality Act [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 two study areas, and the conclusions are presented in summary tables. Tables and maps in this report use the following terminology to illustrate environmental and permitting constraints and challenges:

- **Avoidance Areas** are defined to show where substation construction may not be appropriate due to geologic or environmental factors, or County zoning.
- **Potentially Feasible Areas** are defined to highlight areas that may be more appropriate for substation siting.

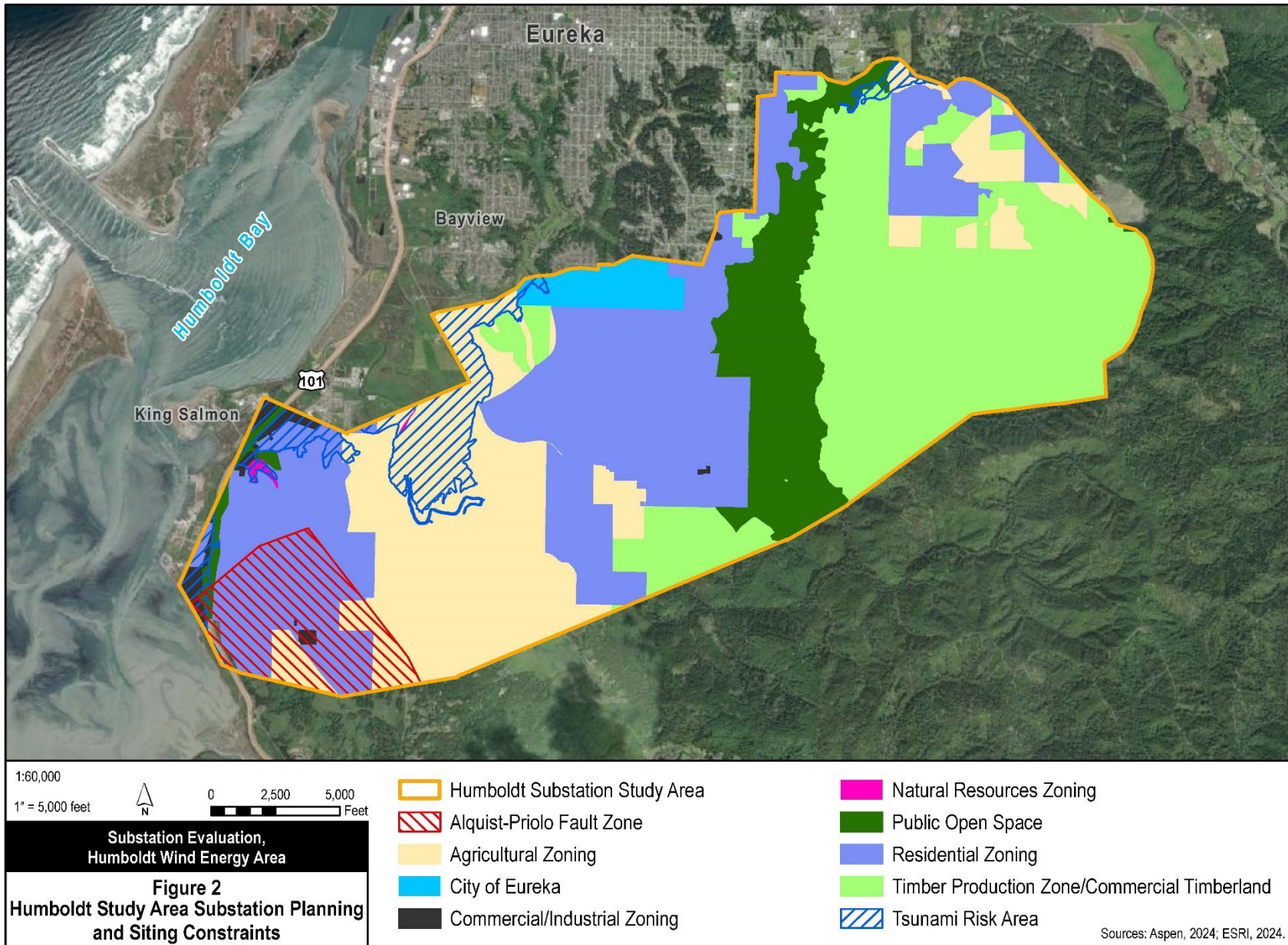
It is important to note that an **Avoidance Area** may not indicate that a substation could never be built within it; it indicates that there may be significant siting or construction challenges. Similarly, **Potentially Feasible Areas** are not intended to imply that permitting would be successful and siting could avoid all concerns. Design and permitting of major energy facilities always bring significant challenges.

Table 1 summarizes the corridor factors and most significant development constraints. The table also notes the percent of each corridor that was defined as avoidance or potentially feasible areas. Figure 2 identifies the planning and siting constraints for the Humboldt study area.

Table 1. Study Area Overview and Major Constraints

Substation Study Area Name	Total Area	Most Significant Siting and Permitting Constraints	Overall Corridor Conclusions
Humboldt Study Area	~11,000 acres	<ul style="list-style-type: none"> ■ Alquist-Priolo active fault zone ■ Tsunami risk area ■ Residential zoning ■ Parcels smaller than 10 acres ■ Timber Production Zone ■ Important bird areas 	51% Avoidance Areas 49% Potentially Feasible Areas
Samoa Study Area	~500 acres	<ul style="list-style-type: none"> ■ Tsunami risk area ■ Potentially infeasible transmission line routing to the east ■ Important Bird Area ■ Disadvantaged community 	100% Avoidance Areas 0% Potentially Feasible Areas

Figure 2. Humboldt Study Area - Substation Planning and Siting Constraints



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 and required substations are available when OSW projects are ready to come on-line requires robust planning. Preliminary analysis of substation planning 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.

The Transmission Corridor Report (docketed in May 2024 and updated in July 2024) provided information about alternative transmission corridors, routes, and rights-of-way, with the associated environmental impacts.⁴ This report considers potential substation locations. For this substation site evaluation, the study gathers available public information to examine the likely siting constraints that may have to be considered during the environmental permitting processes.

The Transmission Corridor Report provided a summary of the following topics:

- Federal Commercial Wind Energy Leasing
- AB 525 Strategic Plan
- Joint Agency Transmission and Resource Planning
- CAISO Annual Transmission Planning Process
- CAISO 20-Year Transmission Outlook
- Northern California/Southern Oregon OSW Transmission Study
- North California and Southern Oregon Study: Environmental Concerns and Permitting Analysis
- Transmission Planning and Environmental Review Processes

These summaries are not repeated here, except where updated information is now available.

2.1. CAISO Annual Transmission Planning Process

The CAISO's 2023-2024 transmission planning process was completed with the CAISO Board of Governors approval of the 2023-2024 Transmission Plan on May 23, 2024.⁵ The Board-approved 2023-2024 Transmission Plan anticipates 1.6 gigawatts (GW) of offshore wind generating capacity to be installed in the North Coast, Humboldt Wind Energy Area.⁶

⁴ 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>.

⁵ [board-votes-advance-transmission-projects-for-california-and-the-region.pdf](https://www.caiso.com/board-votes-advance-transmission-projects-for-california-and-the-region.pdf) (caiso.com).

⁶ <https://www.caiso.com/generation-transmission/transmission/transmission-planning>. Note that while the CAISO 2023-2024 Transmission Plan is designed to accommodate at least 1.6 GW of OSW capacity from the Humboldt WEA. It is expected that the full build out of the HWEA may be substantially more than 1.6 GW. CAISO examined 2.6 GW of offshore wind generation in the HWEA in its sensitivity analysis and proposed a 500 kV alternating current transmission line from Humboldt to Collinsville

With the 2023-2024 Transmission Plan, the CAISO found the need for the following projects to be evaluated in a competitive solicitation process:

- New Humboldt 500 kV Substation, with a 500/115 kV transformer (topic of this report)
- New Humboldt to Fern Road 500 kV Line (approximately 140 miles)(addressed in the Transmission Corridor Evaluation Report)
- New HVDC line from new Humboldt Substation to Collinsville Substation (HVDC to be initially operated as AC; approximately 260 miles)(addressed in the Transmission Corridor Evaluation Report)

The Aspen Team developed two substation study areas for evaluation in this report to potentially accommodate a location for the new Humboldt 500/115 kV substation that was approved in the 2023-2024 Transmission Plan.

2.2. Transmission Planning and Environmental Review Processes

2.2.1. Process Overview

This discussion provides a brief overview of transmission planning efforts leading to this evaluation for substation planning and permitting requirements. This substation study is not part of a formal environmental review process. As described in Section 1.2, this report is a very early assessment of potential siting and 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)

- CAISO Board of Governors Approval of the 2023-2024 Plan (May 23, 2024)
- Developers Submit Competitive Bids for Transmission Facilities: 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
- Tribal Government Consultation
- Public Scoping; Development of Alternatives
- Release of Draft EIR/EIS
- Consideration of Public Comments
- Release of Final EIR/EIS
- Agency Decisions

that could be converted to high voltage direct current, thereby increasing the capacity of the transmission capacity of the planned infrastructure.

2.2.2. Public Engagement in Transmission and Substation 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 needs, and the technical modeling processes that underpin these decisions. The Transmission Corridor Evaluation report (Section 2.10.2, Table 2) provides an overview of prior and anticipated future points of public engagement, as it relates to transmission and substation expansion for the Humboldt WEA.

3. SUBSTATION SITE REQUIREMENTS AND STUDY AREAS

This study defines the requirements for siting a major substation. The two study areas (Humboldt and Samoa; see Figure 1) would have to support a 500 kV substation, space for a future AC/DC converter station, and transformers supporting 115 kV to 500 kV voltage. This equipment would require a minimum of 40 acres of land, but given the required space for high voltage transmission lines to enter and exit the substation, consideration of a site closer to 100 acres may be required. The final acreage would depend on substation design features.

Primary characteristics or requirements are:

- Road access for hauling very large substation components to the site
- Generally flat land, or land that can be graded to flat
- Access to the transmission lines coming from the west (offshore wind area) and heading to the onshore transmission grid to the south and the east
- Parcels generally larger than 10 acres are preferred (to facilitate land acquisition and avoid residential areas)
- Appropriate zoning, or ability to obtain a zoning variance
- Minimal geologic hazards (active faults, landslide potential)

A wide range of other factors affecting substation siting and permitting were considered in this study; they are defined in Section 4.2.

Because it is not yet known where the subsea cables from the offshore wind energy area would come to shore, two study areas were identified. Each is described in the following sections.

3.1. Humboldt Study Area

The Humboldt study area includes two existing PG&E substations and is adjacent to existing PG&E transmission lines that extend inland from the Humboldt Bay shoreline. This study area covers the area southeast of the 115 kV transmission lines between the Humboldt Bay Substation, at the PG&E Humboldt Bay Generating Station power plant on King Salmon Avenue, and the Humboldt Substation on Mitchell Heights Drive. An existing 115 kV line supported by PG&E lattice tower structures connects these two substations and 60 kV circuits from the Humboldt Bay Substation parallel the southern segment for about 2 miles.

The Humboldt study area includes approximately 10,000 acres adjacent to and primarily south of the existing lines, with an additional area of nearly 1,000 acres on its northern and eastern edges to incorporate additional primarily vacant lands.

3.2. Samoa Study Area

The Samoa study area includes an existing industrial zone, just north of the community of Fairhaven on the North Spit that separates Humboldt and Arcata bays from the Pacific Ocean. The Samoa Peninsula was defined in 2023 by the Humboldt Bay Harbor, Recreation and Conservation District as a potential location for the Humboldt Bay Offshore Wind Heavy Lift Marine Terminal Project,⁷ which would cover about 200

⁷ <https://humboltdbay.org/humboldt-bay-offshore-wind-heavy-lift-marine-terminal-project-3>

acres of land and additional adjacent portions of the Samoa Channel. South of and adjacent to the proposed Marine Terminal Project is an approximately 500-acre industrially-zoned site that could accommodate a large substation. However, the siting of major transmission lines heading east (inland) from the Samoa Peninsula would create a significant challenge, as further described in Chapter 5. In addition, nearly the entire Samoa Peninsula is in a tsunami hazard zone.

4. METHOD AND APPROACH

4.1. Principles of Substation Assessment

4.1.1. Planning versus Siting

The function of this substation planning assessment is to identify potentially major environmental and permitting constraints early in the planning process to inform the substation and transmission siting process. As the planning process progresses, 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 potential substation siting locations lack site-specific information that would be required for siting level or project-level environmental impact analysis. The initial assessment of the sites provided in this evaluation does not replace or preclude the required more granular transmission siting evaluation and permitting processes. Section 2.2 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. Substation Site Evaluation Steps

The assessment follows these steps:

- As defined in Chapter 3, two substation study areas were defined.
- Available geospatial data and information necessary for assessment of the study areas was identified in relation to specific criteria presented in Section 4.2. See Appendix 1 for itemization of all data sources.
- The study areas were overlaid with the geospatial data and other information assembled, and potential environmental and siting concerns and permitting requirements were identified, then the data were assembled for each study area (see Chapter 5).
- The environmental, siting, and permitting constraints for the defined study areas were mapped.

4.2. Data and Approach to Analysis

This section explains how each data set was used in the substation site evaluation process (see Appendix 1 for data sources).

4.2.1. Land Ownership and Parcel Size

The following data were considered in the definition of land ownership.

- Federal lands (National Wildlife Refuges, USDA Forest Service, National Park Service, BLM)
- State lands
- Private lands, including consideration of parcels larger than 10 acres. Areas with smaller parcels include a greater density of residences, so these were avoided. Also, because a large substation will require acquisition of as much as 100 acres of land, larger parcels facilitate land acquisition.

4.2.2. Protected Lands

A substation would not be sited on protected lands, so the study areas were assessed for the presence of these lands so they could be avoided.

- 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)

Lands under conservation easements were identified. The consistency of a substation with such an easement will depend on the specific language of each easement.

4.2.3. Tribal Land

Tribal lands within the study areas or within 5 miles of the study areas were identified. This information was used to assess possible direct impacts (effects on buried resources) and indirect effects (viewshed and cultural landscapes). The following data were used for the evaluation of potential effects on tribal lands.

- The federal Bureau of Indian Affairs list (with locations via Google Maps)⁸
- California Tribal Communities, as identified by the California Courts⁹

4.2.4. Cultural Resources

The following confidential data were 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 data
- California Historical Resources Information System (CHRIS) searches from the Northwest Information Center within the Humboldt study area provided data used to determine the number of eligible sites within each study area and how their locations could affect substation siting.

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

- If federal permits are required, 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.

⁸ <https://www.bia.gov/sites/default/files/dup/assets/bia/pacreg/Central%20California%20Agency%20Jurisdictional%20Map.pdf>

⁹ <https://www.courts.ca.gov/3066.htm>

4.2.5. Aesthetics and Visual Sensitivity

The following data were considered in the assessment of how a new substation could affect viewers:

- California Scenic Highways (designated or proposed)
- BLM Visual Resource Methodology Classes I and II

4.2.6. Biological Resources

The following data were considered in the assessment of biological resources. The study areas were 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.

- **U.S. Fish & Wildlife Service (USFWS) Critical Habitat:** The study areas 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 study areas 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 study area 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: The study areas were assessed based on the presence of these designated habitats.
- **CNDDDB Fish & Aquatic Species Occurrences:** Both total number of species and total number of special-status fish and aquatic species occurrences within the past 30 years.
- **Important Bird Areas (IBAs):** IBAs were considered because of the potential for new transmission and substation infrastructure to cause collisions with birds in flight.
- **CNDDDB Avian Species Occurrences:** Both total number of avian species and total number of special-status avian species occurrences within the past 30 years.
- **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 were 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 continuous barrier bisecting an ECA and wildlife migration and movement could continue around fenced substations.
- **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 of the study areas contain essential fish habitat; therefore, it provides no useful information for comparison.
- **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 among sites.

4.2.7. Cropland and Agricultural Resources

The California Department of Conservation (DOC) includes no data on Prime or Unique Farmland within Humboldt County. Extensive mapping of soil types has not been completed for Humboldt County. Therefore, Humboldt County is not included in the DOC's Farmland Mapping and Monitoring Program. The County's agricultural soils were mapped in a 1965 cooperative project between the Department of Soils and Plant Nutrition, University of California, Davis, and the County of Humboldt.¹⁰

- Agricultural Land Soils Shapefile¹¹

4.2.8. Hazards

The study areas were assessed for the presence and extent of the following potential hazards:

- Tsunami risk (using California Geological Survey Tsunami Hazard Zones)
- Flood risk (using Federal Emergency Management Agency [FEMA] Flood Hazard Zones)
- Wildfire risk (using both FEMA fire risk mapping and CalFire Fire Hazard Severity Zones)
- Alquist-Priolo Fault Hazard Zones
- Landslide Susceptibility (mapping ranks 9 and 10, most severe)
- U.S. Environmental Protection Agency (EPA) Superfund Areas

4.2.9. Airports and Airspace Limitations

The study areas were assessed for the presence of the following airspace and military limitations. The size and classification of the airspace and military areas were used to summarize possible safety hazards associated with substation facilities.

- Class Airspace (≤ 500 feet):¹² 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)
- Airport Locations: Number of airports within 1 mile
- Special-Use Airspace (≤ 500 feet)

¹⁰ [POPULATION\(humboldtgov.org\)](http://POPULATION(humboldtgov.org)) – Humboldt County General Plan Updated – Natural Resources and Hazards

¹¹ <https://humboldtgov.org/276/GIS-Data-Download>

¹² https://www.faa.gov/air_traffic/publications/atpubs/aim_html/chap3_section_2.html

4.2.10. Disadvantaged Communities

Based on the definitions from CalEnviroScreen per SB 535¹³ there are no Disadvantaged Communities in the vicinity of the Humboldt or Samoa study areas.

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.¹⁴

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 recognized tribal areas as identified by the Census in the 2021 American Indian Areas Related National Geodatabase.¹⁵

These communities are identified in this study because transmission line construction and operation contribute 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.

Another federal source of disadvantaged community data¹⁶ is provided by the Climate and Economic Justice Screening Tool. This web map uses different data sources than CalEnviroScreen; its map highlights census tracts that are overburdened and underserved as being disadvantaged. In the Humboldt and Samoa study areas, this map shows the Samoa Peninsula as being disadvantaged.

¹³ Senate Bill 535 (De Leon, Statutes of 2012): <https://oehha.ca.gov/calenviroscreen/sb535>.

¹⁴ https://calepa.ca.gov/wp-content/uploads/sites/6/2022/05/Updated-Disadvantaged-Communities-Designation-DAC-May-2022-Eng.a.hp_-1.pdf

¹⁵ <https://oehha.ca.gov/calenviroscreen/sb535>

¹⁶ <https://screeningtool.geoplatform.gov/en/#6.78/40.133/-122.697>

5. SUBSTATION SITE EVALUATION

This section defines the land uses and anticipated environmental constraints and challenges for each of the two study areas. For each area, discussion addresses the following topics:

- Land ownership and land uses: a description of public and private lands, existing development, and parcel size.
- Challenges or concerns for substation 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 study area are summarized in a table.
- The challenges and concerns for the corridors as a whole are summarized and presented in a simplified map of each study area.

5.1. Humboldt Study Area

5.1.1. Land Ownership and Land Uses

The land within the Humboldt study area is unincorporated Humboldt County land, with the exception of a small area within the City of Eureka (west of Walnut Drive and south of Lundblade Drive).

The land ownership within the study area is mostly private. The two areas of public lands are the large McKay Community Forest and a small portion of the Humboldt Bay National Wildlife Refuge (at the far western end of the study area).

Areas with parcels of 10 acres or less are concentrated at the far western end of the study area (including Humboldt Hill, Fields Landing, and King Salmon), and along Elk River Road and Walnut Drive (Pine Hills area) (see Figure 3). There is another area of smaller parcels in the northeastern corner of the study area (Mitchell Heights).

Aside from the Mitchell Heights area, nearly all of the eastern third of the study area is owned by the Green Diamond Resource Company, which has granted a conservation easement to Cal Fire. The easement allows Green Diamond to continue with timber harvesting, but it also prioritizes habitat conservation and watershed protection.

5.1.2. County Zoning

County zoning is defined separately for the Coastal Zone and the Inland Zone (see Figure 1 for zone boundaries). This study focuses primarily on the Inland Zone because most of the study area is in the Inland Zone and a substation could be permitted with a Conditional Use Permit in most inland County zones. Table 2 defines the acreage of land within various county zones.

Table 2. County Zoning in Humboldt Study Area

County Zone	Acres Within Study Area	Percent of Study Area
Residential (R-1, R-2, R-3, R-4, RA, RM, and RS)	3,560	32.8%
Agricultural (AG, AE)	2,525	23.3%
Commercial and Manufacturing (C-1, C-3, CG, CR)(MC, MG)	119	1.1%

County Zone	Acres Within Study Area	Percent of Study Area
Timber Production Zone (TPZ)	4,185	38.6%
Natural Resources and Public Facility (NR, PF)	150	1.4%

County zoning within the study area includes the following (see Figure 2):

- **Residential** (R-1, R-2, R-3, R-4, RA, RM, and RS): Allowed development varies among the residential zones in lot size, setbacks, and structures permitted. In general, substation installation is not prohibited in residential zones, but in a meeting, the County Planning team emphasized the importance of balancing the energy development with retention of land zoned for residences.¹⁷
- **Agricultural**: In zones defined for Agricultural (AE: agriculture exclusive; AG: agriculture general), the zoning code defines that these are areas where the agriculture is the desirable predominant use,¹⁸ but a substation would not be prohibited.
- **Timber Production Zone** (TPZ): These lands (which include 38.6% of the study area as shown in Table 1) are designated for timber production and the zoning regulations encourage uses that would detract from the use of the land for timber harvest. Development of energy utility infrastructure within a TPZ zoned parcel would require a Conditional Use Permit.
- **Commercial** (C-1, C-3, CG, CR), and **Industrial** (MC, MG): Substations could be permitted with a Conditional Use Permit.
- **Natural Resources** (NR) and **Public Facility** (PF) zones would not be appropriate for a substation.

5.1.3. Challenges or Concerns for Substation Planning and Permitting

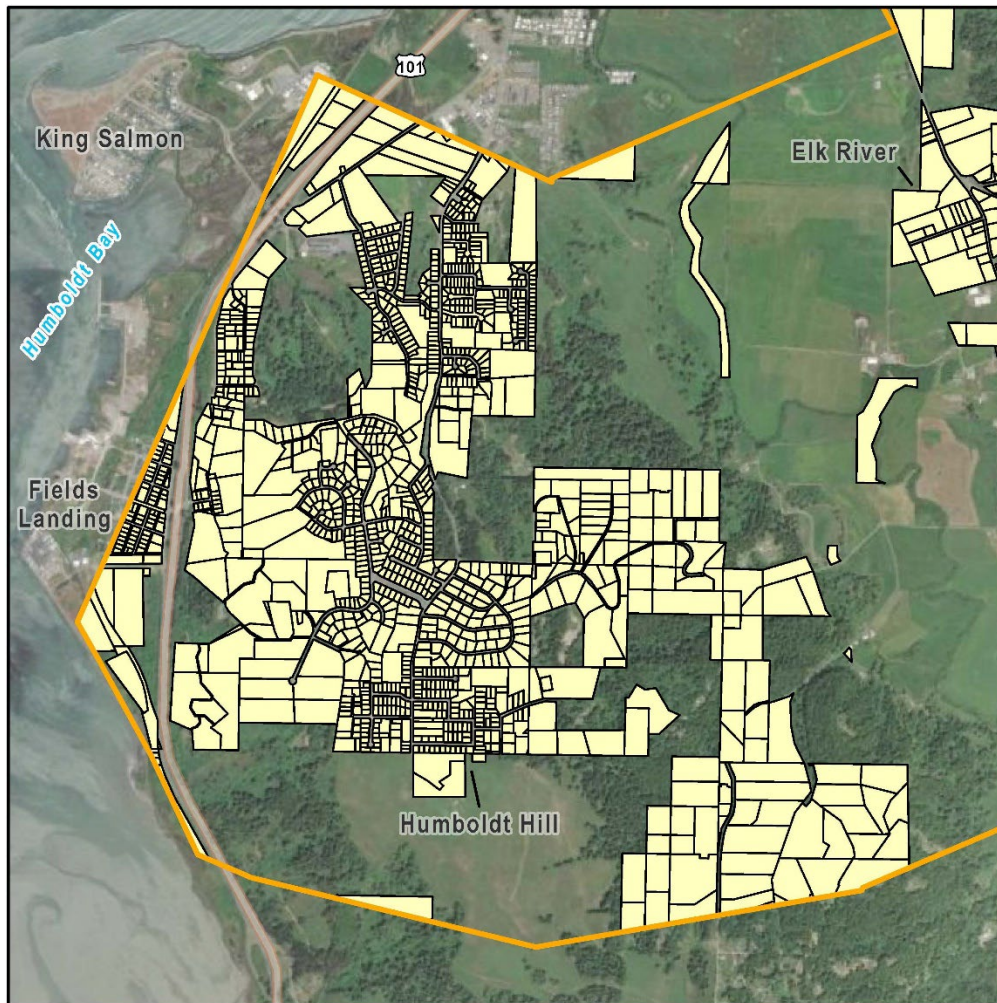
The following lands within the study area were excluded from study because they are not appropriate for a large substation:

- Alquist-Priolo active fault zone around Humboldt Hill (see Figure 2)
- Tsunami Hazard Zones along the Elk River valley, near King Salmon, and along the Marin Slough south of Pine Hill Road (see Figure 2)
- Parks and preserves (McKay Community Forest, including the conservation easement adjacent to it; the Humboldt Bay National Wildlife Refuge is adjacent to the study area at its southwest edge)
- Areas with parcels of 10 acres or less, because these parcels define areas of dense residential development. Figure 3 illustrates an area where smaller parcels exist.

¹⁷ Personal communication, Meeting May 29, 2024 with County Planning staff

¹⁸ <https://humboldt.county.codes/Code/314-7>

Figure 3. Parcels Smaller than 10 Acres in Humboldt Study Area

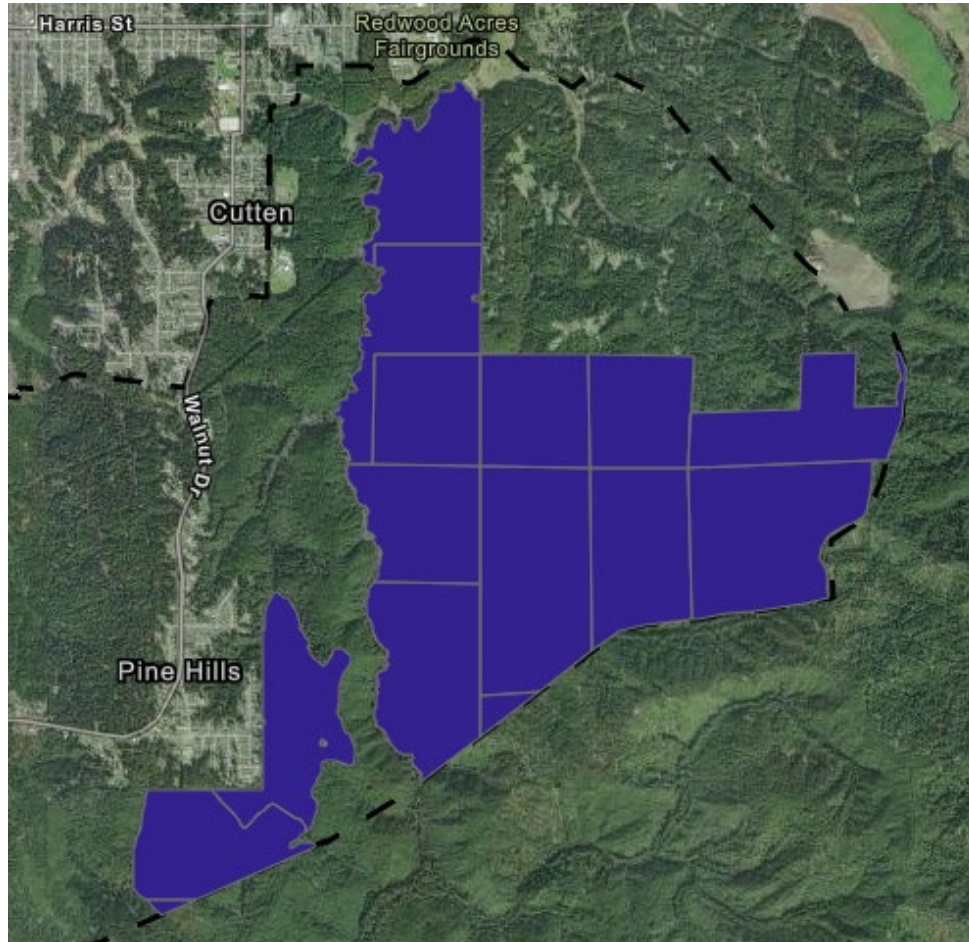


Other areas of serious concern were identified but not excluded from study. These areas include:

- Important Bird Areas, which occur along the entire Elk River Valley
- Areas with residential zoning but that are not yet developed
- Areas with steepest slopes or with landslide potential, where design and engineering may be able to resolve concerns
- The Ryan Creek Conservation Easement, which covers over 2,400 acres of the study area (nearly the entire eastern third). This easement does not cover all of the land zoned as a Timber Production Zone but it does cover most of it. Figure 4 shows the extent of the easement.
- Cultural Resources: A cultural resources records search was completed. Its results identified that two areas contain previously recorded resources: along the Elk River (western study area) and in the timber zone at the eastern quarter of the study area. The resources in these areas are historic resources like railroad grades, farms, residences, and refuse dumps. Within the far eastern edge of the study area, a significant eligible historic refuse dump was identified. Siting in this location would likely lead to a data recovery excavation of this resource. In general, the substation study area is sensitive for buried prehistoric resources, especially along its western edge due to its close

proximity to the coast and the Elk River. In addition, a request to the Native American Heritage Center (NAHC) resulted in a positive response, indicating that there are lands within or adjacent to the study area boundaries that are considered to be Sacred Lands.

Figure 4. Ryan Creek Conservation Easement



Other Less Serious Concerns

- Essential Fish Habitat exists along all streams and rivers, so was not avoided
- BLM Visual Resource Inventory Class II, which is defined as an area where the objective would be to retain the existing character of the landscape, but this area includes no BLM-administered federal lands
- There are few recorded cultural resources in the central portion of the study area, likely due to the lack of cultural resources surveys in the area.
- There is one area of Native American tribal land within 5 miles of the study area: the Table Bluff Rancheria of the Wiyot Tribe. The Rancheria is located about 2 miles southwest of Humboldt Hill and a substation within the study area would be shielded from the Rancheria's view by local topography.

5.1.4. Humboldt Substation Study Area: Conclusions

The study area has been divided into zones: three areas where substation siting would likely be infeasible (Zones A, B, and C), and three areas where siting may be possible (Zones 1, 2, and 3). These areas are illustrated on Figure 5.

The avoidance areas are as follows:

- **Zone A:** Active fault zone, tsunami zone, small parcels with dense residential development as shown in Figures 2 and 3, and commercial zoning
- **Zone B:** Small parcels with dense residential development, McKay Community Forest and conservation easements granted to the County for expansion of the McKay Community Forest
- **Zone C:** Small parcels with residential development

The three areas within which substation siting may be feasible are as described below.

Zone 1 – Elk River: This land is zoned AG, AE, and low-density residential, and has little existing development. Concerns that require further research in this zone are:

- Identifying appropriate setbacks from nearby residential areas
- Location adjacent to Important Bird Areas where future transmission lines may have to be sited
- Design and engineering to consider flood potential along the Elk River floodplain, where flooding during the wet season occurs regularly

Zone 2 – South Eureka: This land is primarily County land zoned R-1 but includes the southern section of the City of Eureka (currently undeveloped). It also includes areas of Timber Production Zones just south of the Bayview area. Concerns that require further research in this zone are:

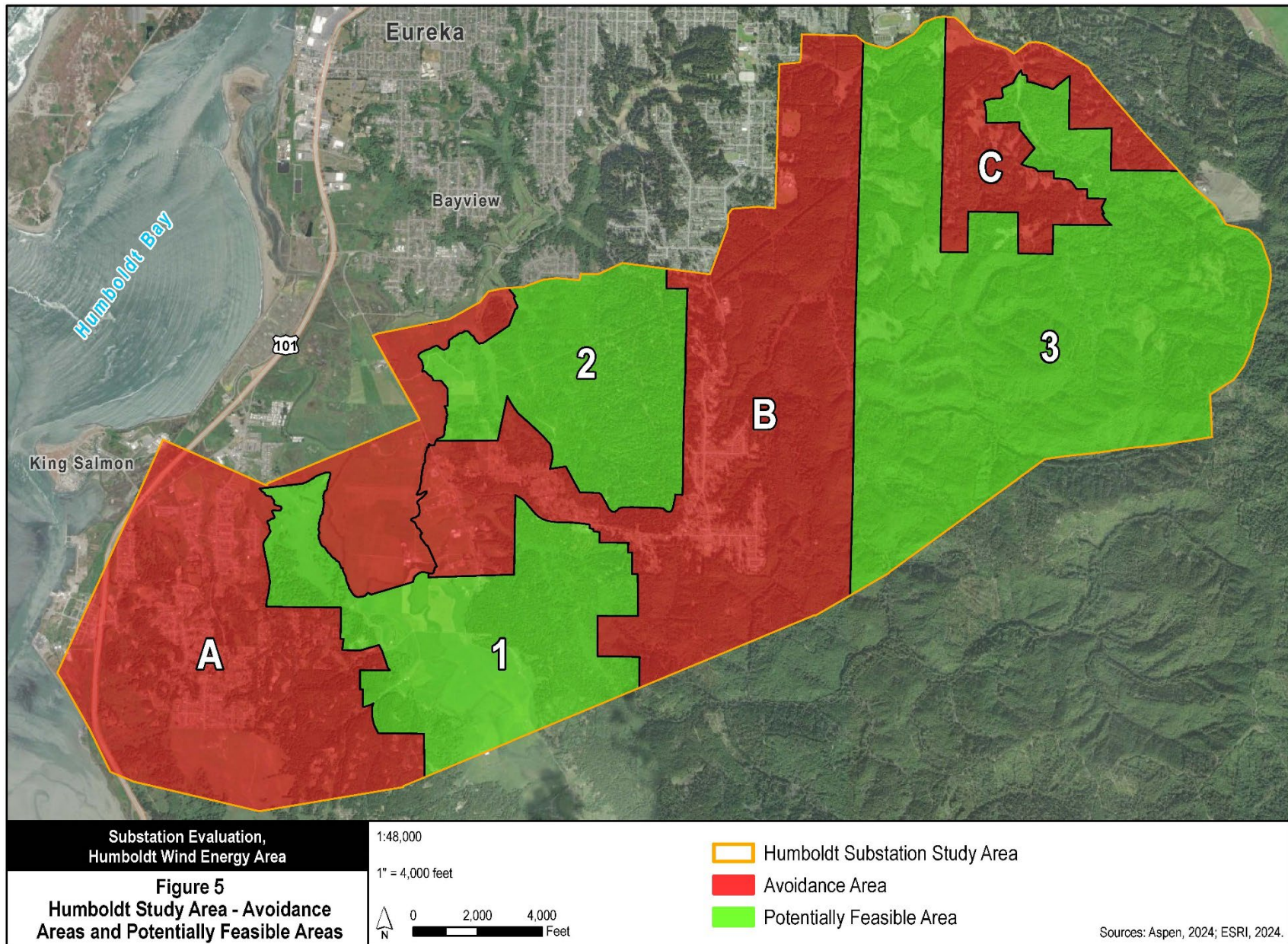
- City and County agreement that zoning is appropriate
- Identifying appropriate setbacks from nearby residential areas

Zone 3 – Ryan Creek: This land is entirely zoned as Timber Production Zone (TPZ) land. It is primarily land under Conservation Easement, but it includes other undeveloped lands not included in the easement. It also includes several hundred acres of lands that have recently been harvested for timber, so substation construction in these areas would require minimal tree removal. Concerns that require further research in this zone are:

- Identification of existing or nearby roads that could be made usable for access by large equipment, and the consistency of such road use with the Conservation Easement and County Planning guidance.
- Identification of specific parcels that are not encumbered by the Conservation Easement: there are some parcels on the eastern edge of the study area that are zoned AE and TPZ that are not within the easement area.
- Determination of compliance with the terms of the Conservation Easement (which does allow for renewable energy and energy facilities).

The potential need for grading a large substation pad and associated access roads (given the existing slopes) and concurrent requirement to protect water quality as a term of the Conservation Easement.

Figure 5. Humboldt Study Area - Avoidance Areas and Potentially Feasible Areas



5.2. Samoa Study Area

5.2.1. Land Ownership and Land Uses

The Samoa Peninsula is about 10 miles long and 1 mile wide. Native Americans used the peninsula for fishing and for ceremonial purposes.¹⁹

The channel separating the north and south peninsulas was created, and is maintained, by dredging in order to establish a channel to support commercial shipping. Since the late 1800's the peninsula was used for a sawmill and for worker housing, then a lumber company and a ship-building facility.²⁰ The sawmill was purchased by Georgia-Pacific Corporation in 1956 and operation continued until 1980.

The peninsula includes three residential areas: Samoa, Manila, and Fairhaven. It also includes the Manila and Samoa Dunes, which are ecologically diverse. Parklands include the BLM-administered Samoa Dunes Recreation Area (300 acres at the south end of the peninsula), the Samoa Dunes and Wetlands,²¹ and the Samoa Boat Ramp County Park and Campground.

About 500 acres of the Samoa Peninsula, between the communities of Samoa and Fairhaven, are zoned for Industrial land use, much of which is designated for Coastal Dependent uses. This is the area studied for a potential substation site.

5.2.2. Challenges for Substation Planning and Siting

There are two major challenges affecting the feasibility of siting of a major substation on the Samoa Peninsula: tsunami risk and transmission line siting.

Tsunami Risk. Nearly the entire peninsula is within a Tsunami Hazard Zone (see Figure 6). The peninsula is covered with dune sands that are typically forested and reach as much as 60 to 70 feet above sea level near the town of Samoa. Overall, less than 2 percent of the study area is outside of the risk zone. There is a Tsunami Evacuation Site in the town of Samoa on one of these high points. However, to the south (where the substation could be located), the dunes are generally less than 20 feet in elevation²² and the tsunami risk is high in an area of such low elevation. Critical infrastructure is not typically considered to be compatible with this level of risk.

Transmission Line Siting. The other major challenge associated with building a major substation on the Samoa Peninsula is that several 500 kV and/or HVDC transmission lines would have to be installed east of the substation to connect with the State's transmission grid (i.e., Fern Road or Collinsville Substation). The Samoa Peninsula is separated from the mainland by about 1,800 feet. While an overhead AC or submarine HVDC transmission line could cross this distance, either line would land in downtown Eureka, with no clear path to the east. An alternative transmission line route could follow the existing 60 kV transmission line that runs north and east around Humboldt Bay, circumventing many of the denser residential areas.

The industrial area of Samoa is about 3.5 miles north of the Humboldt Bay Substation, and given the dense development within Eureka, and in the area immediately east of the substation, defining a route for one or more major transmission lines in these areas would be extremely challenging.

¹⁹ <https://humboldt.gov/DocumentCenter/View/102301/34-Cultural-Resources-PDF>

²⁰ https://en.wikipedia.org/wiki/Samoa,_California

²¹ <https://www.friendsofthedunes.org/property>

²² <https://humboldt.gov/DocumentCenter/View/71168/45-Geology-Soils-and-Seismicity-PDF>

Other Concerns. Besides the engineering and feasibility concerns associated with tsunami risk and transmission line siting, two other serious environmental concerns exist in the Samoa study area:

- **Disadvantaged Community.** The entirety of the industrially zoned area is within a Disadvantaged Community, as defined by the Climate and Economic Justice screening tool, but it is not disadvantaged as defined in the SB 535 assessment. While one of the valuable goals of offshore wind development is to bring good jobs to communities that have been disadvantaged by loss of these jobs from industries that have left the region, it is also important to acknowledge that a substation and the required transmission lines would add to the industrial burden of the Samoa Peninsula.
- **Important Bird Area.** All of the Samoa study area is within an Important Bird Area (see Figure 6). Given the need to install numerous transmission lines to interconnect a major substation in this area, the high bird use would likely result in significant collision risk.

5.2.3. Samoa Substation: Conclusions

For the reasons defined in Section 5.2.2 and illustrated in Figure 6, a major substation on the Samoa Peninsula is not considered to be feasible.

Figure 6. Samoa Study Area Siting Constraints



APPENDIX 1: GEOSPATIAL DATA SOURCES

California Department of Conservation

Alquist-Priolo Fault Hazard Zones

<https://maps-cnra-cadoc.opendata.arcgis.com/datasets/cadoc::cgs-seismic-hazards-program-alquist-priolo-fault-hazard-zones/about>

Landslide Susceptibility

<https://gis.conservation.ca.gov/portal/home/item.html?id=87289025c11d4ba7ae65f0f472bf7c2d>

California Department of Fish & Wildlife

California Natural Diversity Database

<https://wildlife.ca.gov/Data/CNDDDB/Data-Updates>

Essential Connectivity Areas

<https://data.cnra.ca.gov/dataset/essential-connectivity-areas-california-essential-habitat-connectivity-cehc-ds620>

Owned and Operated Lands and Easements

<https://wildlife.ca.gov/Data/GIS/Clearinghouse>

State Refuges

<https://wildlife.ca.gov/Data/GIS/Clearinghouse>

Wild and Scenic Rivers (State Designations Only)

https://gis.data.ca.gov/datasets/708e420c300b4f9793af993a2612dbd4_0/about

California Department of Forestry and Fire Protection

California Land Ownership (USFS and BLM)

<https://www.fire.ca.gov/what-we-do/fire-resource-assessment-program/gis-mapping-and-data-analytics>

Incorporated Cities

<https://gis.data.ca.gov/datasets/CALFIRE-Forestry::california-incorporated-cities-1/about>

California Office of Environmental Health Hazard Assessment

Disadvantaged Communities

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

California Protected Areas

California Conservation Easement Database

<https://www.calands.org/cced/>

California Protected Areas Database<https://www.calands.org/cpad/>**California Department of Transportation***California Scenic Highways*<https://www.arcgis.com/apps/webappviewer/index.html?id=465dfd3d807c46cc8e8057116f1aaca>**California Geological Survey***Tsunami Hazard Areas*https://maps.conservation.ca.gov/cgs/informationwarehouse/ts_evacuation/**California Parcels***Statewide Parcels*<https://www.arcgis.com/home/item.html?id=f937000d00c340fb8b502fdd16e30882>*Humboldt County*<https://humboldt.gov/276/GIS-Data-Download>**Council on Environmental Quality***Climate and Economic Justice Screening Tool*<https://screeningtool.geoplatform.gov/en/#6.78/40.133/-122.697>**County of Humboldt, Planning and Building***Agricultural Soils*<https://humboldt.gov/276/GIS-Data-Download>**Federal Aviation Administration***Airport Locations*<https://adds-faa.opendata.arcgis.com/datasets/faa::airports-1/about>*Class Airspace*<https://adds-faa.opendata.arcgis.com/datasets/faa::class-airspace/about>*Military Training Routes*<https://adds-faa.opendata.arcgis.com/datasets/faa::mtr-segment-1/about>**Federal Emergency Management Agency***National Flood Hazard Layer*<https://hazards.fema.gov/femaportal/NFHL/searchResult>
<https://hazards.fema.gov/femaportal/NFHL/searchRes11ult>

National Risk Index Wildfire Risk

<https://hazards.fema.gov/nri/data-resources#gdbDownload>

Federally Recognized Tribal Lands

**ESRI Living Atlas (within ArcGIS Pro): American Indian, Alaska Native, and Native Hawaiian Areas
National Audubon Society**

Important Bird Areas

<https://ca.audubon.org/conservation/california-important-bird-areas-gis-data-and-methods>

National Oceanic and Atmospheric Administration*National Marine Fisheries Service Critical Habitat*

<https://noaa.maps.arcgis.com/home/item.html?id=f66c1e33f91d480db7d1b1c1336223c3>

West Coast Essential Fish Habitat

<https://www.habitat.noaa.gov/application/efhinventory/index.html>

West Coast Habitat Areas of Particular Concern

<https://www.habitat.noaa.gov/application/efhinventory/index.html>

National Park Service*California National Historic Trail*

<https://irma.nps.gov/DataStore/Reference/Profile/2238903>

National Natural Landmarks

<https://services1.arcgis.com/fBc8EJBxQRMcHlei/ArcGIS/rest/services/NonSensitiveNNLs/FeatureServer>

National Park Service Tract and Boundary Data

<https://public-nps.opendata.arcgis.com/datasets/nps::nps-land-resources-division-boundary-and-tract-data-service/about?layer=2>

National Register of Historic Places

https://services1.arcgis.com/fBc8EJBxQRMcHlei/ArcGIS/rest/services/National_Register_Points/FeatureServer/0

US Bureau of Land Management*Areas of Critical Environmental Concern*

<https://gbp-blm-egis.hub.arcgis.com/datasets/BLM-EGIS::blm-ca-areas-of-critical-environmental-concern/about?layer=0>

National Monuments

<https://gbp-blm-egis.hub.arcgis.com/datasets/BLM-EGIS::blm-natl-nlcs-national-monuments-national-conservation-areas-polygons/about>

Visual Resource Management

<https://gbp-blm-egis.hub.arcgis.com/datasets/BLM-EGIS::blm-natl-visual-resource-inventory-classes-polygons/about>

US Environmental Protection Agency*Superfund Areas*

<https://catalog.data.gov/dataset/npl-superfund-site-boundaries-epa1>

US Fish & Wildlife Service*Critical Habitat*

<https://ecos.fws.gov/ecp/report/table/critical-habitat.html>

National Wetlands Inventory

<https://www.fws.gov/program/national-wetlands-inventory/download-state-wetlands-data>

National Wildlife Refuges

<https://www.fws.gov/service/national-wildlife-refuge-system-gis-data-and-mapping-tools>

US Department of Agriculture Forest Service*National Wilderness Areas*

<https://data.fs.usda.gov/geodata/edw/datasets.php?xmlKeyword=national+wilderness+areas>

National Wild and Scenic Rivers

<https://data.fs.usda.gov/geodata/edw/datasets.php?xmlKeyword=scenic+river>