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ATTACHMENTS 5.13-A– 5.20-A
TO PROPONENT'S ENVIRONMENTAL ASSESSMENT

ATTACHMENT 5.13-A: NOISE AND VIBRATION IMPACT ASSESSMENT REPORT

LS Power Grid California, LLC

Noise and Vibration Impact Assessment Report

Manning 500/230 Kilovolt Substation Project
Fresno County, California

Revision 1

November 30, 2023

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Acronyms and Abbreviations

AC	Alternating Current
ANSI	American National Standards Institute
BPA	Bonneville Power Administration
Cadna-A	Computer Aided Noise Abatement
CAISO	California Independent System Operator
Caltrans	California Department of Transportation
CEQA	California Environmental Quality Act
CNEL	Community Noise Equivalent Level
CPUC	California Public Utilities Commission
dB	Decibel (unweighted)
dBA	Decibel (A-weighted)
FHWA	Federal Highway Administration
FTA	Federal Transit Administration
GIS	Gas Insulated Switchgear
HVAC	Heating, Ventilation, and Air Conditioning
Hz	Hertz
ID	Identification
ISO	International Organization for Standardization
kV	Kilovolt
L_{dn} or DNL	Day-Night Sound Level
L_{eq}	Equivalent Sound Level
$L_{eq(day)}$	Continuous Equivalent Sound Level Between 07:00 AM and 10:00 PM
$L_{eq(night)}$	Continuous Equivalent Sound Level Between 10:00 PM and 07:00 AM
L_{max}	Maximum Sound Level
L_{PA}	Sound Pressure Level
L_{WA}	Sound Power Level
L_x	Sound Level Exceed x Percent of a Specified Time Period
LSPGC	LS Power Grid California, LLC
MVA	Mega Volt Ampere
NVIA	Noise and Vibration Impact Assessment
ONAN	Oil Natural Air Natural
ONAF	Oil Natural Air Forced (First Stage Cooling)

ONAF2	Oil Natural Air Forced (Second Stage Cooling)
PG&E	Pacific Gas and Electric Company
PPV	Peak Particle Velocity
RCNM	Roadway Construction Noise Model
ROW	Right-of-Way
SLM	Sound Level Meter
USEPA	United States Environmental Protection Agency
WSDOT	Washington State Department of Transportation

Executive Summary

Arcadis Inc. (Arcadis), on behalf of LS Power Grid California, LLC (LSPGC), a wholly owned subsidiary of LS Power, has prepared this noise and vibration impact assessment (NVIA) report to evaluate noise and vibration impacts for the Manning 500/230 Kilovolt (kV) Substation Project (Proposed Project) in unincorporated Fresno County, California. The Proposed Project involves the construction of a substation and transmission lines to address the California Independent System Operator (CAISO)-identified overloads on the existing Borden-Storey 230 kV transmission lines and facilitate the advancement of renewable energy generation within the Westlands/San Joaquin Valley area. The Manning Substation site will occupy approximately 12 acres of approximately 40 acres of land, including additional space for future buildout. This NVIA report provides an evaluation of the potential noise and vibration impacts from the Proposed Project during construction, operation, and maintenance based on standards of impact significance derived from Appendix G of the California Environmental Quality Act (CEQA) Noise Guidelines.

Arcadis identified locations of sensitive receptors using aerial maps and geographic information systems. One (1) sensitive receptor was identified within one mile (5,280 feet) radius from the new substation boundary and two (2) sensitive receptors were identified within a quarter mile (1,320 feet) of the new LSPGC 230 kV transmission lines and Pacific Gas and Electric Company (PG&E) proposed 230 kV rebuild lines. All three identified sensitive receptors are single-family residential homes.

A three-dimensional industrial noise model was built for the new Manning Substation combining digital elevation data with the sound source specifications and coordinates, sensitive receptor coordinates, and sound propagation parameters to generate a sound model for the Proposed Project. The resulting model was then used to perform sound emission calculations using International Organization for Standardization (ISO) 9613-2 method. Corona-generated audible noise from the new transmission lines was predicted using methods and equations developed by the Bonneville Power Administration (BPA). The BPA audible noise calculation method is an empirical method developed from long-term statistical measurements on a number of full-scale operating or test transmission lines.

The findings of this NVIA report are that under CEQA, the noise impact associated with the construction, operation, and maintenance of the Proposed Project would be less than significant. Similarly, vibration impact associated with the construction of the Proposed Project would be less than significant; however, vibration from the Proposed Project's operation and maintenance would result in no impact.

1 Introduction

LS Power Grid California, LLC (LSPGC), a wholly owned subsidiary of LS Power established to own and operate transmission projects in California, is proposing the Manning 500/230 kilovolt (kV) Substation Project (Proposed Project) to be located in unincorporated Fresno County, California. The Manning Substation site will occupy approximately 12 acres of an approximately 40 acres of land, including additional space for future buildout. The Proposed Project involves the construction of a substation and transmission lines to address the California Independent System Operator (CAISO)-identified overloads on the existing Borden-Storey 230 kV transmission lines and facilitate the advancement of renewable energy generation within the Westlands/San Joaquin Valley area.

The main components of the Proposed Project include:

- Constructing an approximately 12-acre 500/230 kV substation (Manning Substation);
- Constructing an approximately 12-mile-long double-circuit 230 kV line from the proposed LSPGC Manning Substation to PG&E's existing Tranquillity Switching Station;
- Interconnecting the following PG&E lines into the proposed LSPGC Manning Substation:
    - Los Banos-Midway #2 500 kV Line (approximately 0.75 mile),
    - Los Banos-Gates #1 500 kV Line (approximately 0.75 mile), and
    - Panoche-Tranquillity #1 and #2 230 kV lines (approximately 4.2 miles each); and
- Rebuilding approximately 7 miles of PG&E's existing Panoche-Tranquillity #1 and #2 230 kV lines.[1]

For the purpose of this report, the LSPGC Manning 500/230 kV Substation is referred to as Manning Substation or new substation. The LSPGC new 230 kV line is referred to as new 230 kV line or new transmission lines. The PG&E 500 kV interconnecting lines and PG&E 230 kV interconnecting lines are referred to as 500 kV interconnection lines and 230 kV interconnection lines, respectively (or collectively referred to as interconnection lines). The PG&E 230 kV rebuild lines is referred to as 230 KV rebuild lines or rebuild lines.

Arcadis was retained by LSPGC to prepare a NVIA report for the Proposed Project as part of the Proponent's Environmental Assessment that will be submitted to the California Public Utilities Commission (CPUC). The Manning Substation will include seven single phase 500/230 kV autotransformers (six operating, one spare), two 500 kV series capacitors banks, two control houses, 500 kV gas insulated switchgear (GIS) enclosed in a hall, and 230 kV GIS enclosed in a hall. The Manning Substation would be surrounded by prefabricated interlocking security wall that would be 10 feet tall with 1 foot of barbed wire on top. The access gate would have an opening of 16 feet in width.

The Manning-Tranquillity 230 kV #3 and #4 transmission lines would be approximately 12 miles in length within an approximately 120-foot-wide right-of-way. The Proposed Project would leverage existing roads and cleared areas around existing structures to the extent practical. However, temporary access roads would be required to

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1 PG&E would be responsible for interconnecting the existing Los Banos-Midway #2 and Los Banos-Gates #1 500 kV transmission lines and the Panoche-Tranquillity #1 and #2 230 kV transmission lines into the proposed LSPGC Manning Substation. PG&E would route these transmission line extensions to a point within 100 feet of the proposed LSPGC Manning Substation wall, where they would terminate on dead-end structures owned by PG&E. PG&E would also be responsible for rebuilding approximately 7 miles of its Panoche-Tranquillity #1 and #2 230 kV transmission lines and making any necessary adjustments to the existing series capacitors on the Los Banos-Midway #2 and Los Banos-Gates #1 500 kV transmission lines.

provide access to some structures and construction areas. New permanent access roads may be constructed for access to structures, where needed, based on engineering design and landowner feedback.

The proposed transmission line would be constructed using predominantly self-supported double-circuit tubular steel monopoles with a vertical conductor configuration and two overhead optical ground wires. The LSPGC 230 kV structures and the PG&E 230 kV structures range from 70 to 199 feet; the PG&E 500 kV structures range from 100 to 160 feet. Typical structures would be supported by direct-embed foundations. Where required, dead-end and angle structures would also be supported using guy wires and anchors. Modifications to PG&E's existing Tranquillity Switching Station as well as the Los Banos, Panoche, Gates, and Midway substations would not generate any significant noise or vibration and are therefore, excluded from this NVIA report.

The Proposed Project is located in a remote area with few scattered rural residences, electrical utilities (PG&E-owned switching station and power lines), and open land; land use within the Proposed Project is predominantly agricultural. The Manning Substation is generally bound by Manning Avenue the north, an unnamed private road to the east, Mountain View Avenue to the south, and Tumey Hills to the west. Interstate 5 (West Side Freeway) is located east and northeast of the new substation site. The new transmission lines traverse through few isolated residences and open-space areas (mostly agricultural parcels) within the unincorporated Fresno County. A Project Overview map showing the location of the Manning Substation site, new transmission lines, interconnection lines, and rebuild lines is included in **Figure 1**. The Proposed Project components are depicted in more detail in **Figure 2**.

The nearest sensitive receptors to the Manning Substation site and new transmission lines are shown in **Figure 3**. The noise and vibration study area for the Proposed Project covers one mile (5,280 feet) radius of the new substation and quarter mile (1,320 feet) of the new transmission lines. The nearest sensitive receptor to the center of the Manning Substation site is an isolated residence (depicted as R3 in **Figure 3**) located approximately 3,400 feet northeast. The nearest residences to the new 230 kV line are approximately 190 feet north of the line (R2 in **Figure 3**) and 1,090 feet south of the line (R1 in **Figure 3**), respectively. The rebuild lines parallel the new 230 kV lines in the area near R1 and R2. R1 is approximately 1,120 feet south of the 230 kV rebuild lines and R2 is adjacent to the 230 kV rebuild lines. There are no sensitive noise receptors within a quarter mile (1,320 feet) of the interconnection lines (500 kV and 230 kV lines).

The objectives of this NVIA report are as follows:

- Identify applicable noise and vibration regulations.
- Estimate Project-related noise and vibration levels at nearest sensitive receptors during construction, operation, and maintenance.
- Determine whether the Proposed Project can operate in compliance with the applicable noise and vibration regulatory standards and CEQA impact significance thresholds and recommend mitigation measures if needed.

This NVIA report includes a description of the Proposed Project site, noise and vibration fundamentals, applicable regulations and standards, existing noise and vibration conditions, modeling and impact significance analysis for construction, operations, and maintenance, and concluding comments.

2 Fundamentals of Noise and Vibration

2.1 Basic Noise Concepts

The terms 'sound' and 'noise' tend to be used interchangeably, but noise can be defined as unwanted sound, whereas sound is a normal and desirable part of life. However, when noise is imposed on people it can lead to disturbance, annoyance, and other undesirable effects. Sound is physically characterized by amplitude and frequency. The amplitude of sound is measured in decibels (dB) as the logarithmic ratio of a sound pressure to a reference sound pressure (20 micro-Pascals). The reference sound pressure corresponds to the typical threshold of human hearing. To the average listener, a 3-dB change in a continuous broadband sound is considered "just barely perceptible"; a 5-dB change is considered "clearly noticeable"; and a 10-dB change is considered a doubling (or halving if the sound is decreasing) of the apparent loudness and can cause an adverse response. Sound waves can occur at different frequencies, which correspond to the sound's wavelength. Frequency is measured in Hertz (Hz), which is the number of wave cycles per second that occur. The typical human ear can hear frequencies ranging from approximately 20 to 20,000 Hz. Normally, the human ear is most sensitive to sounds in the middle frequencies (1,000 to 8,000 Hz) and is less sensitive to sounds in the lower and higher frequencies. As such, the A-weighting scale was developed to simulate the frequency response of the human ear to sounds at typical environmental levels. The A-weighting scale emphasizes sounds in the middle frequencies and de-emphasizes sounds in the low and high frequencies. Any sound level to which the A-weighting scale has been applied is expressed in A-weighted decibels, or dBA. Sound levels and relative loudness of common noise sources are presented for reference in **Table 2-1**.

Table 2-1. Sound Levels of Common Noise Sources

Common Noise Source	Noise Levels, dBA
Threshold of pain	140
Jet taking off (200 feet away)	130
Operating heavy equipment	120
Night club (with music)	110
Construction site	100
Boiler room	90
Freight train (100 feet away)	80
Classroom chatter	70
Conversation (3 feet away)	60
Urban residence	50
Soft whisper (5 feet away)	40
North Rim of Grand Canyon	30
Silent study room	20
Threshold of human hearing (1,000 Hertz)	0

Notes:
dBA = A-weighted decibel
Source: U.S. Department of Labor, Occupational Safety and Health Administration 2013

Sound can be characterized in terms of sound power level and sound pressure level. The sound power level is a measure of the total power radiated by a source. The sound power level is a fundamental property of the source and is independent of the surrounding environment. The sound pressure level is the level of sound pressure, as measured at a distance by a standard sound level meter with a microphone. This differs from the sound power level in that it is the received sound as opposed to the sound intensity at the source.

A given level of noise may be more or less tolerable depending on the sound level, duration of exposure, character of the noise sources, time of day during which the noise is experienced, and activity affected by the noise. For example, noise that occurs at night tends to be more disturbing than that which occurs during the day because sleep could potentially be disturbed.

Since sound in the environment often varies over time, statistical noise descriptors have been developed to quantify fluctuating environmental sound levels. The most commonly used indices for measuring community noise levels include the following:

- **L_{eq}**: The equivalent sound level is used to describe noise over a specified period of time, in terms of a single numerical value. The L_{eq} is the constant sound level, which would contain the same acoustic energy as the varying sound level, during the same time period (i.e., the average noise exposure level for the given time period).
- **L_{dn} or DNL**: The day-night noise level or the energy average of the A-weighted sound levels occurring during a 24-hour period, which accounts for the greater sensitivity of most people to nighttime noise by weighting noise levels at night ("penalizing" nighttime noises). Noise between 10:00 p.m. and 7:00 a.m. is weighted (penalized) by adding 10 dBA to consider the greater annoyance of nighttime noises.
- **CNEL**: The Community Noise Equivalent Level, which is similar to the L_{dn}, adds a 5-dBA penalty for the evening hours between 7:00 p.m. and 10:00 p.m. in addition to the 10-dBA penalty between the hours of 10:00 p.m. and 7:00 a.m.[2]
- **L_x**: The sound level that is equaled or exceeded x percent of a specified time period. The L_{50} represents the median sound level (i.e., the noise level exceeded 50 percent of the time, or 30 minutes out of an hour).
- **L_{max}**: The instantaneous maximum noise level measured during the measurement period of interest.

2.2 Basic Vibration Concepts

Vibration is defined as any oscillatory motion induced in a structure or mechanical device as a direct result of some type of input excitation such as forces, moments, or pressure fields. Vibration is transmitted through solid material such as the ground by wave motion, giving rise to the terminology of "groundborne" vibration. Consequently, the term "vibration" and groundborne vibration" are the same and are therefore, used interchangeably in this NVIA report. Groundborne vibration propagates from sources such as railways and impact pile driving through the ground into nearby structures and buildings. Soil properties affect the propagation of groundborne vibration. The vibration energy spreads out as it travels through the ground, causing the vibration amplitude to decrease with distance away from the source. When groundborne vibration interacts with a building there is usually a ground-to-foundation coupling loss, but the vibration can also be amplified by the structural resonances of the walls and floors. Vibration in buildings is typically perceived as the rattling of windows or items

2 For typical community noise environments, the CNEL and L_{dn} levels are nearly always within 1 dB of each other and, therefore, are commonly used interchangeably (as would be the case in this NVIA report).

on shelves or the motion of building surfaces. Vibration of building surfaces can also be radiated as sound and heard as a low-frequency rumbling noise, known as groundborne noise.

Groundborne vibrations transmitted from site activities to the neighborhood can cause anxiety as well as annoyance, and can disturb sleep, work, or leisure activities. Groundborne vibration can be expressed in terms of the peak particle velocity (PPV) of the soil particles resulting from a disturbance in inches per second. Agencies such as California Department of Transportation (Caltrans) use the PPV descriptor because it correlates well with damage and complaints due to vibration.

3 Regulatory Setting

Federal, state, and local noise and vibration regulations were reviewed to determine the applicable sound level limits for the Project.

3.1 Federal Regulations

There are no federal noise standards that directly regulate noise from the operation of electrical transmission lines and substation facilities. However, in 1974 the United States Environmental Protection Agency (USEPA) established guidelines for noise levels, defined to protect public health and welfare with an adequate margin of safety. The USEPA established criteria for protecting the public health and wellbeing. The USEPA guideline recommends a L_{dn} of 55 dBA to protect the public from the effect of broadband environmental noise outdoors in residential areas and farms, and other outdoor areas where people spend widely varying amounts of time, and other places in which quiet is a basis for use (USEPA, 1974). However, these criteria do not constitute enforceable Federal regulations or standards. The USEPA has since delegated regulatory authority to local entities. Therefore, no Federal noise regulations apply to the Proposed Project.

3.2 State Regulations

3.2.1 California Public Utilities Commission

The CPUC General Order 131-D, (GO 131-D), Section XIV.B states: "Local jurisdictions acting pursuant to local authority are preempted from regulating electric power line projects, distribution lines, substations, or electric facilities constructed by public utilities subject to the Commission's jurisdiction. However, in locating such projects, the public utilities shall consult with local agencies regarding land use matters." Therefore, public utilities are directed to consider local regulations and consult with local agencies.

3.2.2 California Government Code Section 65302

California Government Code Section 65302 encourages counties and cities to implement a noise element as part of the general plan. In addition, the California Governor's Office of Planning and Research has developed guidelines for preparing noise elements, which include recommendations for evaluating the compatibility of various land uses as a function of community noise exposure.

3.2.3 California Department of Transportation and Construction-Induced Vibration Guidance

Caltrans provides practical guidance to engineers, planners, and consultants who must address vibration issues associated with the construction, operation, and maintenance of Caltrans-related projects. The guideline vibration criteria in Caltrans' *Transportation and Construction Vibration Guidance Manual* (Caltrans 2020) have been used to assess the effects of vibration during the Proposed Project construction. Vibration was assessed for two potential effects:

1. human annoyance (disturbance or discomfort); and
2. cosmetic or structural damage.

Vibration also has the potential to disrupt the operation of vibration-sensitive research and advanced technology equipment such as optical microscopes, cell probing devices, magnetic resonance imaging machines, scanning electron microscopes, photolithography equipment, micro-lathes, and precision milling equipment (Caltrans 2020). However, there is no known vibration-sensitive research and advanced technology equipment within the Proposed Project vicinity; therefore, vibration criteria and effects on such receptors are not discussed further.

Table 3-1 presents guideline vibration criteria to assess cosmic or structural damage potential from ground vibration induced by construction equipment. In terms of human perception (i.e., annoyance), **Table 3-2** provides guidance on the effects of ground vibration levels due to use of heavy equipment. The guideline vibration criteria in **Tables 3-1** and **3-2** are applicable to continuous and frequent intermittent sources such as construction equipment and passing heavy vehicles that would be used during the Proposed Project construction. For the purpose of this NVIA, continuous or frequent intermittent vibration sources are significant when their PPV exceeds the vibration damage criterion of 0.3 inch per second for older residential structures and/or when it exceeds the vibration annoyance criterion of 0.01 inch per second for a barely perceptible human response.

Table 3-1 Guideline Vibration Damage Potential Threshold Criteria

Structure and Condition	Maximum PPV for Continuous/ Frequent Intermittent Sources (inches per second)
Extremely fragile historic buildings, ruins, ancient monuments	0.08
Fragile buildings	0.1
Historic and some old buildings	0.25
Older residential structures	0.3
New residential structures	0.5
Modern industrial/commercial buildings	0.5

Notes:
PPV = peak particle velocity
Source: Caltrans 2020

Table 3-2 Guideline Vibration Annoyance Potential Criteria

Human Response	Maximum PPV for Continuous/ Frequent Intermittent Sources (inches per second)
Barely perceptible	0.01
Distinctly perceptible	0.04
Strongly perceptible	0.10
Severe	0.4

Notes:
PPV = peak particle velocity
Source: Caltrans 2020

3.3 Local Regulations

The proposed Project is located within the Fresno County. Relevant Fresno County noise standards and policies are described below.

3.3.1 Fresno County General Plan Health and Safety Element

The Fresno County General Plan Health and Safety Element establishes countywide land use compatibility guidelines. For example, the maximum allowable noise exposure level for residential land use is 60 dBA CNEL (Fresno County, 2000). The Fresno County General Plan also includes the following policies relevant to noise:

> ***Policy HS-G.1:*** The County shall require that all proposed development incorporate design elements necessary to minimize adverse noise impacts on surrounding land uses.
>
> ***Policy HS-G.4:*** So that noise mitigation may be considered in the design of new projects, the County shall require an acoustical analysis as part of the environmental review process where:
>
> > a. Noise sensitive land uses are proposed in areas exposed to existing or projected noise levels that are "generally unacceptable" or higher according to the Chart HS-1: "Land Use Compatibility for Community Noise Environments;" [Chart HS-1 is presented in this NVIA report as **Figure 4**.]
> >
> > b. Proposed projects are likely to produce noise levels exceeding the levels shown in the County's Noise Control Ordinance at existing or planned noise-sensitive uses.
>
> ***Policy HS-G.5:*** Where noise mitigation measures are required to achieve acceptable levels according to land use compatibility or the Noise Control Ordinance, the County shall place emphasis of such measures upon site planning and project design. These measures may include, but are not limited to, building orientation, setbacks, earthen berms, and building construction practices. The County shall consider the use of noise barriers, such as soundwalls, as a means of achieving the noise standards after other design-related noise mitigation measures have been evaluated or integrated into the project.
>
> ***Policy HS-G.6:*** The County shall regulate construction-related noise to reduce impacts on adjacent uses in accordance with the County's Noise Control Ordinance.
>
> ***Policy HS-G.8:*** The County shall evaluate the compatibility of proposed projects with existing and future noise levels through a comparison to Chart HS-1, "Land Use Compatibility for Community Noise Environments." [Chart HS-1 is presented in this NVIA report as **Figure 4**.]

3.3.2 Fresco County Noise Ordinance

The Fresno County Noise Ordinance (Chapter 8.40 of the Fresno County Development Code) applies to noise sources that can be regulated by Fresno County, such as equipment related to commercial and industrial land uses. **Table 3-1** summarizes the County's exterior noise standards that would be applicable to the Proposed Project. As indicated in the table, it would be unlawful for Project-related on-site operation and/or maintenance noise levels to exceed an L_{50} of 50 dBA during daytime hours or 45 dBA during nighttime hours at nearby sensitive noise receptors such as single-or multiple-family residences, schools, hospitals, churches, or public libraries. In the event the measured ambient noise level exceeds the applicable noise level standard in any category in the table, the applicable standard shall be adjusted so as to equal the ambient noise level.

In addition to the exterior noise standards, noise ordinance Section 8.40.90, Electrical Substations, identifies a noise level limit of 50 dBA for electrical substations when measured 50 feet from an affected residence.

Section 8.40.060(C) of the ordinance exempts noise sources associated with construction activities from the standards provided they take place after 6:00 a.m. and before 9:00 p.m. on Monday through Friday, or after 7:00 a.m. and before 5:00 p.m. on weekends. Section 8.40.060(G) of the Fresno County Noise Ordinance further provides that noise sources associated with work performed by private or public utilities in the maintenance or modification of its facilities are also exempt.

Table 3-3 Fresno County Exterior Noise Level Standards

Cumulative Number of Minutes in any 1-hour Period (L_x)	Daytime Noise Limit (dBA) 7 a.m. to 10 p.m.	Nighttime Noise Limit (dBA) 10 p.m. to 7 a.m.
30 (L_{50})	50	45
15 (L_{25})	55	50
5 ($L_{8.3}$)	60	55
1 ($L_{1.7}$)	65	60
0 (L_{max})	70	65

Notes:

L_x = The sound level that is equaled or exceeded "x" percent of a specified time period. Forn example, the L_{50} represents the median sound level (i.e., the noise level exceeded 50 percent of the time, or 30 minutes out of an hour).

dBA = A-weighted sound level

Source: Fresco County 1978

4 Existing Noise and Vibration Conditions

4.1 Existing Noise Conditions

Arcadis personnel conducted sound level measurements on September 21-22, 2023, to establish existing ambient environment at key locations of the Proposed Project area, including the Manning Substation site and the new transmission line corridor. Long-term noise measurements were conducted for 24 hours (started at 8:00 a.m. on Thursday September 21 and ended 8:00 a.m. on Friday September 22) along an unnamed dirt road just south of the Manning Substation site, approximately 4,200 feet southwest of nearest residence on Manning Avenue (see **Figure 3**). Short-term measurements were conducted for one hour during the day (1:00 p.m. to 2:00 p.m. on Thursday, September 21) and one hour at night (10:40 p.m. to 11:40 p.m. on Thursday, September 21) within 200 feet of the new transmission line corridor and near intersection of Dinuba Avenue and Douglas Avenue, approximately 730 feet west of a single-family residence (**Figure 3**). The ambient noise recorded at both remote locations are expected to be representative of the existing ambient noise levels at the nearest sensitive receptors to the Manning Substation site and along the new transmission line corridor.

Measurements were taken with a fully calibrated Casella CEL-633C Type 1 Sound Level Meter (SLM), equipped with a microphone/pre-amplifier and a windscreen to reduce wind induced sound. The SLM was secured to a utility pole and the microphone was set up at a height of approximately 5 feet above ground level. The SLM was setup to measure average A-weighted equivalent sound levels (L_{eq}) and was field calibrated prior to and following the noise measurement to ensure accuracy. All sound level measurements conducted and presented in this report were made with a SLM that conforms to the American National Standards Institute (ANSI) specifications for sound level meters (ANSI S1.4 1983 (R2006)). All instruments are maintained with National Bureau of Standards traceable calibrations, per the manufacturers' standards. A copy of the calibration certificate for the SLM is provided in **Appendix A**. A photograph log of the SLM set-up is provided in **Appendix B**.

The primary audible noise sources contributing to the ambient sound levels were steady highway traffic (cars and trucks) from a distance (Interstate 5) and low-to-medium-volume traffic on Manning Avenue and Dinuba Avenue. Buzzing sounds from power lines and cricket noises (at night) were also observed during the survey.

Weather conditions were calm and conducive for noise measurements with sunny conditions during the day and clear skies at night. Ambient temperatures ranged from 60 to 80 degrees Fahrenheit during the day and 66 to 67 degrees Fahrenheit at night. Relative humidity ranged from 39 to 75 percent during the day and 55 to 57 percent at night. Average wind speed during the day ranged from 2 to 3 miles per hour, primarily in a west direction. At night, average wind speed was 6 miles per hour, primarily in an east direction. No precipitation occurred during the survey.

A summary of the 24-hour L_{eq} noise levels measured near the new substation site and the one-hour L_{eq} noise levels measured near the new transmission line corridor are presented in **Table 4-1** and **Table 4-2**, respectively. **Table 4-3** summarizes the measured daytime ambient sound levels ($L_{eq(day)}$) and nighttime ambient sound levels ($L_{eq(night)}$) for the two measurement locations, along with the calculated day-night sound levels (L_{dn}). As defined in Section 3, the L_{dn} is the A-weighted equivalent noise level for a 24-hour period with a 10-dB adjustment added to sound levels occurring during nighttime hours (10:00 p.m. to 07:00 a.m.). The L_{dn} is calculated using the formula:

$$L_{dn} = 10log_{10}(\frac{15}{24}10^{L_{eq(day)}/10} + \frac{9}{24}10^{(L_{eq(night)}+10)/10})$$

Where $L_{eq(day)}$ is the continuous equivalent A-weighted daytime level between 07:00 a.m. and 10:00 p.m., and $L_{eq(night)}$ is the continuous equivalent A-weighted nighttime level between 10:00 p.m. and 07:00 a.m. the following day. Based on the above summaries, the calculated L_{dn} (or CNEL) noise level at sensitive receptors near the new substation and near the new transmission line corridor are 46 and 50 dBA, respectively (**Table 4-3**).

Table 4-1 Measured Hourly Noise Levels Near the Manning Substation Site

Measurement Date	Measurement Time	Measured Noise Levels, One-Hour L_{eq} (dBA)
Thursday, September 21, 2023	08:00 a.m. - 09:00 a.m.	44
	09:00 a.m. - 10:00 a.m.	39
	10:00 a.m. - 11:00 a.m.	37
	11:00 a.m. - 12:00 p.m.	42
	12:00 p.m. - 01:00 p.m.	45
	01:00 p.m. - 02:00 p.m.	32
	02:00 p.m. - 03:00 p.m.	41
	03:00 p.m. - 04:00 p.m.	41
	04:00 p.m. - 05:00 p.m.	44
	05:00 p.m. - 06:00 p.m.	44
	06:00 p.m. - 07:00 p.m.	44
	07:00 p.m. - 08:00 p.m.	41
	08:00 p.m. - 09:00 p.m.	40
	09:00 p.m. - 10:00 p.m.	36
	10:00 p.m. - 11:00 p.m.	36
	11:00 p.m. - 12:00 a.m.	38
Friday, September 22, 2023	12:00 a.m. - 01:00 a.m.	36
	01:00 a.m. - 02:00 a.m.	38
	02:00 a.m. - 03:00 a.m.	36
	03:00 a.m. - 04:00 a.m.	35
	04:00 a.m. - 05:00 a.m.	39
	05:00 a.m. - 06:00 a.m.	35
	06:00 a.m. - 07:00 a.m.	45
	07:00 a.m. - 08:00 a.m.	49

Notes:

L_{eq} = average equivalent sound level; dBA = A-weighted sound level

Table 4-2 Measured Hourly Noise Levels Near the New 230 kV Transmission Line Corridor

Measurement Date	Measurement Time	Measured Noise Levels, One-Hour L_{eq} (dBA)
Thursday, September 21, 2023	01:00 p.m. - 02:00 p.m.	52
	10:40 p.m. -11:40 p.m.	33

Notes:
L_{eq} = average equivalent sound level; dBA = A-weighted sound level

Table 4-3 Summary of Measured Ambient Daytime and Nighttime Noise Levels and Calculated Day-Night Ambient Noise Levels

Noise Measurement Location ID	Measurement Location Description	Measured Ambient L_{eq}(day), dBA	Measured Ambient L_{eq}(night), dBA	Calculated Ambient L_{dn}, dBA
NM1	Long-term measurement location south of new substation site; nearest residence (R3) located 4,200 feet northeast (**Figure 3**)	43	39	46
NM2	Short-term noise measurement location within 200 feet of new transmission corridor and near intersection of Dinuba Avenue and Douglas Avenue; nearest residence (R1) located 730 feet east (**Figure 3**)	52	33	50

Notes:
$L_{eq(day)}$ = average equivalent sound level during daytime (7:00 a.m. to 10:00 p.m.)
$L_{eq(night)}$ = average equivalent sound level during nighttime (7:00 a.m. to 10:00 p.m.)
L_{dn} = A-weighted equivalent sound level for a 24-hour period with a 10-dB adjustment added to sound levels occurring during nighttime hours (10:00 p.m. to 07:00 a.m.)
dBA = A-weighted sound level
ID = identification

4.2 Existing Vibration Conditions

Currently, no ground or air-vibrating sources or activities (i.e., mine blasting, pile driving, locomotives, etc.) are present at or near the Manning Substation site or along the new transmission line corridor. In addition, rubber-tired vehicles such as those on nearby public roads and highways, do not generate any significant amount of groundborne vibration (FTA 2018). Like noise emissions, ground and air vibration effects diminish with distance from the source, so baseline levels of vibration at the Proposed Project site and surrounding areas are expected to be negligible.

5 Modeling

5.1 Construction Noise

5.1.1 Substation Noise During Construction

Construction at the proposed LSPGC Manning Substation site would begin by clearing all vegetation within the site, grading it to create a generally flat area, and constructing the permanent access road to the substation. The below-ground components (e.g., ground grid and equipment foundations) would then be installed, followed by the substation and telecommunication components. Lastly, testing and commissioning would be conducted once the transmission lines were terminated at the proposed substation prior to energization.

The Manning Substation construction noise levels were estimated using the Federal Highway Administration (FHWA) Roadway Construction Noise Model (RCNM) User's Guide (FHWA 2006). Although the model was developed by the FHWA, RCNM is often used for non-roadway projects, because the same types of construction equipment used for roadway projects are also used to construct other project types. Input variables for the RCNM consist of the receptor/land use types, the equipment type, the acoustical usage factor for each piece of equipment (e.g., percentage of time during a construction noise operation that a piece of construction equipment is operating at full power), and the distance between the construction activity and sensitive receptor. No topographical or structural shielding was assumed in the modeling of construction noise (i.e., the receptors are modeled with no obstacles to the propagation of sound between the construction activity and receptor location, a worst-case assumption). For construction equipment where measured noise levels were unavailable, noise level information for similar equipment types was assumed. The only noise sensitive receptor within one mile (5,280 feet) radius of the Manning Substation site is an isolated residence located approximately 3,400 feet northeast (**Figure 3**).

The result of the Manning Substation construction noise analysis is summarized in **Table 5-1**. The table includes a list of equipment typically used for construction of substation facilities by phase and the calculated A-weighted L_{eq} noise levels for each phase of construction based on the individual equipment's maximum noise levels (L_{max}), the equipment usage factor, number of units operating concurrently, and the distances between the work sites and the nearest receptor location. The new substation construction noise levels at nearest receptor (3,400 feet away) range from 34 dBA during survey to 51 dBA during below grade construction.

Table 5-1 New Substation Construction Noise Levels by Phase

Construction Equipment Type	FHWA RCNM Construction Equipment L_{max} at 50 Feet (dBA)	Usage Factor	Estimated Number of Units	Calculated Noise Levels at Nearest Residence, 3,400 feet from Center of New Substation Site, L_{eq} (dBA)
Survey				
Pickup Truck	75	40%	1	34
Site Preparation/Road Work				
Bulldozer	82	40%	1	41
Grader	85	40%		44
Water Truck	72	40%	4	37
Dump Truck	76	40%	4	41
Roller	80	20%	1	36

Table 5-1 New Substation Construction Noise Levels by Phase

Construction Equipment Type	FHWA RCNM Construction Equipment L_{max} at 50 Feet (dBA)	Usage Factor	Estimated Number of Units	Calculated Noise Levels at Nearest Residence, 3,400 feet from Center of New Substation Site, L_{eq} (dBA)
Concrete Mixer	79	40%	1	38
Paver	77	50%	1	37
Loader	79	40%	3	43
Pickup Truck	75	40%	2	37
			Subtotal (Logarithmic Sum)	**50**
Below Grade Construction				
Excavator	81	40%	2	43
Water Truck	72	40%	4	37
Forklift	88	20%	1	44
Pickup Truck	75	40%	5	41
Tractor	84	40%	1	43
Loader	79	40%	3	43
Auger Drill Rig	84	20%	1	40
Dump Truck	76	40%	1	35
Trencher[1]	80	50%	1	40
			Subtotal (Logarithmic Sum)	**51**
Above Grade Construction and Equipment Installation				
Pickup Truck	75	40%	5	41
Man Lift	75	20%	2	34
Crane	81	16%	2	39
Forklift	88	20%	2	47
Welder	74	40%	1	33
			Subtotal (Logarithmic Sum)	**49**
Commissioning and Testing				
Pickup Truck	75	40%	5	41
Forklift	88	20%	2	47
Man Lift	75	20%	1	31
			Subtotal (Logarithmic Sum)	**48**

Notes:
1 Assumed noise level for a slurry trenching machine.
FHWA RCNM = Federal Highway Administration Roadway Construction Noise Model
L_{max} = maximum sound level
L_{eq} = average equivalent sound level
dBA = A-weighted decibel
Source: FHWA 2006, WSDOT 2020

5.1.2 Transmission Line Noise During Construction

Similar to the new substation construction noise, the new transmission line construction noise levels were estimated based on the FHWA RCNM User's Guide (FHWA 2006). Input variables for the RCNM consist of the receptor/land use types, the equipment type, number of units operating concurrently, the acoustical usage factor for each piece of equipment, and the distance between the construction activity and sensitive receptor. No topographical or structural shielding was assumed in the construction noise analysis. For construction equipment where measured noise levels were unavailable, noise level information for similar equipment types was assumed. Two isolated residences are located within one-quarter mile (1,320 feet) of the new 230 kV line corridor; one single-family residence (R2) located 190 feet north of the line and the second single-family residence (R1) located 1,090 feet south of the line (**Figure 3**). As shown in **Figure 3**, the PG&E 230 kV rebuild lines parallel the LSPGC new 230 kV line in the area near the sensitive receptors. One single-family residence (R1) is located approximately 1,120 feet south of the 230 kV rebuild lines and one single-family residence (R2) is located adjacent to the 230 kV rebuild lines. Because the LSPGC new line and the PG&E rebuild lines have the same voltage (230 kV) and parallel one another, audible noise impacts at the nearest receptors would be similar. There are no sensitive noise receptors within one-quarter mile (1,320 feet) of the interconnection lines (500 kV and 230 kV).

The result of the new transmission line construction noise analysis is summarized in **Table 5-2**. The table includes a list of equipment typically used for construction of transmission lines by phase and the calculated A-weighted L_{eq} noise levels for each phase of construction based on the individual equipment's maximum noise levels, the equipment usage factor, and the distances between the work sites and the two nearest receptor locations. The new transmission line construction noise levels at nearest receptor (190 feet away) range from 73 dBA during site access and preparation to 78 dBA during installation of structure foundations.

Table 5-2 New Transmission Line Construction Noise Levels by Phase

Construction Equipment Type	FHWA RCNM Construction Equipment L_{max} at 50 Feet (dBA)	Usage Factor	Estimated Number of Units	Calculated Noise Levels at Residence, 190 Feet from New Transmission Line Corridor, L_{eq} (dBA)	Calculated Noise Levels at Residence, 1,090 Feet from New Transmission Line Corridor, L_{eq} (dBA)
Site Access and Preparation					
Bulldozer	82	40%	1	66	51
Grader	85	40%	1	69	54
Roller	80	20%	1	61	46
Loader	79	40%	2	66	51
Water Truck	72	40%	2	59	44
Dump Truck	76	40%	2	63	48
			Subtotal (Logarithmic Sum)	**73**	**58**
Installation of Structure Foundation					
Bulldozer	82	40%	1	66	51
Loader	79	40%	2	66	51
Backhoe	78	40%	1	62	47
Forklift	88	20%	1	69	54
Crane	81	16%	1	64	49
Auger Drill Rig	84	20%	1	65	50
Long Reach Drill Rig[1]	84	20%	1	65	50
Compressor (air)	78	40%	1	62	47
Pump	81	50%	1	66	51
Drum Mixer	80	50%	1	65	50

Table 5-2 New Transmission Line Construction Noise Levels by Phase

Jackhammer	89	20%	1	70	55
Concrete Mixer Truck	79	40%	1	63	48
Dump Truck	76	40%	2	63	48
Slurry Truck/Plant	78	100%	1	66	51
Specialty Truck[2]	76	40%	2	63	48
Water Truck	72	40%	2	59	44
			Subtotal (Logarithmic Sum)	**78**	**63**
Erection of Support Structure					
Forklift	88	20%	2	72	57
Crane	81	16%	2	64	49
Compressor (air)	78	40%	1	62	47
Flat Bed Truck	74	40%	2	61	46
Water Truck	72	40%	2	59	44
			Subtotal (Logarithmic Sum)	**74**	**59**
Stringing of Conductors, Shield Wire, and Fiber Optic Ground Wire					
Dozer	82	40%	1	66	51
Backhoe	78	40%	1	62	47
Compressor (air)	78	40%	1	62	47
Line Puller[3]	85	50%	1	70	55
Flat Bed Truck	74	40%	2	61	46
Specialty Truck[2]	76	40%	2	63	48
Water Truck	72	40%	2	59	44
			Subtotal (Logarithmic Sum)	**74**	**59**

Notes:

1 Assumed noise level for an auger drill

2 Assumed noise level for a dump truck.

3 Assumed noise level for all other equipment greater than 5 horsepower per FHWA 2006

FHWA RCNM = Federal Highway Administration Roadway Construction Noise Model

L_{max} = maximum sound level

L_{eq} = average equivalent sound level

dBA = A-weighted decibel

Source: FHWA 2006, WSDOT 2020

5.2 Construction Vibration

Temporary sources of ground borne vibration during grading, trenching, and other activities associated with the construction of the Manning Substation and new transmission lines would be produced by the operation of heavy construction equipment. The Proposed Project equipment types most likely to create vibration include a drill rig, large bulldozers, and loaded trucks. Using reference vibration levels at 25 feet, vibration from each equipment can be estimated using the following formula (Caltrans 2020):

$$PPV_{Equipment} = PPV_{Ref} (25/D)^n \text{ (inches per second)}$$

Where:

PPV_{Ref} = reference PPV at 25 feet

D = distance from equipment to the receiver in feet

n = is a scaling factor (unitless), which is related to the attenuation rate through ground and is based on the soil conditions at the site (soil class). The value generally ranges from 1 to 1.5; the suggested value for “n” is 1.5 for the Proposed Project, which corresponds to competent soils that can be dug with shovel (e.g., agricultural lands) (Caltrans 2020).

Groundborne vibration levels generated by these pieces of equipment at a reference distance of 25 feet are shown in **Table 5-3**. The table also shows the distance at which noise generated by these pieces of equipment attenuate to the Caltran’s thresholds for building damage and human annoyance at residential uses. The construction equipment with the highest vibration source level (e.g., a large bulldozer or a drill rig) generates vibration levels of 0.089 PPV inch per second at a distance of 25 feet, while loaded trucks would generate 0.076 PPV inch per second at 25 feet.

Table 5-3 Construction Equipment Vibration Noise Levels

Construction Equipment	Type of Vibration Source	Caltrans Reference Vibration Level at 25 feet, PPV (inches per second)	Distance to Attenuate to Caltran’s Threshold for Damage to Older Residential Structures[1] (feet)	Distance to Attenuate to Caltran’s Threshold for a Barely Perceptible Human Response[2] (feet)
Large Bulldozer	Continuous/ Frequent Intermittent	0.089	11	107
Drill Rig	Continuous/ Frequent Intermittent	0.089	11	107
Loaded Trucks	Continuous/ Frequent Intermittent	0.076	10	97

Notes:

1 Caltrans threshold for damage to older structures is 0.3 inch per second, as provided in Table 3.1

2 Caltrans threshold for a barely perceptible human response is 0.01 inch per second, as provided in Table 3.2.

Caltrans = California Department of Transportation

Source: Caltrans 2020

5.3 Operation and Maintenance Noise

5.3.1 Substation Noise During Operation and Maintenance

The primary sources of noise associated with operation of the Manning Substation would be from six (6) single phase step-down autotransformers and their associated cooling fans (seventh autotransformer is a spare); four (4) heating, ventilation, and air conditioning (HVAC) units mounted on the sides of two control houses (two HVAC units per control house); and eight (8) HVAC units mounted on the sides of two GIS halls (four HVAC units per GIS hall). The autotransformers shall be of mineral oil immersed type for ONAN/ONAF/ONAF2 (220/293.6/367 mega volt ampere [MVA]) multistage cooling.[3]

Sound emissions from each substation autotransformer was modeled as a point source located at a source height of 36 feet. Sound emissions from each control house HVAC and each GIS hall HVAC were modeled as vertical area sources located on the building walls at heights of 12.7 and 29.5 feet, respectively. The overall A-weighted sound power level for each substation equipment type were provided by LSPGC based on vendor sound-

[3] ONAN = Oil Natural Air Natural; ONAF = Oil Natural Air Forced (first stage cooling); ONAF2 = ONAF = Oil Natural Air Forced (second stage cooling)

specifications. The un-weighted octave band sound power levels of each equipment type were estimated using adjustment factors in Handbook of Noise and Vibration (Crocker M.J. 2007). The equipment sound power levels used for the acoustical modeling of the Manning Substation are summarized in **Table 5-4**.

Table 5-4 Equipment Sound Power Levels at Manning Substation

Substation Equipment Description	Height (feet)	Unweighted Sound Power Level in dB per Octave Band Frequency (Hz)									Total Sound Power Level (dBA)
		31.5	63	125	250	500	1000	2000	4000	8000	
Step-down Autotransformer (6 units operating; one spare)	36	96.6	102.6	104.6	99.6	99.6	93.6	88.6	83.6	76.6	100
HVAC units for control house (4 units in total; 2 units per control house)	12.7	55.8	55.8	63.8	67.8	73.8	70.8	65.8	60.8	60.8	75.0
HVAC units for GIS hall (8 units in total; 4 units per GIS hall)	29.5	68.8	68.8	76.8	80.8	86.8	83.8	78.8	73.8	73.8	88.0

Notes:
HVAC = heating, ventilation, and air conditioning
GIS = Gas Insulated Switchgear
dBA = A-weighted decibel
MVA – mega volt ampere
Hz = Hertz

Community noise levels associated with future operation of the Manning Substation were predicted using Cadna-A noise calculation software developed by DataKustik Gmbh. This software implements International Organization for Standardization (ISO) 9613-2 international standard for sound propagation (Acoustics – Attenuation of Sound during Propagation Outdoors – Part 2: General Method of Calculation) for environmental noise sources and outdoor sound propagation. It is a comprehensive three-dimensional, ray-tracing model in which noise sources are assembled from a point, line, area, and/or vertical area components each emitting L_{WA} in octave bands or broadband A-weighted format. Distance losses, ground attenuation, terrain effects, wind effects, building shielding, attenuation through walls, and barrier/berm effects are computed in the Cadna-A model, and the resulting L_{PA} are computed at any number of receptors of interest.

Cadna-A starts with a Google Earth® base map of the area extending out approximately a mile from the facility. The model is capable of importing topography data for consideration of terrain shielding where appropriate. Elevation contours for the modeling domain were directly imported into Cadna-A, which allowed for consideration of terrain shielding where appropriate. The terrain height contour elevations for the modeling domain were generated from elevation information derived from the National Elevation Dataset developed by the United States Geological Survey. The model also accounts for the 10-foot high prefabricated interlocking security wall that would be constructed around the Manning Substation site.

All calculations assumed favorable conditions for sound propagation per ISO 9613-2, corresponding to a moderate, well-developed ground-based temperature inversion, as might occur on a calm, clear night, or equivalently downwind propagation. Furthermore, the ISO 9613-2 standard assumes all receptors are downwind of every sound source simultaneously. In other words, the model assumes that each source propagates its maximum sound level in all directions at all times. This will likely overpredict upwind sound levels. Each receptor was modeled as a receiver at a height of 5.0 feet above ground level.

A temperature of 10 degrees Celsius (50 degrees Fahrenheit) and 70 percent relative humidity was used to calculate atmospheric absorption for the ISO 9613-2 model. These parameters were selected to minimize atmospheric attenuation in the 500 and 1000 Hz octave bands where the human ear is most sensitive, and thus provide conservative results. No meteorological correction was added to the results.

The land is primarily used for agricultural purposes and vegetation is mostly low-lying (i.e., little-to-no trees or foliage). All vegetation was excluded from the analysis to maintain conservativeness in the model. Ground attenuation is expected to be fairly high, due to the "soft ground" of surrounding areas but was assumed to be semi-reflective in the model for conservativeness. Ground absorption was set to a value of 0.5, where only half the available ground absorption is considered. Lastly, the model was programmed to include the sound contribution of two acoustical reflections off the Manning Substation buildings.

The Manning Substation layout, supplied by LSPGC, was used to establish relevant physical and positional characteristics of the substation equipment and buildings. Sound pressure levels were predicted for the identified receptors in the Cadna-A noise modeling program using source sound power levels at each octave-band frequency and the model input parameters and assumptions described above. Sound modeling was completed for the substation layout and the predicted daytime, nighttime, and day-night noise levels at each receptor (the logarithmic sum of sound levels from every source) are included in **Tables 5-5**, **5-6**, and **5-7**, respectively. **Figures 5**, **6**, and **7** contain graphical representations of the predicted daytime, nighttime and day-night noise levels, respectively. Results of the modeled daytime, nighttime, and day-night noise levels from the operation of all substation equipment (excluding existing noise levels) at the nearest residential receptor 3,400 feet away was estimated to be 34 dBA $L_{eq(day)}$, 34 dBA $L_{eq(night)}$, and 40 dBA L_{dn} (or CNEL), respectively.

Table 5-5 Daytime Substation Noise Modeling Results at Nearest Sensitive Receptor

Receptor ID	Receptor Type	Distance and Direction from Center of Manning Substation Facility	Predicted Daytime Noise Level at Sensitive Receptor, $L_{eq(day)}$ (dBA)	Predicted Daytime Noise Level Plus Existing Level of 43 dBA, $L_{eq(day)}$ (dBA)[1]	Daytime Noise Increase Above Existing Levels (dBA)
R3	Residential	3,400 feet northeast	34	43	0.5

Notes:

1 Summary of measured ambient (existing) daytime noise levels is provided in **Table 4-3**.

$L_{eq(day)}$ = average equivalent sound level during daytime (7:00 a.m. to 10:00 p.m.).

dBA = A-weighted sound level

ID = Identification

Table 5-6 Nighttime Substation Noise Modeling Results at Nearest Sensitive Receptor

Receptor ID	Receptor Type	Distance and Direction from Center of Manning Substation Facility	Predicted Nighttime Noise Level at Sensitive Receptor, $L_{eq(night)}$ (dBA)	Predicted Nighttime Noise Level Plus Existing Level of 39 dBA, $L_{eq(night)}$ (dBA)[1]	Nighttime Noise Increase Above Existing Levels (dBA)
R3	Residential	3,400 feet northeast	34	40	1

Notes:

1 Summary of measured ambient (existing) nighttime noise levels is provided in **Table 4-3**.

$L_{eq(night)}$ = average equivalent sound level during nighttime (10:00 p.m. to 7:00 a.m.).

dBA = A-weighted sound level

ID = Identification

Table 5-7 Day-Night Substation Noise Modeling Results at Nearest Sensitive Receptor

Receptor ID	Receptor Type	Distance and Direction from Center of Manning Substation Facility	Predicted Day-Night Noise Level at Sensitive Receptor, L_{dn} (dBA)	Predicted Day-Night Noise Level Plus Existing Level of 46 dBA, L_{dn} (dBA)[1]	Day-Night Noise Increase Above Existing Levels (dBA)
R3	Residential	3,400 feet northeast	40	47	1

Notes:

1 Summary of measured ambient (existing) day-night noise levels is provided in **Table 4.3.**

L_{dn} = A-weighted equivalent sound level for a 24-hour period with a 10-dB adjustment added to sound levels occurring during nighttime hours (10:00 p.m. to 07:00 a.m.).

dBA = A-weighted sound level

ID = Identification

5.3.2 Transmission Line Audible Noise During Operation and Maintenance

Corona-generated audible noise is the most common noise associated with transmission lines and is heard as a crackling or hissing sound. Corona is the breakdown of air into charged particles caused by electrical field at the surface of conductors. Once transmission lines are energized, the audible noise due to the line(s) would vary depending on weather conditions, with foul weather producing increased levels of audible noise over levels in fair weather. Corona-generated audible noise from the new transmission lines was predicted using methods and equations developed by the Bonneville Power Administration (BPA) (Chartier and Larson 1977). The BPA audible noise calculation method (BPA method) is an empirical method developed from long-term statistical measurements on a number of full-scale operating or test transmission lines. It is specifically designed to calculate audible noise based on phase configuration, typical operating voltage, height above mean sea level, number of conductors in a bundle (if applicable), conductor diameter, and height above ground at maximum conductor sag. Information for the PG&E 500 kV interconnection, PG&E 230 kV interconnection, and PG&E 230 kV rebuild lines associated with the Proposed Project was limited at the time this NVIA report was written.

Therefore, a few assumptions were made based on physical and electrical characteristics of similar transmission lines. The physical and electrical characteristics (input data) used to calculate audible noise for the Proposed Project's new transmission lines are provided in **Table 5-8**. In **Table 5-8** and the subsequent discussion, the 230 kV lines include the LSPGC new 230 kV line, the PG&E 230 kV interconnection, and the PG&E 230 kV rebuild lines. The 500 kV line includes the PG&E 500 kV interconnection.

Table 5-8 Physical and Electrical Characteristics of the LSPGC and PG&E Transmission Lines

Line Characteristics	230 kV Lines	500 kV Lines	Unit
Average Voltage	230	500	Kilovolt
Circuit Configuration	Double	Single	--
Average Current	4,049	Data not available	Ampere
Frequency of AC Supply	60	60	Hertz
Electric Phasing	A C'	B	--
	B B'	A C	
	C A'		
Phase Spacing	39.4 to 45.9H, 26.2V	45.9H, 32.8V	feet
Horizontal Distance of Conductor Bundle from Center of Tower	A (-19.7) C'(19.7)	B (0.0)	feet
	B (-23.0) B'(23.0)	A (-29.5) C (29.5)	
	C (-19.7) A'(19.7)		
Height of Conductor Bundle at Tower	A (118.1) C' (118.1)	B (124.7)	feet
	B (91.9) B' (91.9)	A (91.9) C (91.9)	
	C (65.6) A' (65.6)		
Height of Conductor Bundle at Mid-span	A (85.3) C' (85.3)	B (65.6)	feet
	B (59.1) B'(59.1)	A (32.8) C (32.8)	
	C (32.8) A'(32.8)		
Sub-conductor Spacing	18	18	inches
Sub-conductor Diameter	1.4	1.16	inches
Number of Sub-conductors in Bundle	2	2	--
Centerline Distance to Edge of ROW	60.0	60.0	feet
Average Altitude	350	350	feet
Receptor Height	5	5	feet

Notes:

H = horizontal spacing between conductor bundles
V = vertical spacing between phases
kV = kilovolt
AC = alternating current
ROW = right-of-way

The audible noise profiles in fair and foul weather at midspan were calculated for the 230 kV lines and 500 kV interconnection line using the BPA method. The analysis evaluates the L_{50} audible noise levels assuming a rain rate of 1 millimeter per hour (0.04 inch per hour), which is the default rate for the BPA audible noise calculations.

The audible noise level for the 230 kV lines with a conductor ground clearance of at least 33 feet and at an average altitude of 350 feet above sea level were calculated and plotted in **Figure 8**. A lower voltage or lower altitude would result in lower audible noise. The audible noise level in fair weather at the edges of the right-of-way (ROW) is approximately 9 dBA increasing to approximately 11 dBA within the ROW under the line (**Figure 8** Fair

Weather). In foul weather, the audible noise level from the line increase to approximately 34 dBA at the edges of the ROW and approximately 36 dBA under the line within the ROW (**Figure 8** Foul Weather). Two isolated residences are located within one-quarter mile (1,320 feet) of the new 230 kV line and 230 kV rebuild lines. One residence (R2) is located 190 feet north of the new 230 kV line and the second residence (R1) is located 1,090 feet south of the new 230 kV line. One single-family residence (R1) is located approximately 1,120 feet south of the 230 kV rebuild lines and one single-family residence (R2) is located adjacent to the 230 kV rebuild lines (**Figure 3**).

The audible noise level for the 500 kV interconnection line with a conductor ground clearance of at least 33 feet and at an average altitude of 350 feet above sea level were calculated and plotted in **Figure 9**. The audible noise level in fair weather at the edges of the ROW is approximately 38 dBA increasing to approximately 41 dBA within the ROW under the line (**Figure 9** Fair Weather). In foul weather, the audible noise level from the line increase to approximately 63 dBA at the edges of the ROW and approximately 66 dBA under the line within the ROW (**Figure 9** Foul Weather). There are no sensitive noise receptors within one-quarter mile (1,320 feet) from the 500 kV interconnection line (**Figure 3**). As shown in **Figures 8** and **9**, the 500 kV interconnection line would be the primary source of possible audible noise from the lines involved in the Proposed Project since lower voltage lines such as the new 230 kV line contribute little-to-no audible noise under fair weather conditions. Although the contribution of the new 230 kV line may increase in foul weather, the audible noise in foul weather from the lower voltage line (i.e., the new 230 kV line) is less than from the 500 kV interconnection line.

6 Impacts Significance Analysis

The significance of noise and vibration impacts from the Proposed Project's construction, operation, and maintenance have been analyzed by using the CEQA guidelines, Appendix G (as amended in December 2019), Environmental Checklist. The impact questions related to noise (and vibration) in the CEQA Environmental Checklist are discussed below:

a) Would the project result in the generation of a substantial temporary or permanent increase in ambient noise level in the vicinity of the project in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies?

<u>Construction</u>

Less Than Significant Impact. Short-term noise level increases from construction activities would cause significant impacts if the activities would conflict with local policies or standards. The Proposed Project construction activities taking place between 6:00 a.m. and 9:00 p.m. Monday through Friday and between 7:00 a.m. and 5:00 p.m. on weekends would be exempt from standards in the Fresno County Noise Ordinance. Any construction activities taking place outside these hours would be considered to result in a significant impact if resulting noise levels at the receptors would exceed the Fresno County exterior noise standard of 45 dBA L_{eq} for nighttime. Although there are no quantitative local noise level standards applicable to the Proposed Project construction, a quantitative analysis of its construction noise is included in this analysis for informational purposes.

Proposed Project construction is scheduled to begin in early 2026 after the necessary permits and authorizations are secured. The construction phase is anticipated to take approximately 26 months, concluding with the energization of the Proposed Project facilities. The Proposed Project is required to be placed in service by June 1, 2028, per the CAISO's functional specifications.

Construction of the Proposed Project would generate noise that would temporarily increase ambient noise levels. The Proposed Project construction noise would be generated by the operation of on-site construction equipment such as water trucks, graders, loaders, excavators, and drill rigs, as well as from on-road sources such as vehicle trips transporting workers, equipment, and materials to and from the Proposed Project site. The magnitude of the impact at receptors would depend on the type of construction activity, equipment being used, duration of the construction phase, distance between the noise source and receiver, the presence of intervening structures that enhance attenuation, and the existing ambient noise levels at the receptors. Construction noise levels generated by equipment would also vary depending on several factors such as the type and age of equipment, specific equipment manufacture and model, the operations being performed, and the overall condition of the equipment and exhaust system mufflers.

Construction of the Manning Substation would consist of several phases, including survey, site preparation and road work, below grade construction, above grade construction and equipment installation, and commissioning and testing. Construction of the new transmission lines would consist of several phases, including site access and preparation, installation of structure foundations, erection of support structures, stringing of conductors, shield wire, and fiber optic ground wire. Each construction phase would occur sequentially for a few months and construction impacts were assessed for the nearest sensitive receptor to the work sites; impacts to sensitive receptors further away would be reduced. Details of the method and assumptions used to predict the Proposed Project construction noise, including the construction noise model (FHWA RCNM) and the reference L_{max} for each construction equipment at 50 feet, are discussed in Section 5.1. The result of the construction noise analysis by phase for the Manning Substation site and the LSPGC new transmission lines are summarized in **Table 5.1** and

Table 5.2, respectively. As shown in **Figure 3**, the PG&E 230 kV rebuild lines parallel the LSPGC new 230 kV line in the area near the sensitive receptors. Because the LSPGC new line and the PG&E rebuild lines have the same voltage (230 kV) and parallel one another, audible noise impacts at the nearest receptors would be similar. The noise modeling conservatively assumed that all construction equipment within each phase would operate simultaneously for the duration of that phase; in reality all construction equipment would not occur concurrently. The new substation construction noise levels at nearest receptor (3,400 feet away) range from 34 dBA during survey to 51 dBA during below grade construction. The new transmission line construction noise levels at nearest receptor (190 feet away) range from 73 dBA during site access and preparation to 78 dBA during installation of structure foundations.

As discussed above and in Section 3.3.2, noise from construction activities would be exempt from the Fresno County General Plan's noise policies and the Fresno County Noise Ordinance standards if the activities would occur between the hours of 6:00 a.m. and 9:00 p.m. on weekdays, or 7:00 a.m. and 9:00 p.m. on Saturdays and Sundays. Construction activities at the Proposed Project site would generally be scheduled to occur during daylight hours 6 days per week (Monday through Saturday), which is consistent with the construction hours allowed by the Fresno County Noise Ordinance.

Because the Proposed Project construction would take place consistent with the hours allowed by the Fresno County Noise Ordinance, noise generated by daytime construction activities would not be audible above the existing ambient level at the nearest receptor to the Manning Substation site (3,400 feet away) and the new transmission line corridor (190 feet away). Because any nighttime construction noise levels would not exceed the County's nighttime exterior noise level standards, the Proposed Project construction noise would result in a less-than-significant impact.

In addition to noise generated by on-site construction equipment, construction-related vehicle trips would increase noise levels along roadways leading to the Proposed Project site. Access to the Manning Substation site for construction equipment, supplies, and workers would likely be from Interstate 5 to Manning Avenue to Brannan Avenue. A permanent access road to the substation would also be constructed. This would include improvements to an unnamed private road that extends south from the intersection of South Brannon Avenue and Manning Avenue along the east side of the Proposed Project site. Additionally, improvements would be made at the intersection of Manning Avenue and the unnamed private road to allow larger vehicles to safely turn onto the unnamed private road. The peak vehicle trips would be from approximately May 2026 through December 2027 during the earthwork and grading of the Proposed Project (e.g., site development and below-grade construction activities) due to the removal or importation of fill. Total vehicle round trips during this construction period would be approximately 143 per day, consisting of approximately 41 truck trips. Other periods of the Proposed Project construction would have lower daily vehicle trips, and therefore would have correspondingly lower noise levels. The addition of 143 construction-related daily vehicle trips on the segment of South Brennan Avenue (coming from Manning Avenue and Interstate 5) would increase ambient traffic noise levels along this segment, but any increase would be minimal, as these trips would be spread out throughout the day. Therefore, the Project construction traffic noise would result in a less-than-significant impact.

<u>Operation and Maintenance</u>

Less Than Significant Impact. Long-term operation and maintenance noise impacts would be considered significant if the Proposed Project-related noise would exceed the Fresno County exterior noise standards of 50 dBA L_{50} during daytime hours (i.e., 7:00 a.m. to 10:00 p.m.) or 45 dBA L_{50} during nighttime hours (i.e., 10:00 p.m. to 7:00 a.m.). For most common noise sources, L_{50} can be interpreted as close to the L_{eq} metric. Therefore, if the

Proposed Project would generate noise levels in excess of 50 dBA L_{eq} during the daytime or 45 dBA L_{eq} during the nighttime, such noise generation would constitute a significant noise impact. The Fresno County General Plan specifies CNEL-based community noise exposure levels that consider the contributions of daytime and nighttime noise levels. The maximum allowable noise exposure level for residential land use is 60 dBA CNEL. For typical community noise environments, the CNEL and L_{dn} levels are nearly always within 1 dB of each other and, therefore, are commonly used interchangeably (as would be the case in this NVIA report).

The primary sources of noise associated with operation of the Manning Substation would be from six (6) single phase step-down autotransformers and their associated cooling fans (seventh autotransformer is a spare); four (4) HVAC units mounted on the sides of two control houses (two HVAC units per control house); and eight (8) HVAC units mounted on the sides of two GIS halls (four HVAC units per GIS hall). Details of the method and assumptions used to predict the new substation operational noise, including the three-dimensional industrial noise model (Cadna-A) and the sound power level of each source type, are discussed in Section 5.3.1. The Manning Substation operational noise modeling results are presented in **Tables 5.5** to **5.7** and shown visually as noise contours in **Figures 5** to **7**. The results of the modeled daytime, nighttime, and day-night noise levels from the operation of all substation equipment (excluding existing noise levels) at the nearest residential receptor 3,400 feet away was estimated to be 34 dBA $L_{eq(day)}$, 34 dBA $L_{eq(night)}$, and 40 dBA L_{dn} (or CNEL), respectively. The results indicate that predicted noise levels for the Manning Substation would be below Fresno County's exterior noise standards of 50 dBA L_{50} (or L_{eq}) and 45 dBA L_{50} (or L_{eq}) during daytime and nighttime hours, respectively. The predicted operational noise levels would also be below the Fresno County General Plan allowable noise exposure level of 60 dBA CNEL (or L_{dn}) for residential land uses. **Tables 5.5** to **5.7** also show that noise increases above existing ambient levels at the nearest receptor (3,400 feet away) would range from 0.5 to 1 dB, which is not perceptible to the average human ear. Therefore, noise associated with the Manning Substation operational equipment would result in a less-than-significant impact.

Corona-generated audible noise in fair and foul weather from the new 230 kV line and the 500 kV interconnection line was predicted using methods and equations developed by the BPA (Chartier and Larson 1977). The BPA method is specifically designed to calculate audible noise based on phase configuration, typical operating voltage, height above mean sea level, number of conductors in a bundle (if applicable), conductor diameter, and height above ground at maximum conductor sag. The predicted audible noise level for the new 230 kV line in fair weather at the edges of the ROW is approximately 9 dBA increasing to 11 dBA within the ROW under the line (**Figure 8** Fair Weather). In foul weather, the audible noise level from the new 230 kV line increase to approximately 34 dBA at the edges of the ROW and 36 dBA under the line within the ROW (**Figure 8** Foul Weather). The new 230 kV line audible noise level at nearest receptor (190 feet away) is approximately 5 dBA in fair weather and 30 dBA in foul weather; both levels are below the existing daytime and nighttime noise levels of 52 dBA and 33 dBA, respectively. As shown in **Figure 3**, the PG&E 230 kV rebuild lines parallel the LSPGC new 230 kV line in the area near the sensitive receptors. Because the LSPGC new line and the PG&E rebuild lines have the same voltage (230 kV) and parallel one another, audible noise impacts at the nearest receptors would be similar (i.e., less than existing sound levels). For the 500 kV interconnection line, audible noise level in fair weather at the edges of the ROW is approximately 38 dBA increasing to 41 dBA within the ROW under the line (**Figure 9** Fair Weather). In foul weather, the audible noise level from the 500 kV interconnection line increase to approximately 63 dBA at the edges of the ROW and 66 dBA under the line within the ROW (**Figure 9** Foul Weather). Although noise levels at the ROW of the 500 kV interconnection line are much higher than that for the new 230 kV line, there are no sensitive noise receptors within one-quarter mile (1,320 feet) from the 500 kV interconnection line. Additionally, existing sound levels under foul (wet) weather conditions would be higher than the levels measured under fair (dry) weather conditions. Consequently, under foul weather conditions, the increased existing sound levels (i.e., from rainfall) is expected to mask most of the audible noise from the transmission lines. Therefore, noise from the LSPGC and PG&E 230 kV lines and the PG&E 500 kV interconnection line would not be audible at the nearest sensitive receptors and as such, would result in no impact.

The proposed LSPGC Manning Substation would be unstaffed and operated remotely. System-wide assessments would be accomplished primarily through visual inspections, which would consist of monthly observations of the substation and related equipment. LSPGC would regularly inspect, maintain, and repair the Proposed Project following construction. Typical operations and maintenance activities would involve routine inspections and preventive maintenance to ensure service reliability, as well as emergency work to maintain or restore service. The routine on-site inspection and maintenance activities would be conducted by small, specialized teams at the Proposed Project site. Such activities would result in a negligible number of vehicle trips per year (light utility trucks) that would not be anticipated to have a substantive impact on traffic noise along roadways in the Proposed Project vicinity. PG&E would be responsible for maintaining and operating its respective portions of the Proposed Project. Considering the small number of infrequent trips associated with the Proposed Project's operation, inspection, and maintenance, the Project would be anticipated to have a negligible impact on roadside traffic noise levels in the vicinity.

On-site activities are not anticipated to result in noise levels in excess of existing agricultural and electrical infrastructure operations on the Proposed Project site and surrounding properties. Therefore, on-site maintenance is not anticipated to result in a substantial increase in noise levels. Finally, the Fresno County Noise Control Ordinance (Section 8.40.060(G)) exempts maintenance activities for private and public utilities from its noise limit standards.

2. Would the project result in the generation of excessive groundborne vibration or groundborne noise levels?

<u>Construction</u>

Less Than Significant Impact. Ground-borne vibration or noise levels from construction activities are considered significant if they cause damage to structures, or cause sleep disturbance if such activities occur at night near residential areas. There are no vibration sensitive structures identified in the Proposed Project's immediate vicinity. Construction activities would take place during daylight hours only, and the nearest noise sensitive receptors to the Manning Substation site and the new transmission lines are located at 3,400 feet and 190 feet away, respectively.

The three pieces of equipment types most likely to create vibration during the Proposed Project construction include a drill rig, large bulldozers, and loaded trucks. Details of the method and assumptions used to predict the Proposed Project construction vibration, including reference vibration levels at 25 feet for the three pieces of equipment, are discussed in Section 5.2. Vibration levels generated by the three pieces of equipment at a reference distance of 25 feet are shown in **Table 5.3**. The table also shows the distance at which noise generated by these pieces of equipment attenuate to the Caltrain's thresholds for building damage and human annoyance at residential uses.

As shown in **Table 5.3**, groundborne vibration attenuates rapidly with distance and would not be perceptible beyond 107 feet from the construction work sites. The Caltran's vibration threshold for building damage (older residential structures) is 0.3 PPV inch per second; vibration from construction equipment would attenuate to below this level within 11 feet of the source and would not cause any cosmetic or structural damage to the nearest residential structures 190 feet away. The Caltran's threshold for human annoyance at residential uses is 0.01 inch per second; vibration from construction equipment would attenuate to below this level within 107 feet of the source and would not be perceptible at the nearest residential receptors 190 feet away. Because of distance attenuation, the Proposed

Project construction would not have the potential to generate significant short-term groundborne vibration or groundborne noise at the nearest sensitive receptors. Therefore, construction-related vibration and groundborne noise associated with the Proposed Project would result in a less-than-significant impact.

Operation and Maintenance

No Impact. The Proposed Project would not include the use of any large rotating equipment during its operation that would introduce any new sources of perceivable groundborne vibration. In addition, operation and maintenance activities at the Proposed Project site would not require the use of heavy equipment that would generate high vibration levels. Therefore, the Proposed Project has no potential to generate groundborne vibration levels greater than the significance criteria for structural damage to older residential structure (0.3 inch per second) or for human annoyance (0.01 inch per second). Therefore, vibration from the Proposed Project's operation and maintenance would result in no impact.

3. For a project located within the vicinity of a private airstrip or an airport land use plan or, where such a plan has not been adopted, within 2 miles of a public airport or public use airport, would the project expose people residing or working in the project area to excessive noise levels?

No Impact. The Proposed Project site is not located within the vicinity of a private airstrip or within 2 miles of a public airport or public use airport. Therefore, the Proposed Project would not expose people residing or working at the site to excessive noise levels from aircraft. Therefore, there would be no impact.

7 Conclusions

The findings of this NVIA report are that under CEQA, the noise impact associated with the construction, operation, and maintenance of the Proposed Project would be less than significant. Similarly, vibration impact associated with the construction of the Proposed Project would be less than significant; however, vibration from the Proposed Project's operation and maintenance would result in no impact.

8 References

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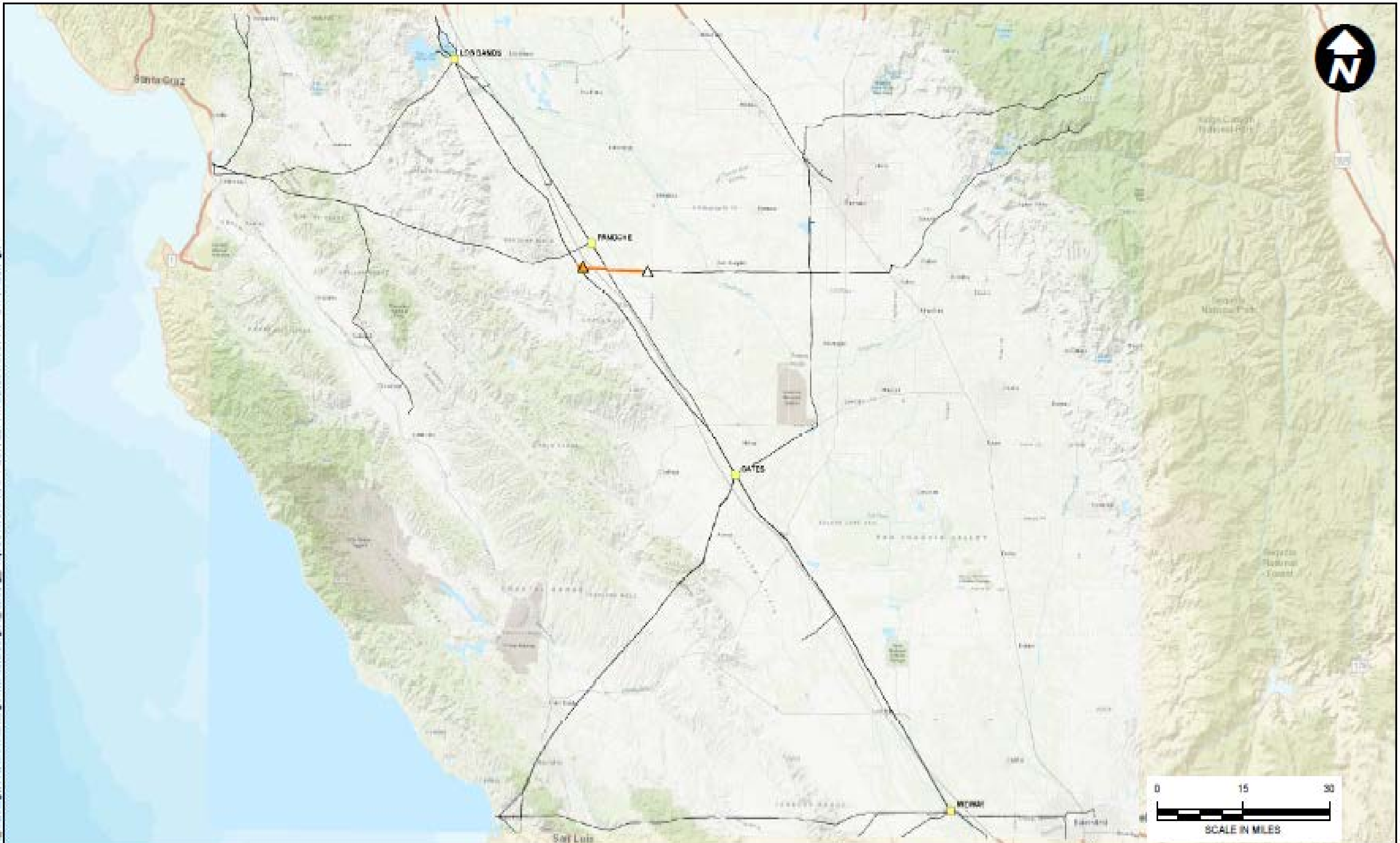
Figures



LEGEND

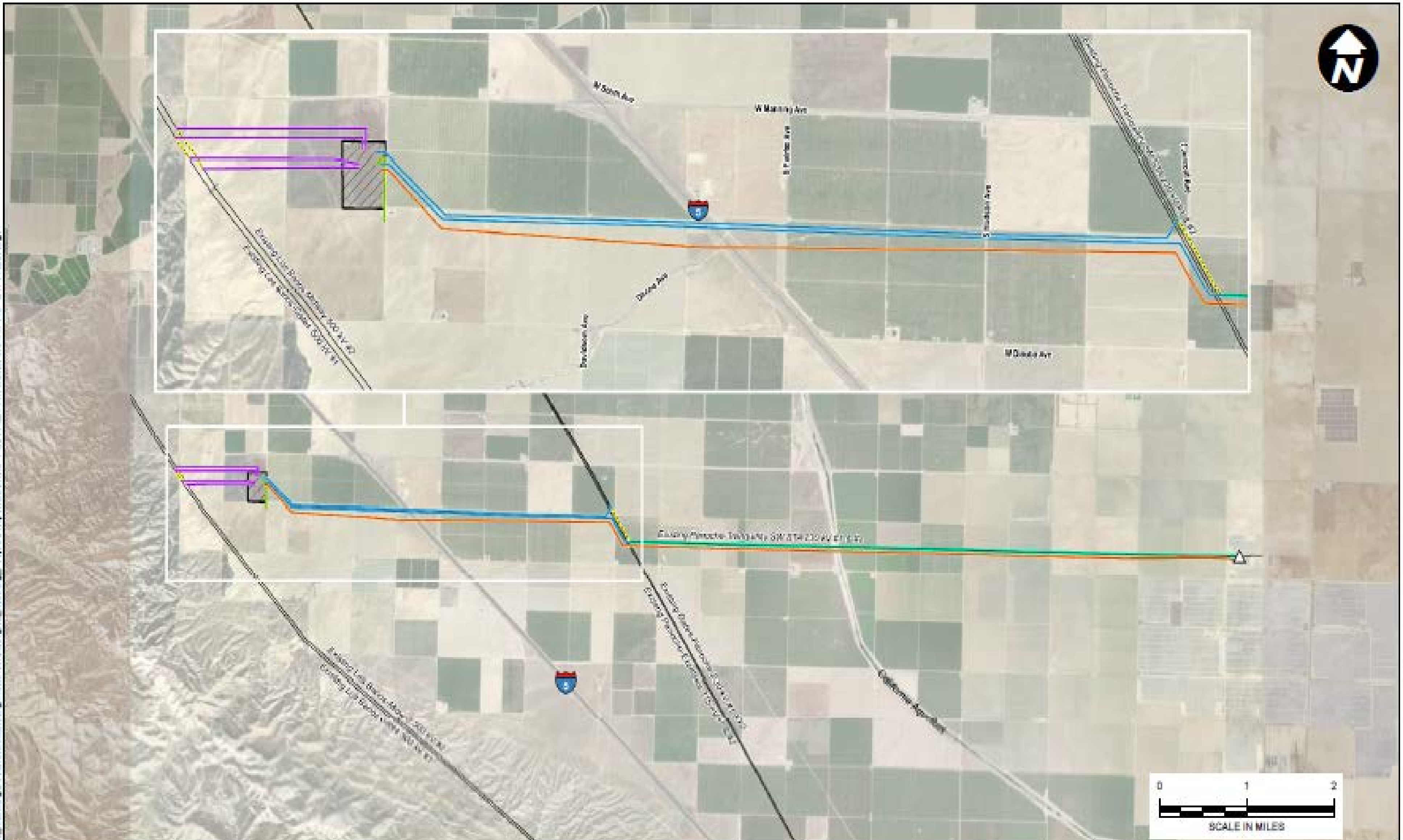
- Existing PG&E Substation
- Existing PG&E Tranquillity Switching Station
- Existing PG&E Transmission Line
- Proposed LSPGC Substation
- Proposed Transmission Lines and Interconnections

LS POWER GRID CALIFORNIA, LLC
MANNING 500/230 KV SUBSTATION PROJECT

PROJECT OVERVIEW MAP

ARCADIS

FIGURE
1



LEGEND

- Existing PG&E Tranquility Switching Station
- Existing PG&E Transmission Line
- Existing PG&E Transmission Line to be Removed
- Proposed LSPGC 230 kV Transmission Lines
- Proposed PG&E 500 kV Interconnections
- Proposed PG&E 230 kV Interconnections
- Proposed PG&E 230 kV Rebuild
- Proposed PG&E 12 kV Distribution Line
- Proposed LSPGC Manning Substation Site

LS POWER GRID CALIFORNIA, LLC
MANNING 500/230 KV SUBSTATION PROJECT

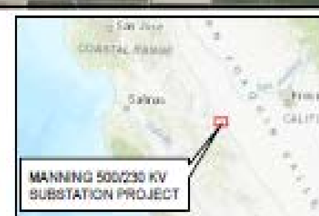
PROJECT COMPONENTS MAP

ARCADIS

FIGURE
2

LEGEND

- SENSITIVE NOISE RECEPTORS
- NOISE MEASUREMENT LOCATION
- TRANSMISSION LINE
- PROPOSED LSPGC MANNING SUBSTATION
- EXISTING PG&E TRANQUILLITY SWITCHING STATION



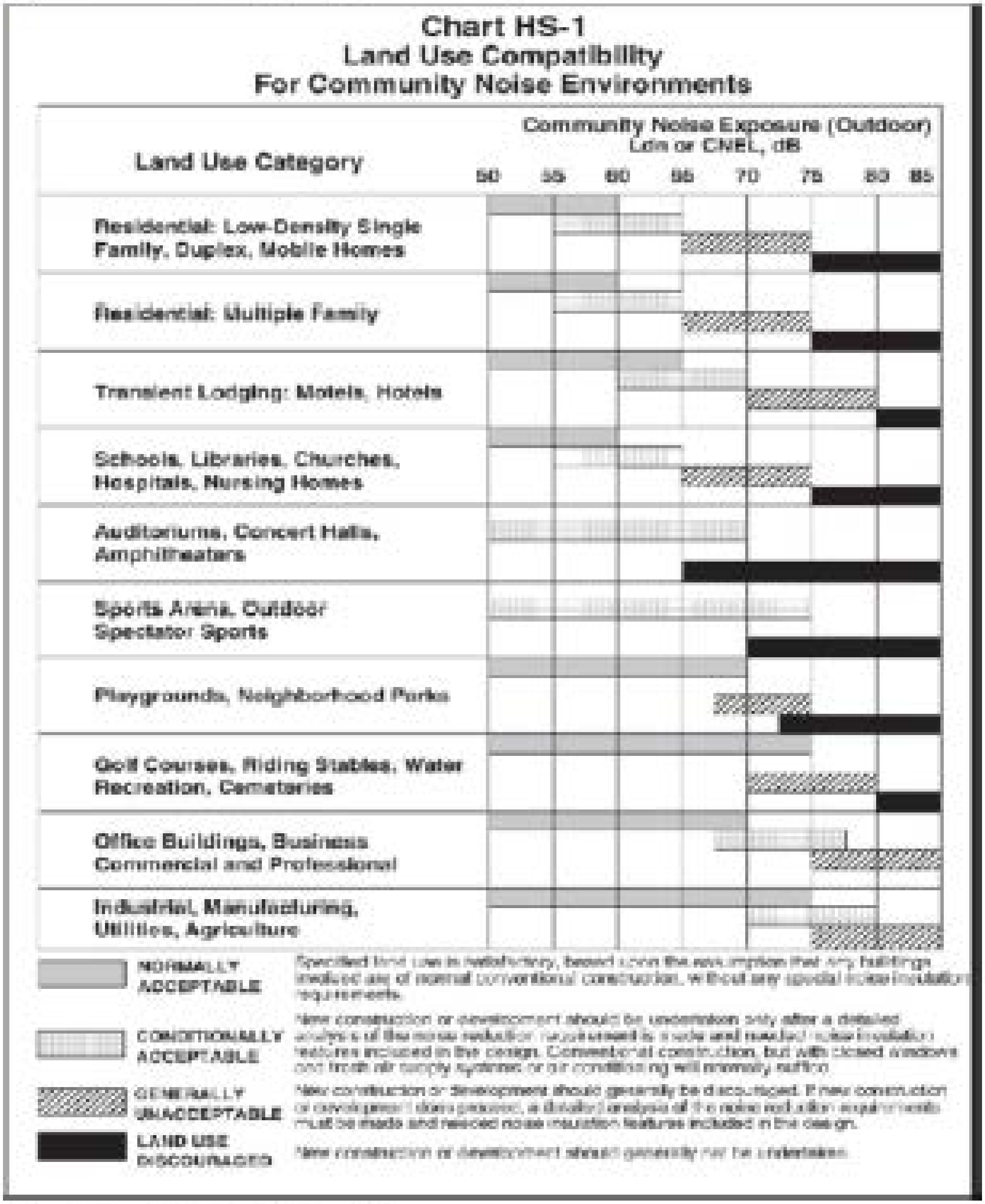
LS POWER GRID CALIFORNIA, LLC
MANNING 500/230 KV SUBSTATION PROJECT

NOISE MEASUREMENT LOCATIONS AND NEAREST SENSITIVE RECEPTORS

ARCADIS

FIGURE 3

Figure 4: Land Use Compatibility for Community Noise Environments



Source: Fresno County 2000 General Plan

LEGEND:

- RECEPTOR
- SITE BOUNDARY

DAYTIME NOISE CONTOUR (dBA)

- 45
- 50
- 55
- 60
- 65

0 500 1,000 Feet

GRAPHIC SCALE

NOTE:

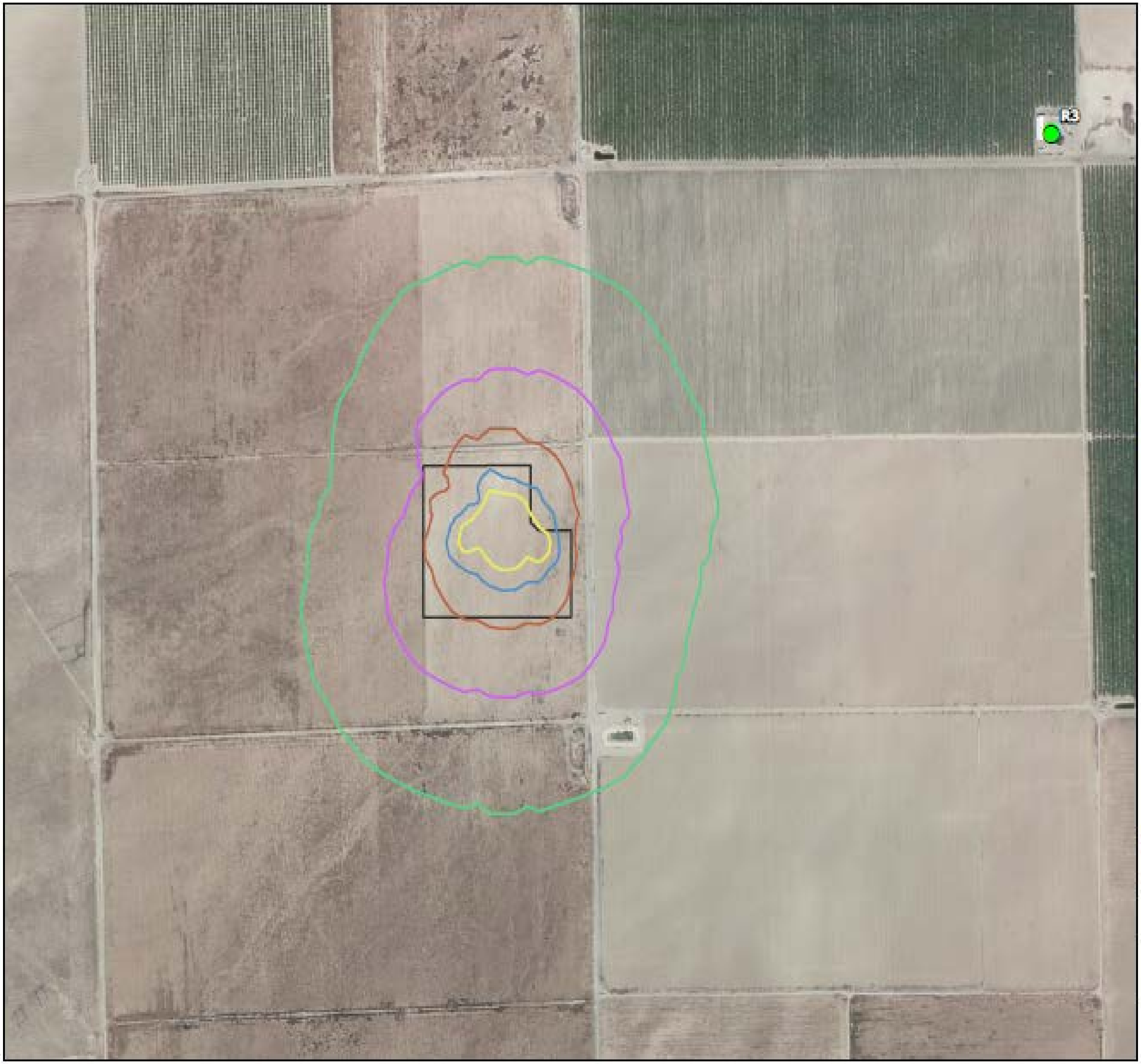
1. BASEMAPPING IMAGERY OBTAINED FROM GOOGLE EARTH PRO DATED 8/30/2023.

LS POWER GRID CALIFORNIA LLC
MANNING 500/230 KV SUBSTATION PROJECT

DAYTIME NOISE CONTOURS

ARCADIS

FIGURE 5



LEGEND:

- RECEPTOR
- SITE BOUNDARY

NIGHTTIME CONTOUR (dBA)

- 45
- 50
- 55
- 60
- 65

0 300 600 Feet

GRAPHIC SCALE

NOTE:

1. BASEMAPPING IMAGERY OBTAINED FROM GOOGLE EARTH PRO DATED 8/30/2023.

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MANNING 500/230 KV SUBSTATION PROJECT

NIGHTTIME NOISE CONTOURS

ARCADIS

FIGURE
6

LEGEND:

RECEPTOR

SITE BOUNDARY

DAY-NIGHT CONTOUR (dBA)

- 45
- 50
- 55
- 60
- 65

0 600 1,200 Feet

GRAPHIC SCALE

NOTE:

1. BASEMAPPING IMAGERY OBTAINED FROM GOOGLE EARTH PRO DATED 8/30/2023.

LS POWER GRID CALIFORNIA LLC
MANNING 500/230 KV SUBSTATION PROJECT

DAY-NIGHT NOISE CONTOURS

ARCADIS

FIGURE 7

Figure 8

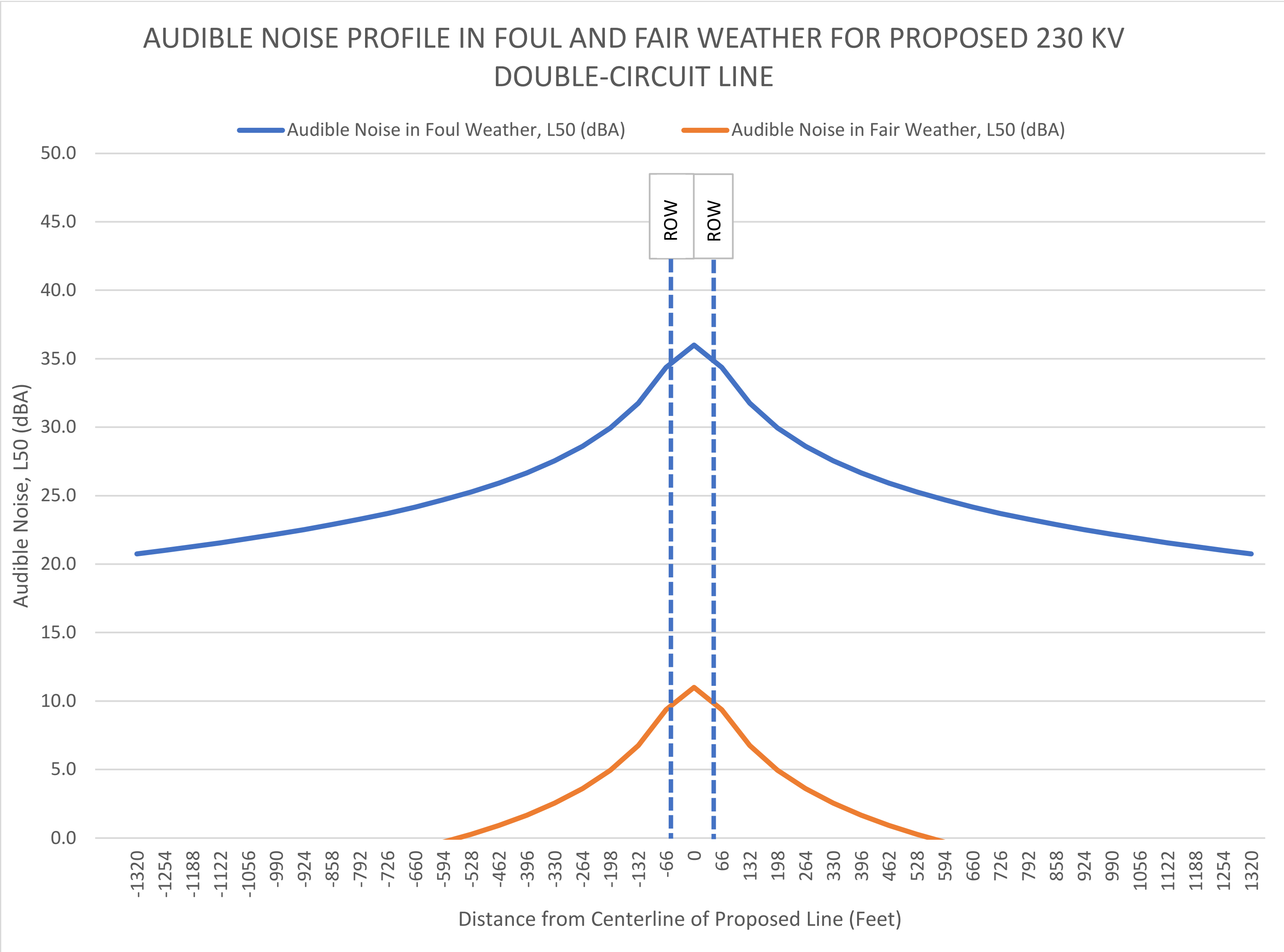
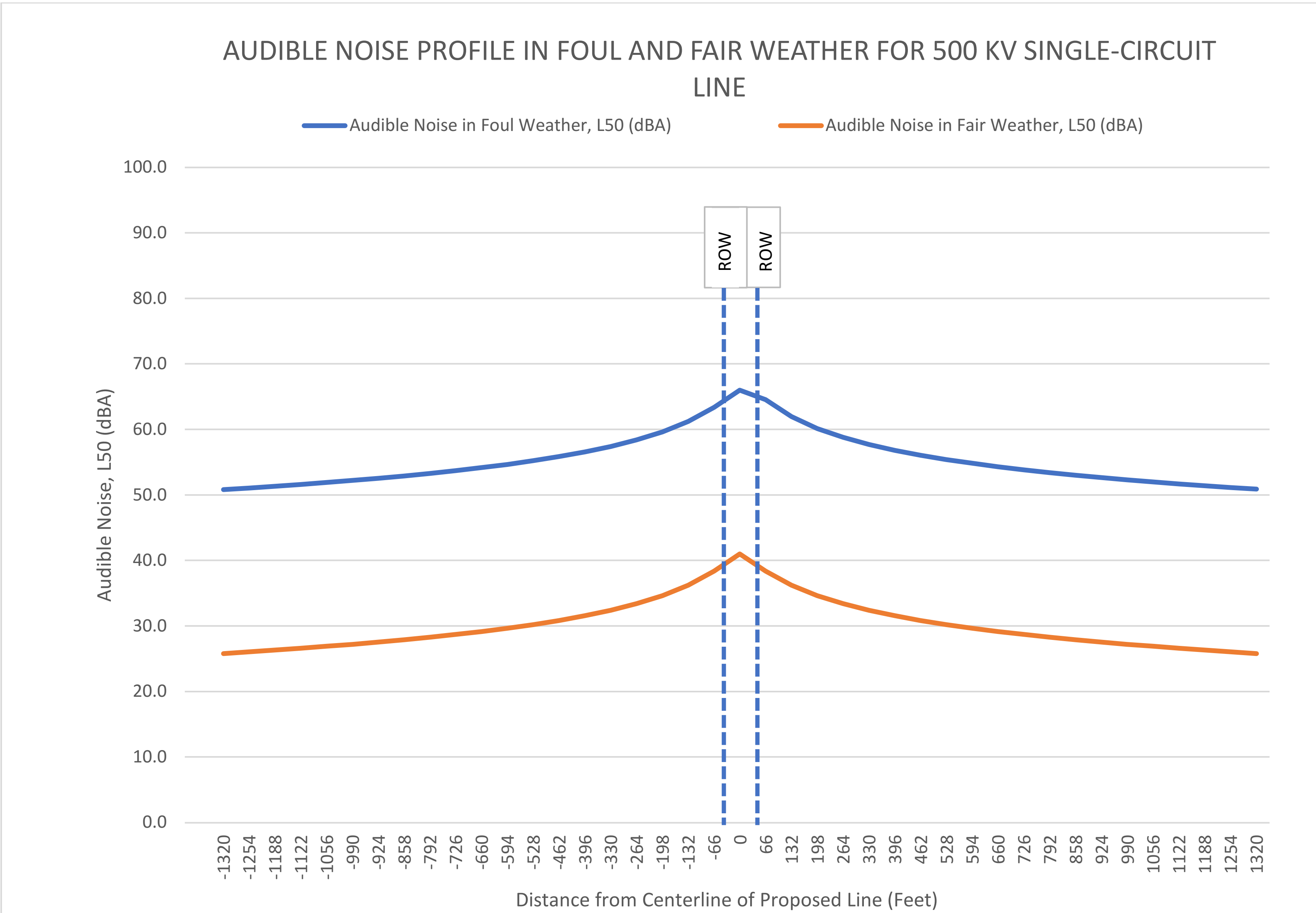

AUDIBLE NOISE PROFILE IN FOUL AND FAIR WEATHER FOR PROPOSED 230 KV DOUBLE-CIRCUIT LINE
Audible Noise in Foul Weather, L50 (dBA)
Audible Noise in Fair Weather, L50 (dBA)
Audible Noise, L50 (dBA)
50.0
45.0
40.0
35.0
30.0
25.0
20.0
15.0
10.0
5.0
0.0
ROW
ROW
-1320 -1254 -1188 -1122 -1056 -990 -924 -858 -792 -726 -660 -594 -528 -462 -396 -330 -264 -198 -132 -66 0 66 132 198 264 330 396 462 528 594 660 726 792 858 924 990 1056 1122 1188 1254 1320
Distance from Centerline of Proposed Line (Feet)

Figure 9


AUDIBLE NOISE PROFILE IN FOUL AND FAIR WEATHER FOR 500 KV SINGLE-CIRCUIT LINE
Audible Noise in Foul Weather, L50 (dBA)
Audible Noise in Fair Weather, L50 (dBA)
Audible Noise, L50 (dBA)
100.0
90.0
80.0
70.0
60.0
50.0
40.0
30.0
20.0
10.0
0.0
ROW
ROW
-1320 -1254 -1188 -1122 -1056 -990 -924 -858 -792 -726 -660 -594 -528 -462 -396 -330 -264 -198 -132 -66 0 66 132 198 264 330 396 462 528 594 660 726 792 858 924 990 1056 1122 1188 1254 1320
Distance from Centerline of Proposed Line (Feet)

Appendix A

Instrument Certificate of Calibration

www.casellasolutions.com FA04179 CASELLA

Certificate of Conformity and Calibration

Instrument Model:-	CEL-633C		
Serial Number	0499599		
Firmware revision	V006-05		
Microphone Type:-	CEL-251	Preamplifier Type:-	CEL-495
Serial Number	2845	Serial Number	004704
Instrument Class/Type:-	1		

Applicable standards:-

IEC 61672: 2013 / EN 60651 (Electroacoustics - Sound Level Meters)
IEC 60651 1979 (Sound Level Meters), ANSI S1.4. 1983 (Specifications For Sound Level Meters)

Note:- The test sequences performed in this report are in accordance with the current Sound level meter *Standard - IEC61672. The combination of tests performed are considered to confirm the products electro-acoustic performance to all applicable standards including superceeded Sound Level Meter Standards - IEC60651 and IEC60804.*

Test Conditions:-	21 °C 33 %RH 996 mBar	Test Engineer:- Date of Issue:-	Stephen Adams September 28, 2022

Declaration of conformity:-

This test certificate confirms that the instrument specified above has been successfully tested to comply with the manufacturer's published specifications. Tests are performed using equipment traceable to national standards in accordance with Casella's ISO 9001:2015 quality procedures. This product is certified as being compliant to the requirements of the CE Directive.

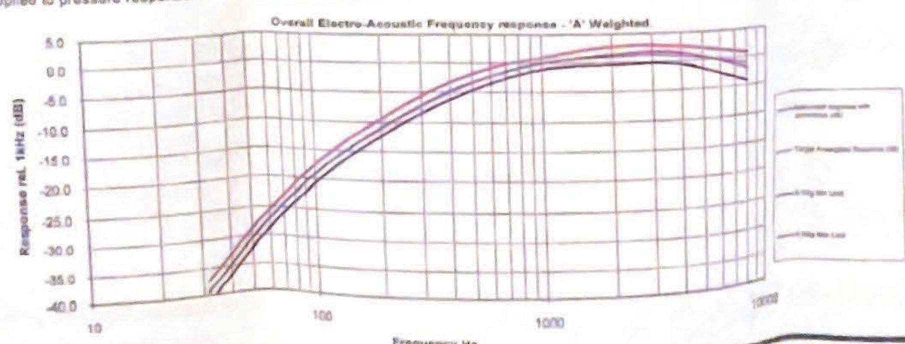
Test Summary:-

Self Generated Noise Test	All Tests Pass
Electrical Signal Test Of Frequency Weightings	All Tests Pass
Frequency & Time Weightings At 1 kHz	All Tests Pass
Level Linearity On The Reference Level Range	All Tests Pass
Toneburst Response Test	All Tests Pass
C-peak Sound Levels	All Tests Pass
Overload Indication	All Tests Pass
Acoustic Tests	All Tests Pass

Combined Electro-Acoustic Frequency Response - A Weighted

Combined Electro-Acoustic Frequency Response - A Weighted (IEC 61672-3:2006)

The following A-Weighted frequency response graph shows this instruments overall frequency response based upon the application of multi-frequency pressure field calibrations. The microphones Pressure to Free field correction coefficients are applied to pressure response. Reference level taken at 1kHz.



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Casella China

CASELLA

Certificate of Conformity and Calibration

Customer:	Eco-Rental Solutions
Instrument:	CEL-120/2
Serial Number:	4039312
Job Number:	26544
Date of Issue:	28-Sep-2022
Engineer:	S. Adams

Traceable Equipment:

Reference Calibrator	EQ11086
DVM type Fluke 45	EQ00023

Test Conditions:

Ambient Temperature	21.0	°C
Ambient Humidity	33.0	%RH
Ambient Pressure	996	mBar

Results:

	Level 1	Level 2	Frequency
Initial Reading	114.00 dB	N/A dB	1.0000 kHz
Final Reading	114.00 dB	N/A dB	1.0000 kHz

Uncertainty:

Level	± 0.15	dB
Frequency	± 0.5	Hz

This test certificate confirms that the instrument specified above has been successfully tested to comply with the manufacturer's published specifications.
Tests are performed using equipment traceable to national standards in accordance with Casella's ISO 9000:2015 quality procedures.
The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor k=2, providing a level of confidence of approximately 95%.
This certificate may not be reproduced other than in full, except with prior written approval of the issuing laboratory.

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Certificate of Conformity and Calibration

Instrument Model:-	CEL-633C		
Serial Number	2511397		
Firmware revision	V129-09		
Microphone Type:-	CEL-251	**Preamplifier Type:-**	CEL-495
Serial Number	1713	Serial Number	003768
Instrument Class/Type:-	1		

Applicable standards:-

IEC 61672: 2013 / EN 60651 (Electroacoustics - Sound Level Meters)
IEC 60651 1979 (Sound Level Meters), ANSI S1.4: 1983 (Specifications For Sound Level Meters)

Note:- The test sequences performed in this report are in accordance with the current Sound level meter *Standard - IEC61672. The combination of tests performed are considered to confirm the products electro-acoustic performance to all applicable standards including superceeded Sound Level Meter Standards - IEC60651 and IEC60804*

Test Conditions:-	23 °C 44 %RH 996 mBar	**Test Engineer:-** **Date of Issue:-**	Paul Blackwell October 24, 2022

Declaration of conformity:-

This test certificate confirms that the instrument specified above has been successfully tested to comply with the manufacturer's published specifications. Tests are performed using equipment traceable to national standards in accordance with Casella's ISO 9001:2015 quality procedures. This product is certified as being compliant to the requirements of the CE Directive.

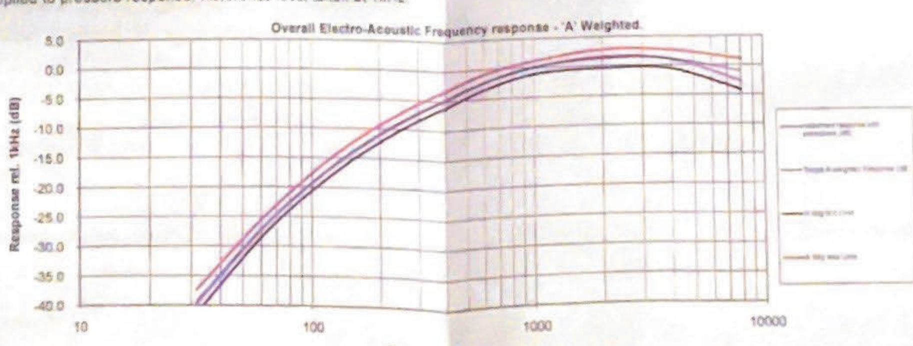
Test Summary:-

Self Generated Noise Test	All Tests Pass
Electrical Signal Test Of Frequency Weightings	All Tests Pass
Frequency & Time Weightings At 1 kHz	All Tests Pass
Level Linearity On The Reference Level Range	All Tests Pass
Toneburst Response Test	All Tests Pass
C-peak Sound Levels	All Tests Pass
Overload Indication	All Tests Pass
Acoustic Tests	All Tests Pass

Combined Electro-Acoustic Frequency Response - A Weighted

Combined Electro-Acoustic Frequency Response - A Weighted (IEC 61672-3:2006)

The following A-Weighted frequency response graph shows this instruments overall frequency response based upon the application of multi-frequency pressure field calibrations. The microphones Pressure to Free field correction coefficients are applied to pressure response. Reference level taken at 1kHz



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CASELLA

Certificate of Conformity and Calibration

Customer:	Eco-Rental Solutions
Instrument:	CEL-110/1
Serial Number:	301160
Job Number:	26739
Date of Issue:	24-Oct-2022
Engineer:	P Blackwell

Traceable Equipment:	Reference Calibrator	EQ11085
	DVM type Fluke 45	EQ00318

Test Conditions:

Ambient Temperature	23.0	°C
Ambient Humidity	44.0	%RH
Ambient Pressure	996	mBar

Results:

	Level 1	Level 2	Frequency
Initial Reading	113.95 dB	93.94 dB	1.0001 kHz
Final Reading	114.00 dB	94.05 dB	1.0001 kHz

Uncertainty:

Level	±	0.15	dB
Frequency	±	0.5	Hz

This test certificate confirms that the instrument specified above has been successfully tested to comply with the manufacturer's published specifications.
Tests are performed using equipment traceable to national standards in accordance with Casella's ISO 9000:2015 quality procedures.
The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor k=2, providing a level of confidence of approximately 95%.
This certificate may not be reproduced other than in full, except with prior written approval of the issuing laboratory.

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Appendix B

Photograph Log

Photograph Log

LS Power Grid California, LLC
Manning Substation
30184020

Photograph: 1

Description:
Manning 24HR
Monitoring Location

Location:
Manning, CA

Photograph taken by:
Mary-Catherine
Goddard

Date: 9/21/2023

Photograph: 2

Description:
Manning Short Term
Monitoring Location

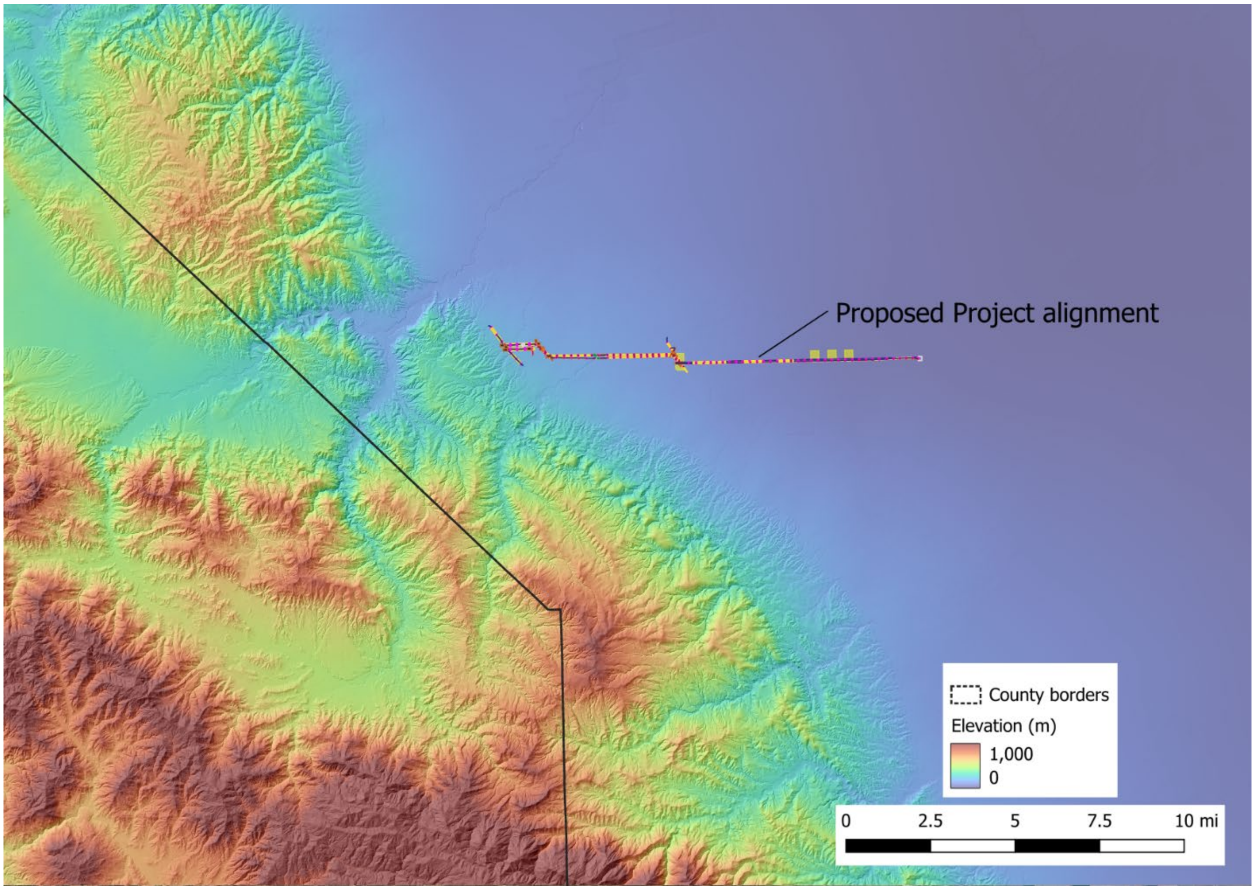
Location:
Manning, CA

Photograph taken by:
Mary-Catherine
Goddard

Date: 9/21/2023

ATTACHMENT 5.20-A: WILDFIRE TECHNICAL REPORT

Manning 500/230 kV Substation Project - Wildfire Analyses



Christopher W. Lautenberger, PhD, PE

CloudFire

October 20, 2023

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LIST OF FIGURES

1.0 INTRODUCTION

CloudFire Inc. (CloudFire) has been retained by Insignia environmental (Insignia) to provide a wildfire risk analysis of the proposed Manning 500/230 kilovolt (kV) Substation Project (Proposed Project). This analysis addresses components outlined in Section 5.20.1 of the California Public Utilities Commission (CPUC) "Guidelines for Energy Project Application Requiring CEQA Compliance"[1], hereafter "CPUC guidelines". This report presents the findings of this analysis.

[1] https://www.cpuc.ca.gov/-/media/cpuc-website/files/legacyfiles/c/6442463239-ceqa-pre-filing-guidelines-pea-checklist-nov-2019.pdf

2.0 HIGH FIRE RISK AREAS AND STATE RESPONSIBILITY AREAS

CPUC guidelines Section 5.20.1.1 requires identification of Wildland Urban Interface (WUI) areas and high fire risk areas within the Proposed Project area. To meet this requirement, CloudFire analyzed the following maps developed by the Federal Government and State of California:

1. CAL FIRE State Responsibility Areas[2] - See Figure 1.
2. 1990-2020 wildland-urban interface of the coterminous United States[3] - see Figure 2.
3. CPUC High Fire Threat District map[4] - see Figure 3.
4. Currently adopted Fire Hazard Severity Zone maps[5] - see Figure 4.
5. Fire Resource Assessment Program (FRAP) Fire Threat map[6] - see Figure 5.

Figure 1 shows Local Responsibility Area (LRA), State Responsibility Area (SRA), and Federal Responsibility Area (FRA) relative to the Proposed Project Alignment. East of Interstate 5 the Proposed Project is in Local Responsibility areas and west of Interstate 5 it is in State Responsibility areas. Figure 2 shows that the predominant WUI classifications in the Proposed Project area are “very low density” and “low density,” with a small amount of “medium density” WUI approximately 4 miles north and 8 miles southeast of the Proposed Project alignment.

As shown collectively in Figure 3 – Figure 5, the Proposed Project is sited in a generally low fire risk area. The Proposed Project is not located within or near CPUC high fire threat districts. West of Interstate 5, the Proposed Project is in a moderate fire hazard severity zone. Fire threat along the alignment is not rated, meaning it is less than the minimum fire threat category (low).

[2] https://gis.data.ca.gov/datasets/3991e5168faf47dfa0953caa1fe53bae_0
[3] https://www.fs.usda.gov/rds/archive/catalog/RDS-2015-0012-4
[4] https://www.cpuc.ca.gov/industries-and-topics/wildfires/fire-threat-maps-and-fire-safety-rulemaking
[5] https://osfm.fire.ca.gov/divisions/community-wildfire-preparedness-and-mitigation/wildfire-preparedness/fire-hazard-severity-zones/fire-hazard-severity-zone-maps/
[6]https://34c031f8-c9fd-4018-8c5a-4159cdff6b0d-cdn-endpoint.azureedge.net/-/media/calfire-website/what-we-do/fire-resource-assessment-program---frap/gis-data/fire-threat-v14_2.zip?rev=6e6841d8777b429397875c25b9bb696c&hash=A2667077F81E905061931642470112CF

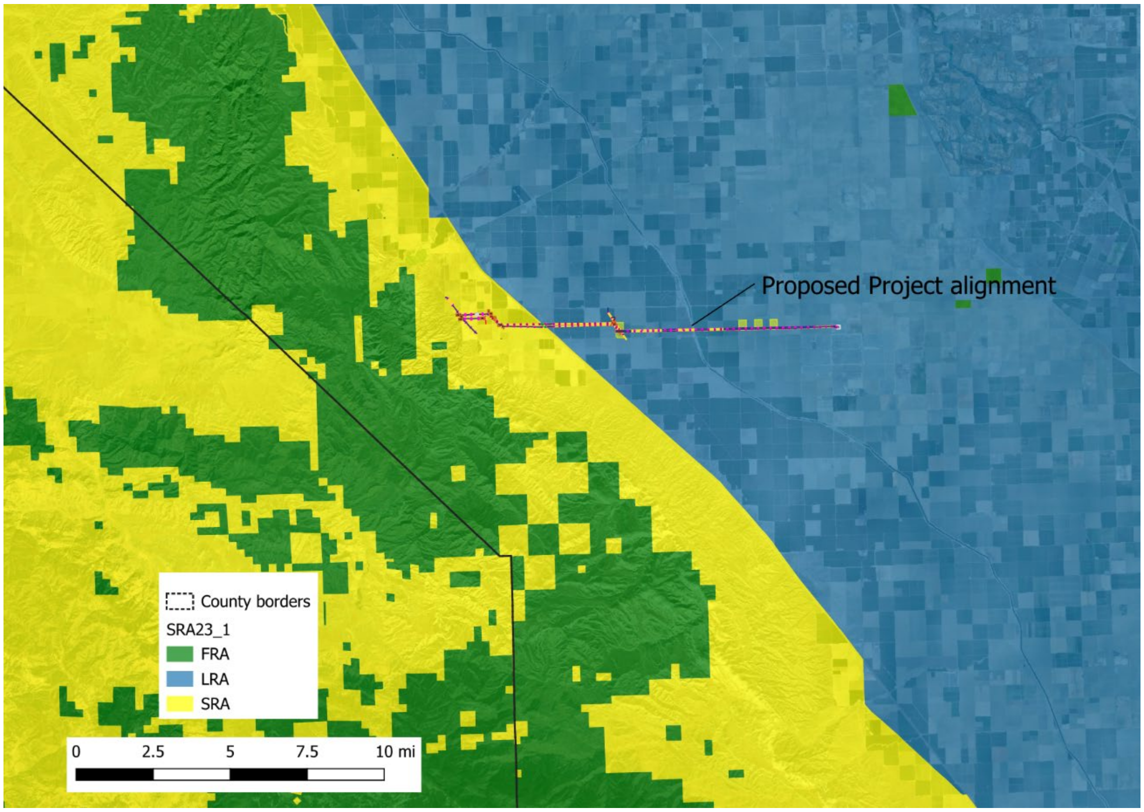

Figure 1. Local, State, and Federal responsibility areas relative to Proposed Project.

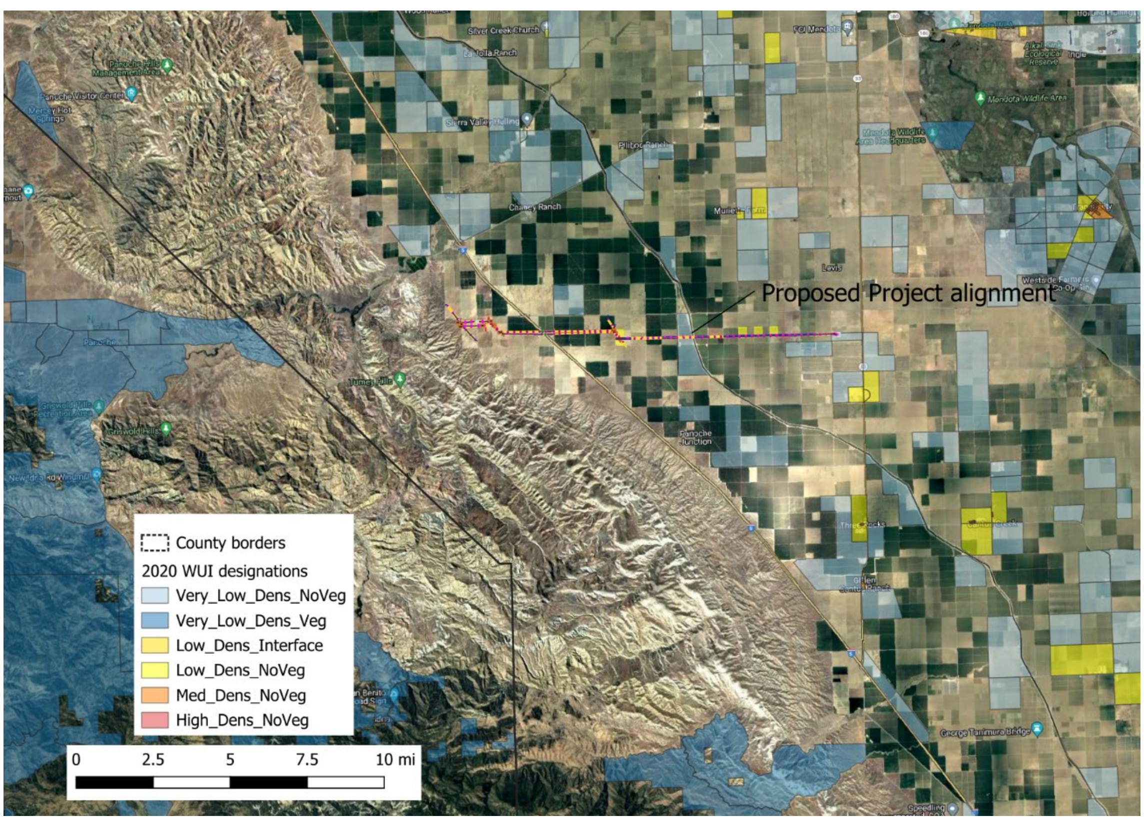

Figure 2. Wildland urban interface areas relative to Proposed Project area.

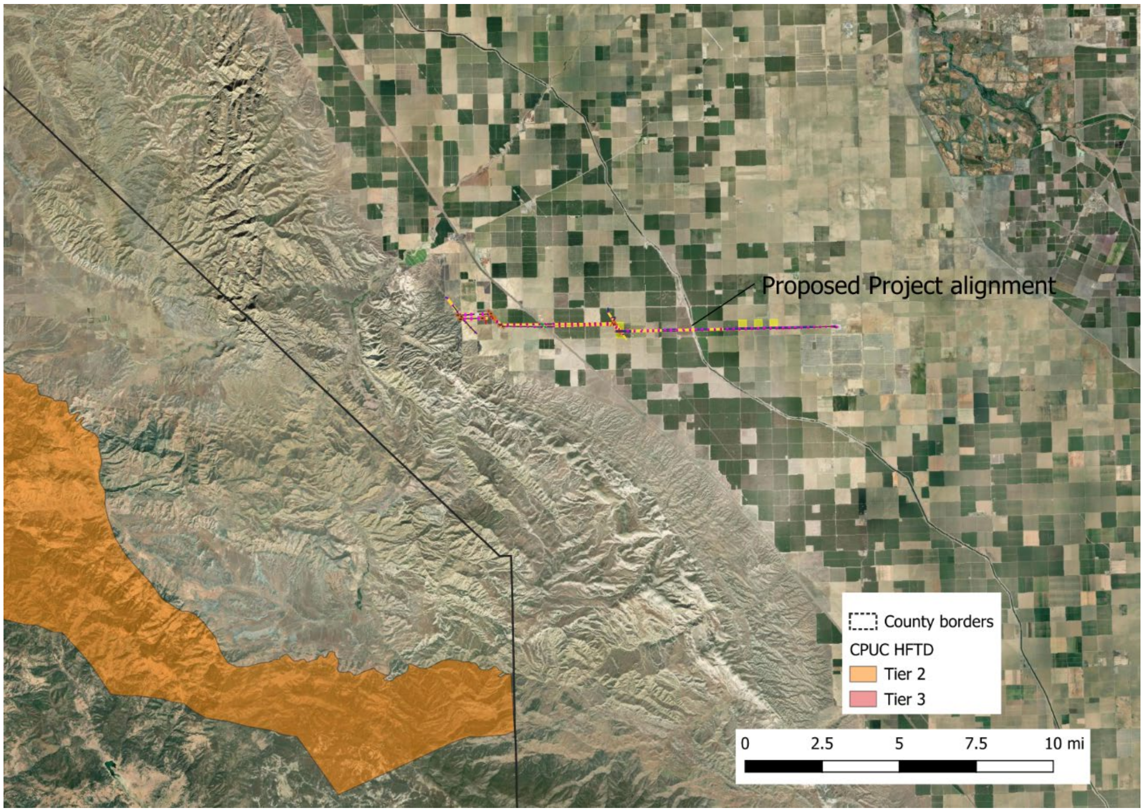

Figure 3. CPUC High Fire Threat District map relative to Proposed Project area.

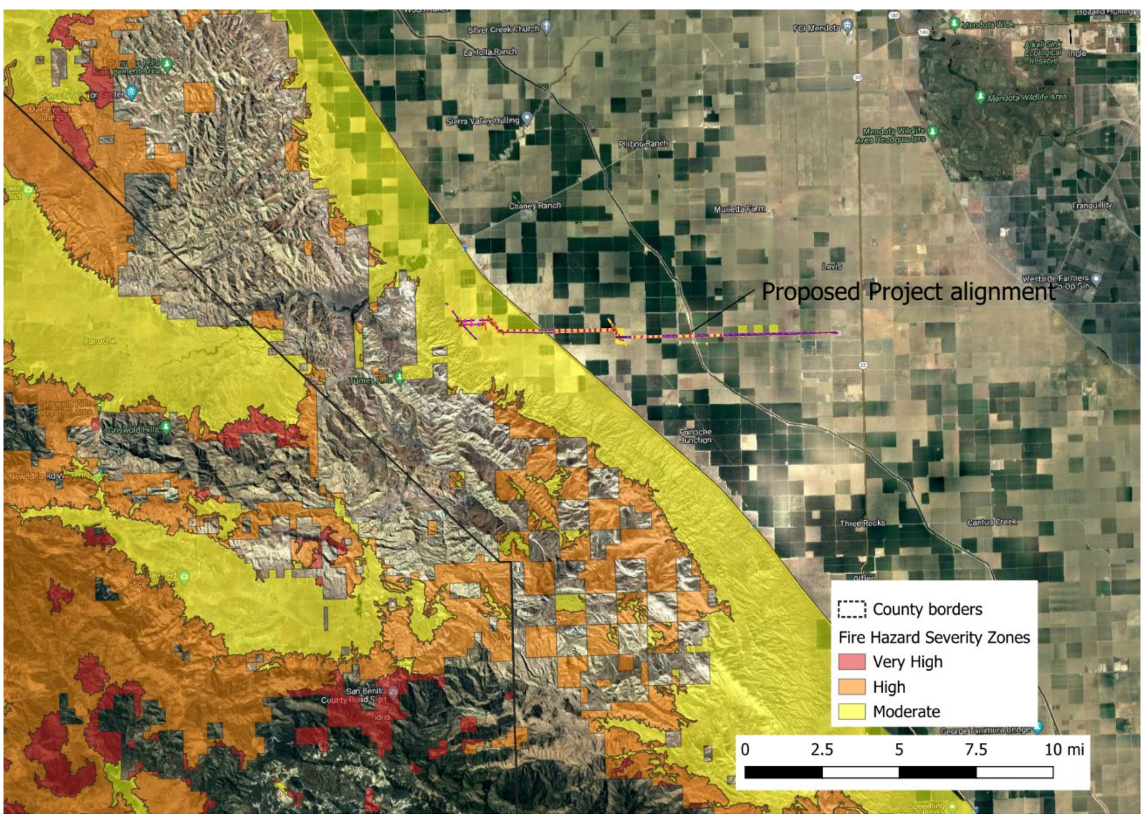

Figure 4. Fire Hazard Severity Zone map relative to Proposed Project area.

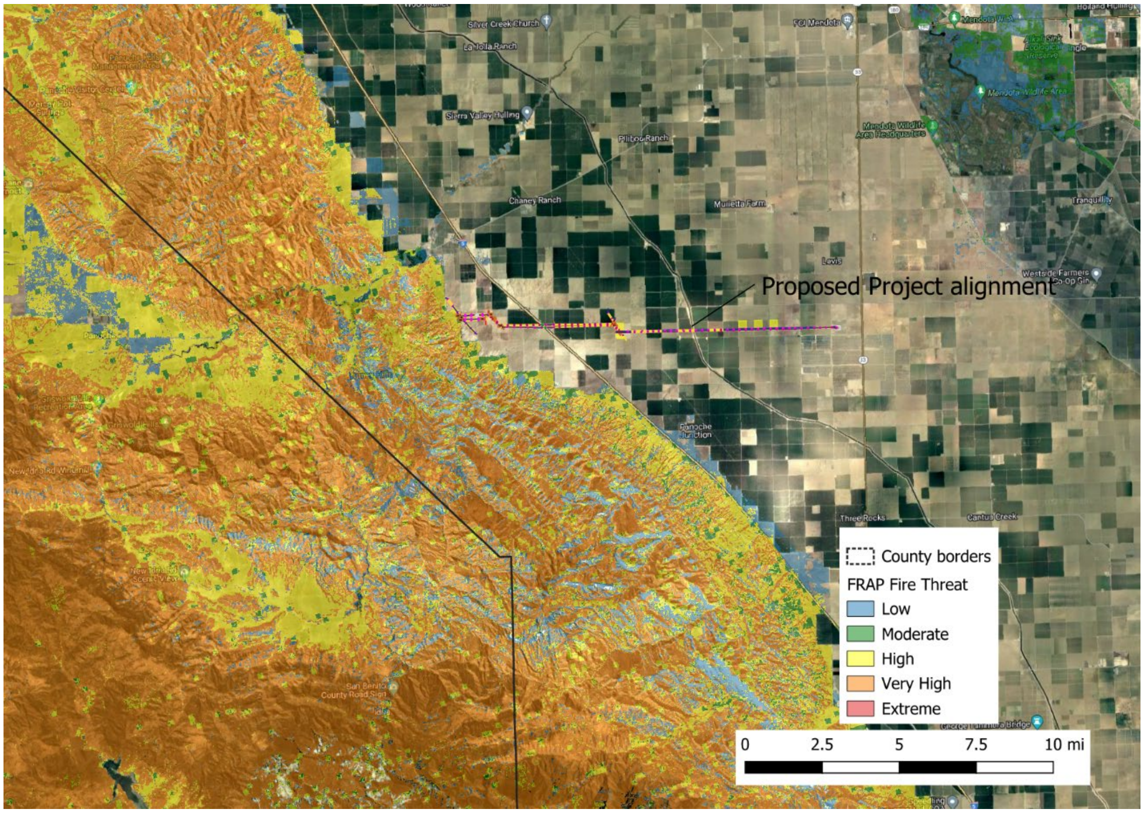

Figure 5. Fire Threat Map relative to Proposed Project area.

3.0 Historical Fire Occurrence

CPUC guidelines Section 5.20.1.2 require identification of recent (within the last 10 years) large fires that have occurred within the Proposed Project vicinity. Figure 6 shows 10 years (2013 – 2022) of fire history per CAL FIRE's fire perimeter database[7].

The three largest fires in the Proposed Project area are as follows:

1. 2016 Hill Fire – 190 acres, caused by lightning.
2. 2017 Tumey Fire – 160 acres, miscellaneous fire cause.
3. 2016 Panocho – 53 acres, miscellaneous fire cause.

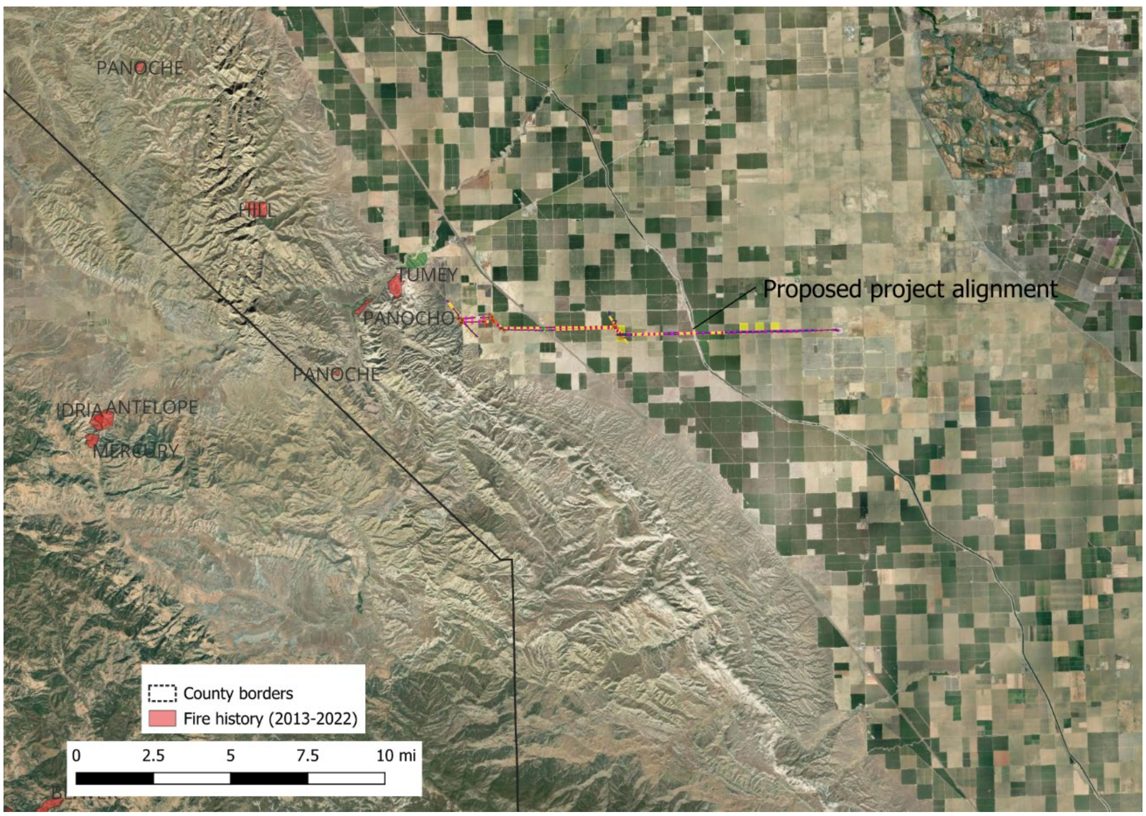

Figure 6. Historical fire occurrence (2013-2022) relative to Proposed Project area.

[7] https://gis.data.ca.gov/datasets/CALFIRE-Forestry::california-fire-perimeters-all-1/explore

4.0 BASELINE FIRE RISK

4.1 Surface fuels

CPUC guidelines section 5.20.1.3(a) requires "… fuel modeling using Scott Burgan fuel models…" For that reason, surface fuel models in the Scott & Burgan system from LANDFIRE 2022 are shown in Figure 7 near the Proposed Project. The predominant surface fuel models in the Proposed Project area are agricultural; low load, dry climate grass; and moderate load broadleaf litter. West of the Proposed Project, fuels are primarily low load, dry climate grass and grass-shrub.

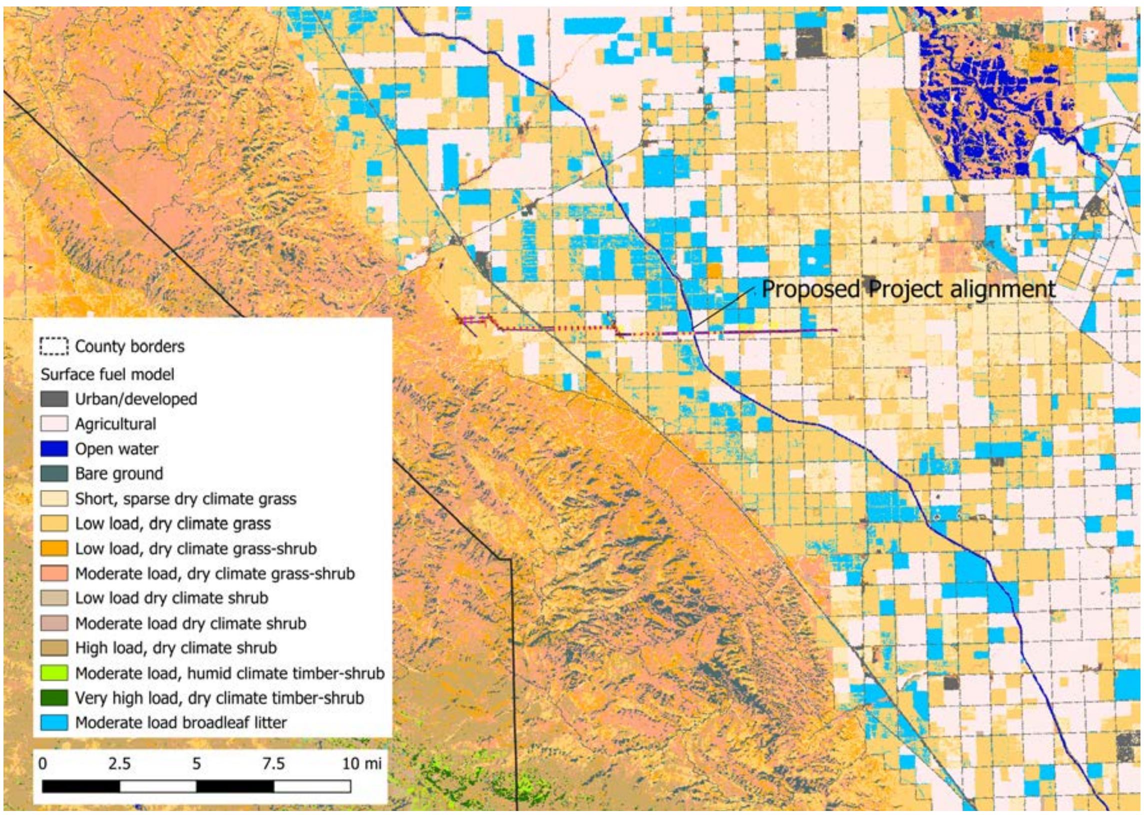

Figure 7. LANDFIRE 2022 Scott & Burgan surface fuel models near Proposed Project area.

4.2 Fire weather

CPUC guidelines section 5.20.1.3(b) requires "…values of wind direction and speed, relative humidity, and temperature for representative weather stations along the alignment for the previous 10 years, gathered hourly." Fire weather climatology is typically conducted using data from Remote Automated Weather Stations (RAWS). The closest RAWS station, Panoche Road, is located approximately 12 miles northwest of the western extent of the Proposed Project. Its available period of record is 1994-current. Figure 8 shows a wind rose for Panoche Road RAWS calculated from 10 years (2013-2022) of hourly observations with no seasonal or diurnal filtering.

Yearly variations in daily maximum temperature, daily minimum relative humidity, and wind gust speed are shown in Figure 9 - Figure 11. These data show that peak winds occur “off season”, meaning during the wetter months. Temperatures of over 100 °F are reached during the summer months, with minimum relative humidity typically below 20%. Between May 1 and October 1, peak wind gusts approach 40 mph with occasional excursions above 40 mph.

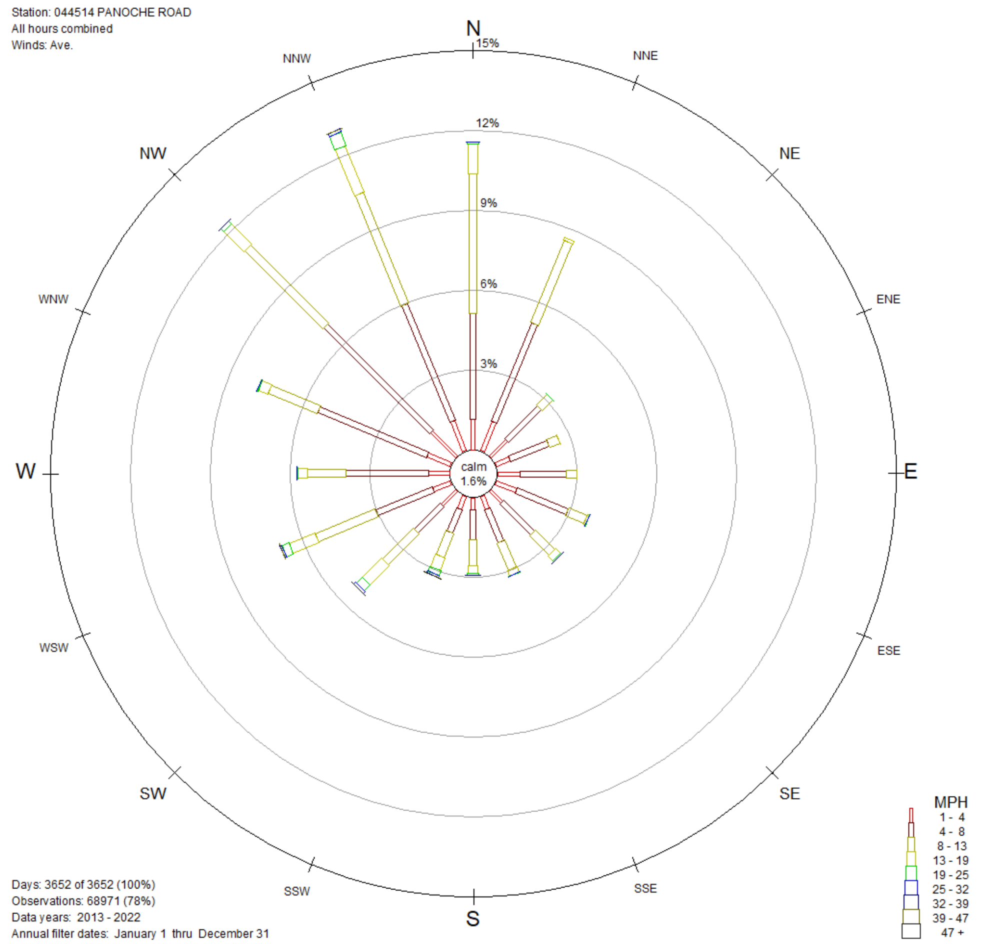

Figure 8. Panoche Road RAWS wind rose.

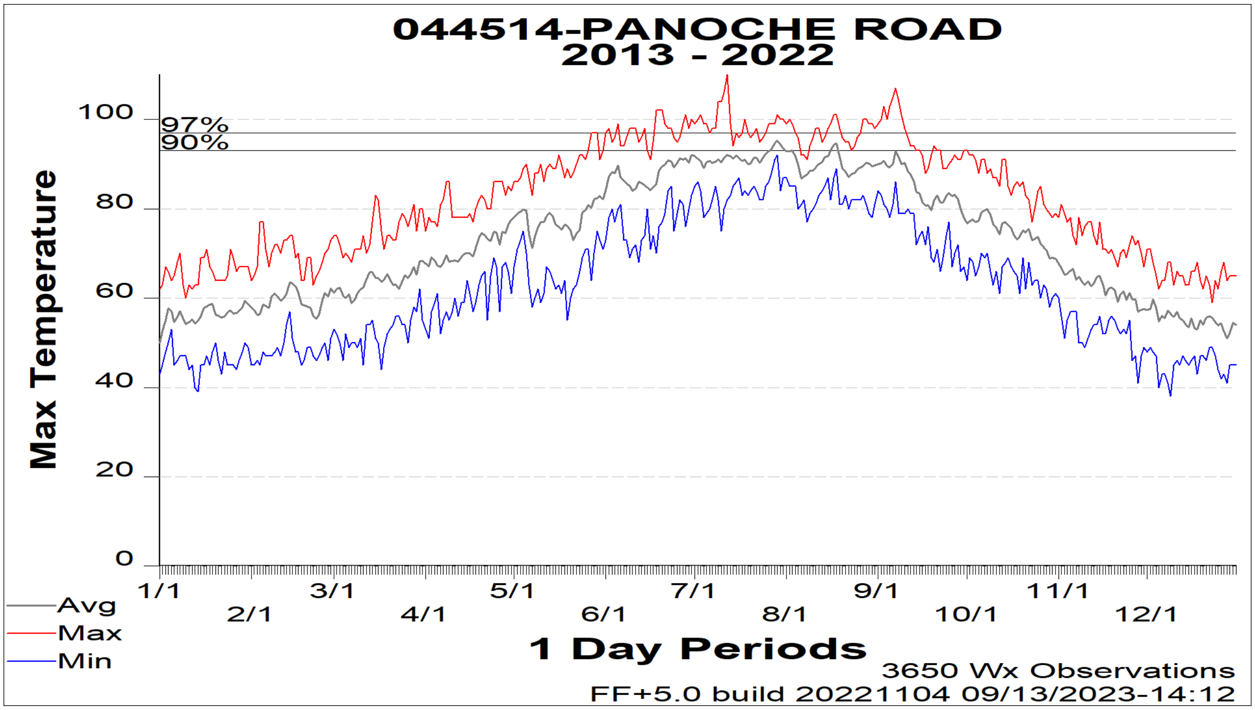

Figure 9. Panoche Road RAWS daily maximum temperature.

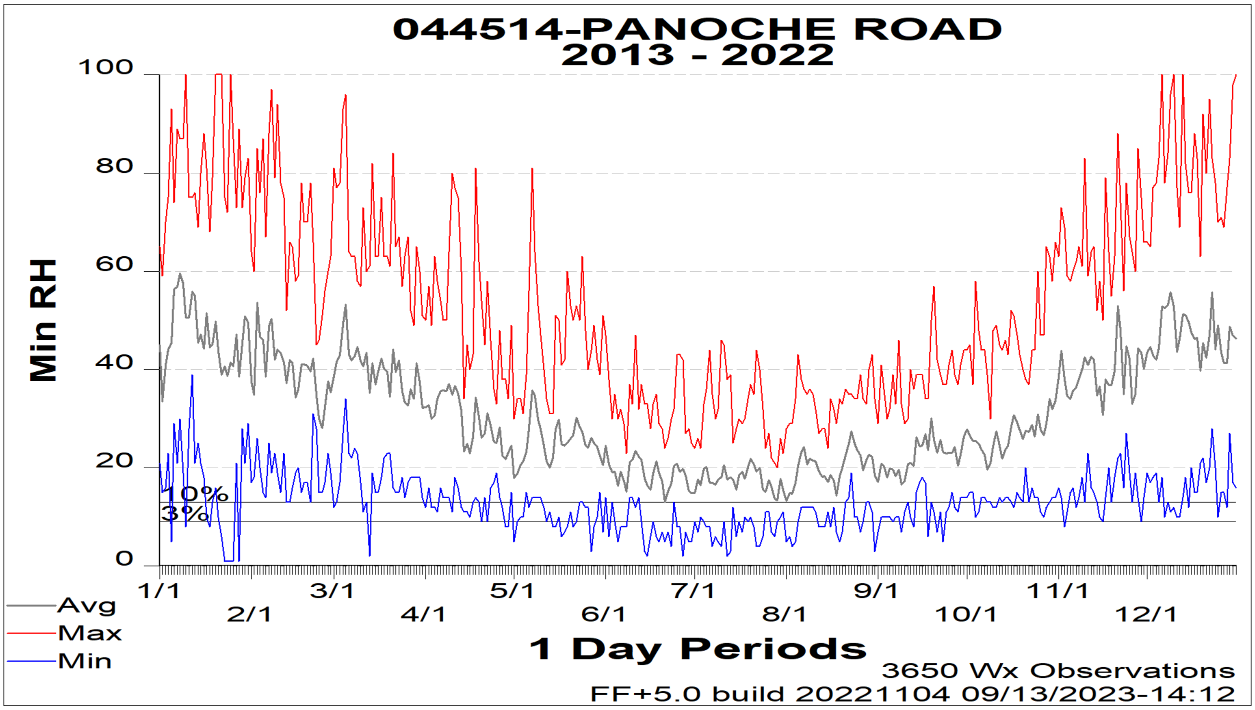

Figure 10. Panoche Road RAWS daily minimum relative humidity.

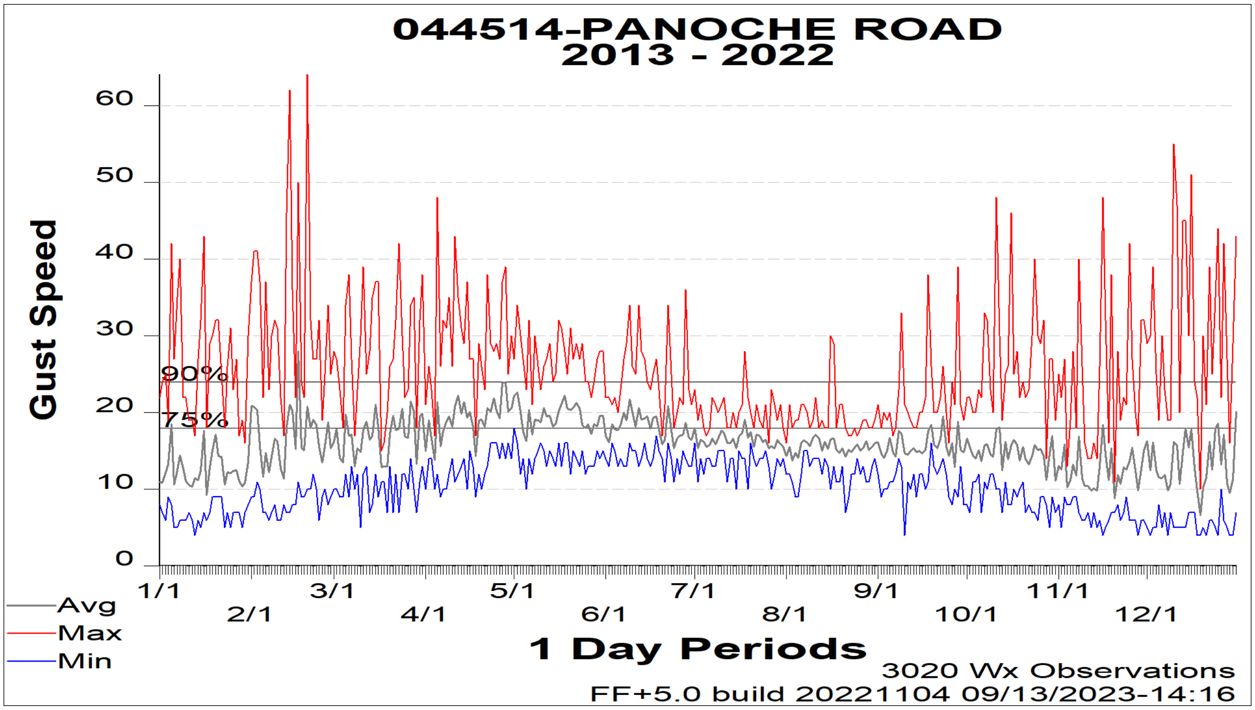

Figure 11. Panoche Road RAWS wind gust.

4.3 Topography analysis

CPUC guidelines section 5.20.1.3(c) requires "Digital elevation models for the topography in the project region…" To meet this requirement, Figure 12 shows a hybrid hillshade/digital elevation model near the Proposed Project. The easternmost part of the Proposed Project is located at an elevation of approximately 215 ft. Moving west along the Proposed Project alignment, elevation reaches a peak of approximately 770 ft. This corresponds to an average grade of < 1% along the length of the Proposed Project alignment. Higher elevations are reached and topography becomes more complex west of the Proposed Project alignment.

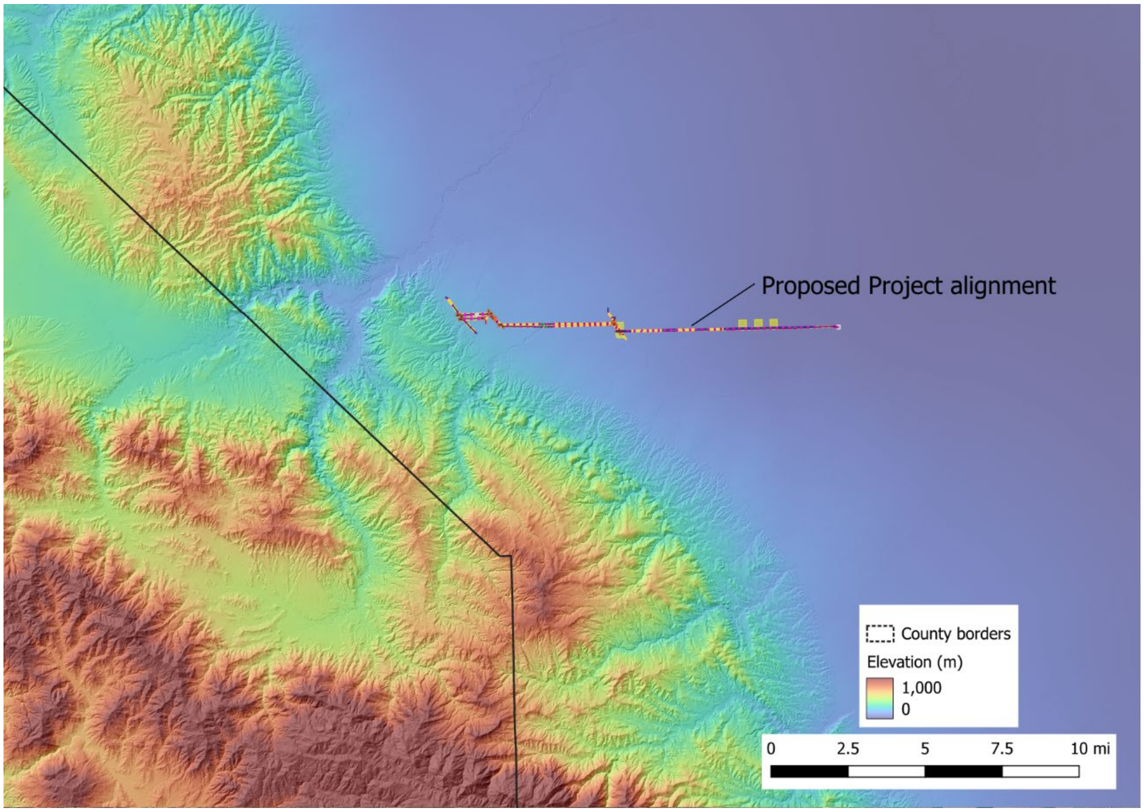

Figure 12. Hybrid hillshade/digital elevation model near Proposed Project area.

4.4 Vegetation description

CPUC guidelines section 5.20.1.3(d) requires a description of "vegetation fuels within the project vicinity". This is redundant with surface fuel models and the reader is referred to Section 4.1.

5.0 VALUES AT RISK

CPUC guidelines Section 5.20.1.4 requires identification of values at risk. To meet this requirement, CloudFire mapped the following values at risk:

1. Structures[8] – See Figure 13.
2. Transmission lines[9] – See Figure 14.
3. Roads[10] – See Figure 15.
4. Crops[11] - See Figure 16.
5. Habitat[12] - See Figure 17.

In general, the Proposed Project area is sparsely populated with few structures. The primary value at risk is agricultural areas / crops. Several steel-tower 500 kV transmission lines are in the Proposed Project area, with additional 115 kV and 230 kV transmission lines. There is no significant sensitive habitat near the Proposed Project.

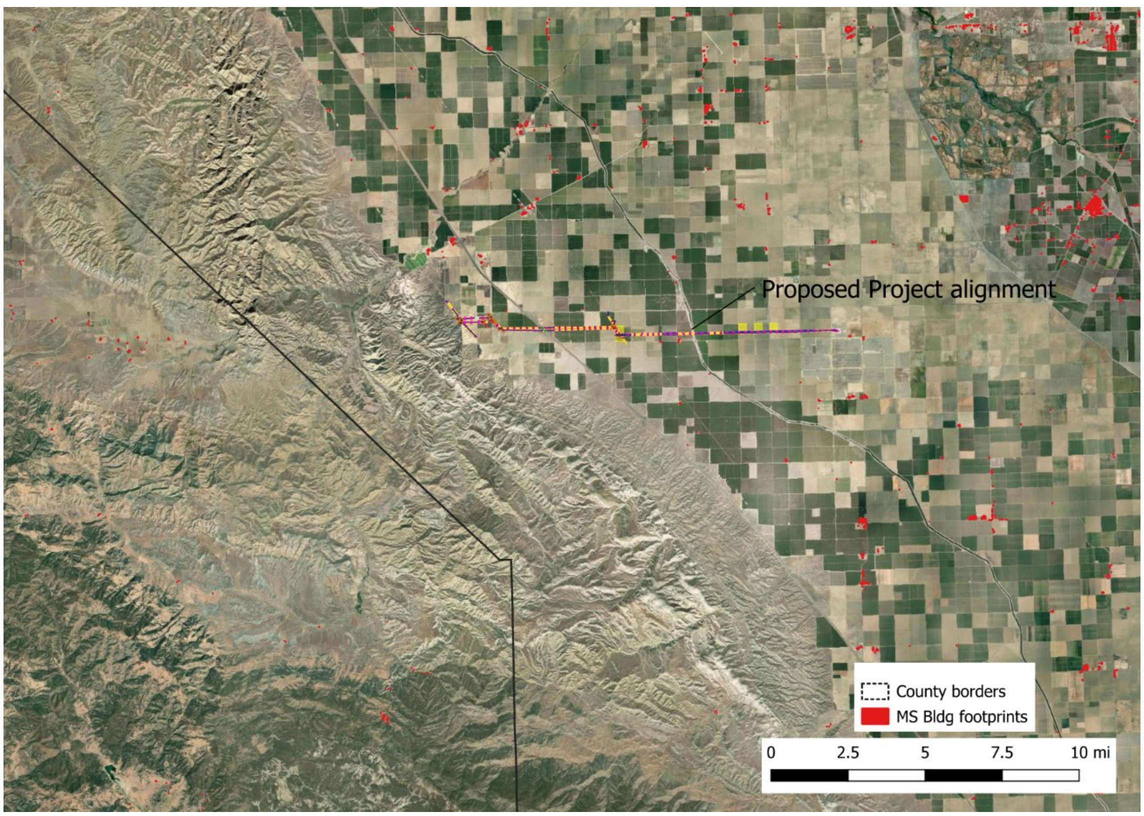

Figure 13. Structures near Proposed Project area.

[8] https://github.com/Microsoft/USBuildingFootprints
[9] https://data.ca.gov/dataset/california-electric-transmission-lines
[10] https://download.geofabrik.de/north-america/us/california.html
[11] https://data.cnra.ca.gov/dataset/statewide-crop-mapping
[12] https://ecos.fws.gov/ecp/report/table/critical-habitat.html

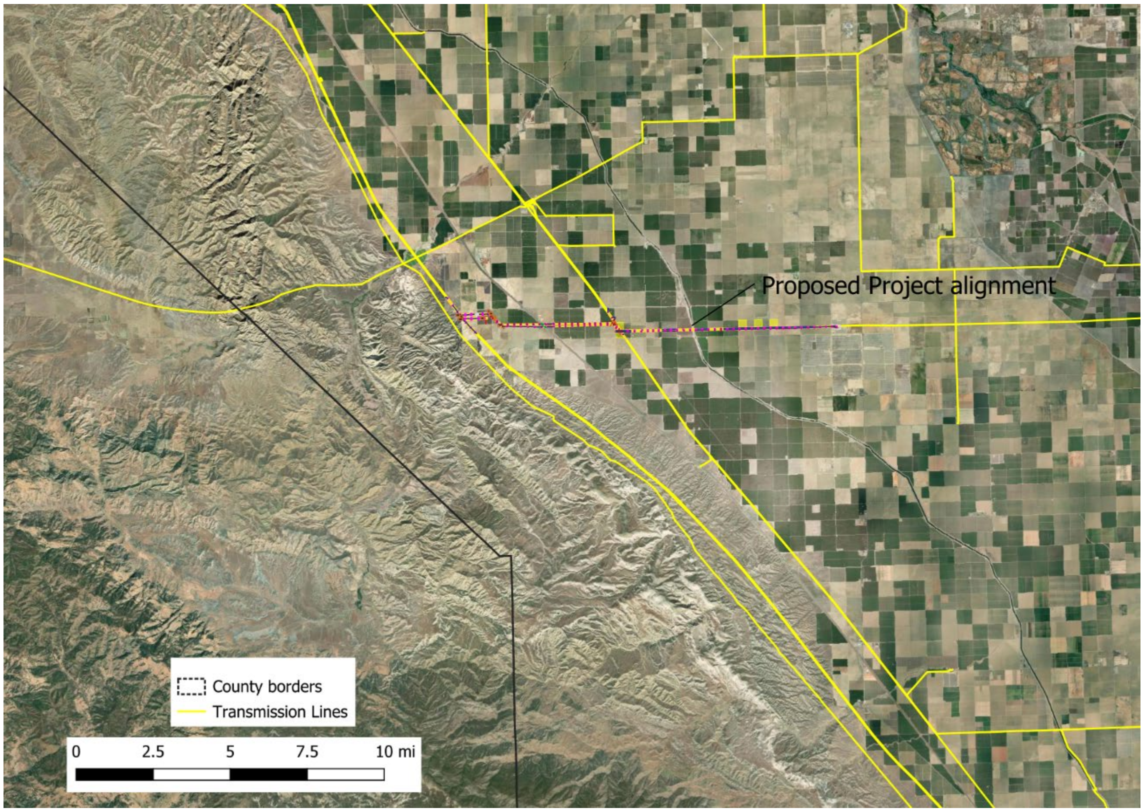

Figure 14. Transmission lines near Proposed Project area.

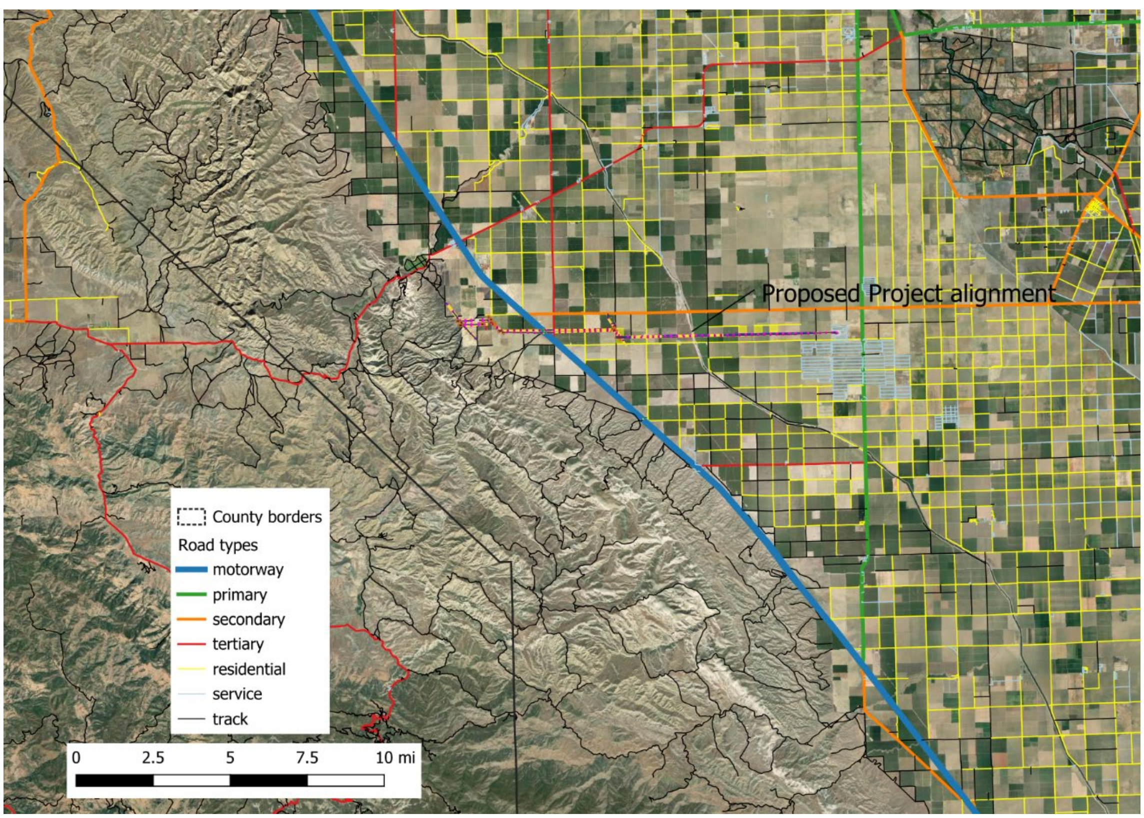

Figure 15. Roads near Proposed Project area.

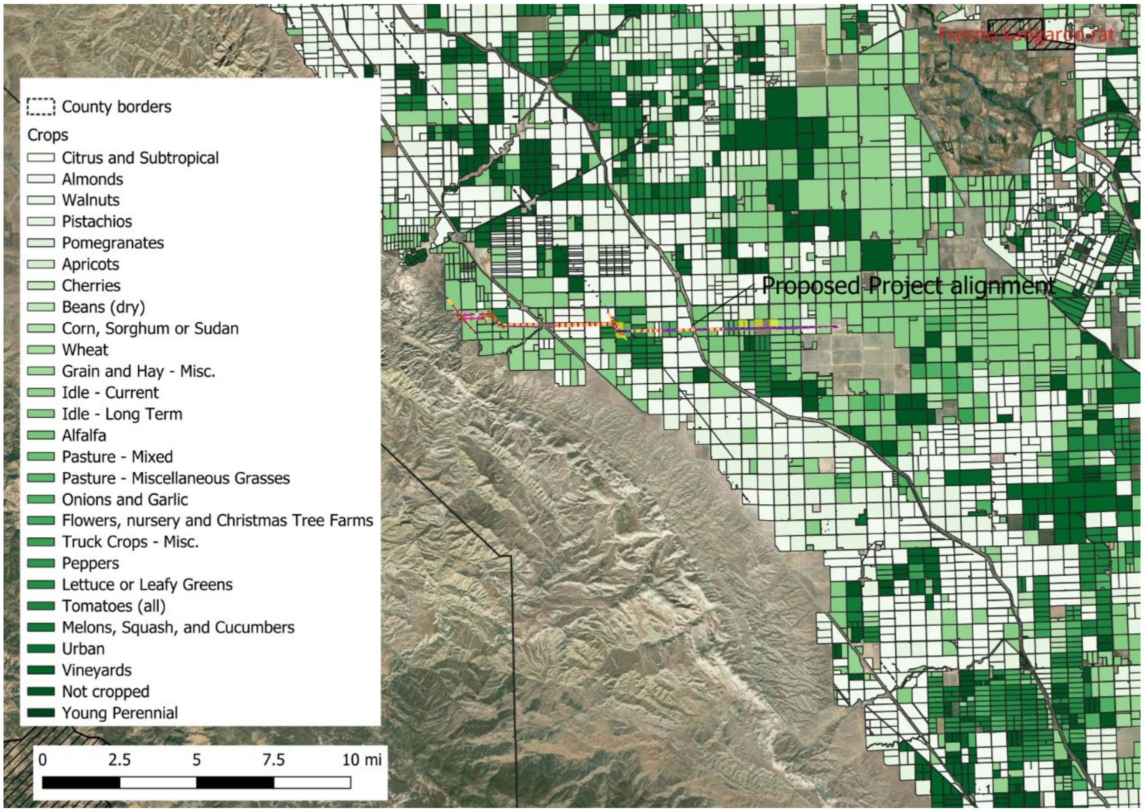

Figure 16. Crops near Proposed Project area.

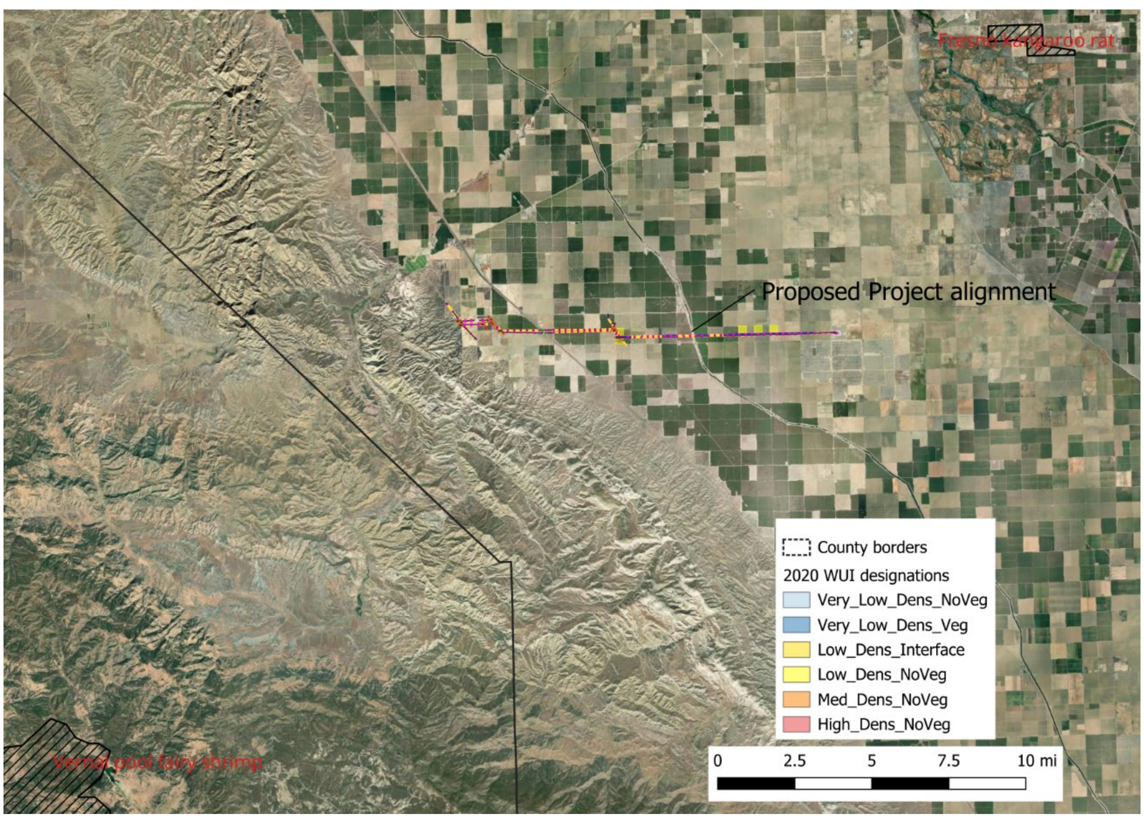

Figure 17. Habitat near Proposed Project area.

6.0 EVACUATION ROUTES

CPUC guidelines section 5.20.1.5 requires identification of evacuation routes and areas that lack a secondary point of egress. As shown in Figure 15, roads in the Proposed Project area are laid out on a grid to provide access to agricultural areas. This arrangement provides good means of ingress and egress with no dead ends.

7.0 IMPACT ANALYSES

CPUC guidelines Section 5.20.4.2 requires fire behavior modeling to support the analysis of wildfire risk. To meet this requirement, CloudFire conducted fire potential modeling using the ELMFIRE open-source operational fire spread model[13,14,15]. Based on the climatological analysis presented earlier, head fire spread rate and flame length were modeled across the Proposed Project area under near-worst case conditions as follows:

- 1-hour fuel moisture: 2%
- 10-hour fuel moisture: 3%
- 100-hour fuel moisture: 4%
- Live herbaceous fuel moisture: 30%
- Live woody fuel moisture: 60%
- 20-ft sustained wind speed: 20 mph

Figure 18 (spread rate) and Figure 19 (flame length). These results indicate that along the Proposed Project alignment, spread rate and flame length are expected to be low. Flame length and spread rate southwest of the Proposed Project are considerably higher, but the predominant wind direction and fire history indicates that the probability of a fire igniting in the Proposed Project area and spreading to these locations is low.

[13] https://doi.org/10.1016/j.firesaf.2013.08.014
[14] https://elmfire.io
[15] https://github.com/lautenberger/elmfire

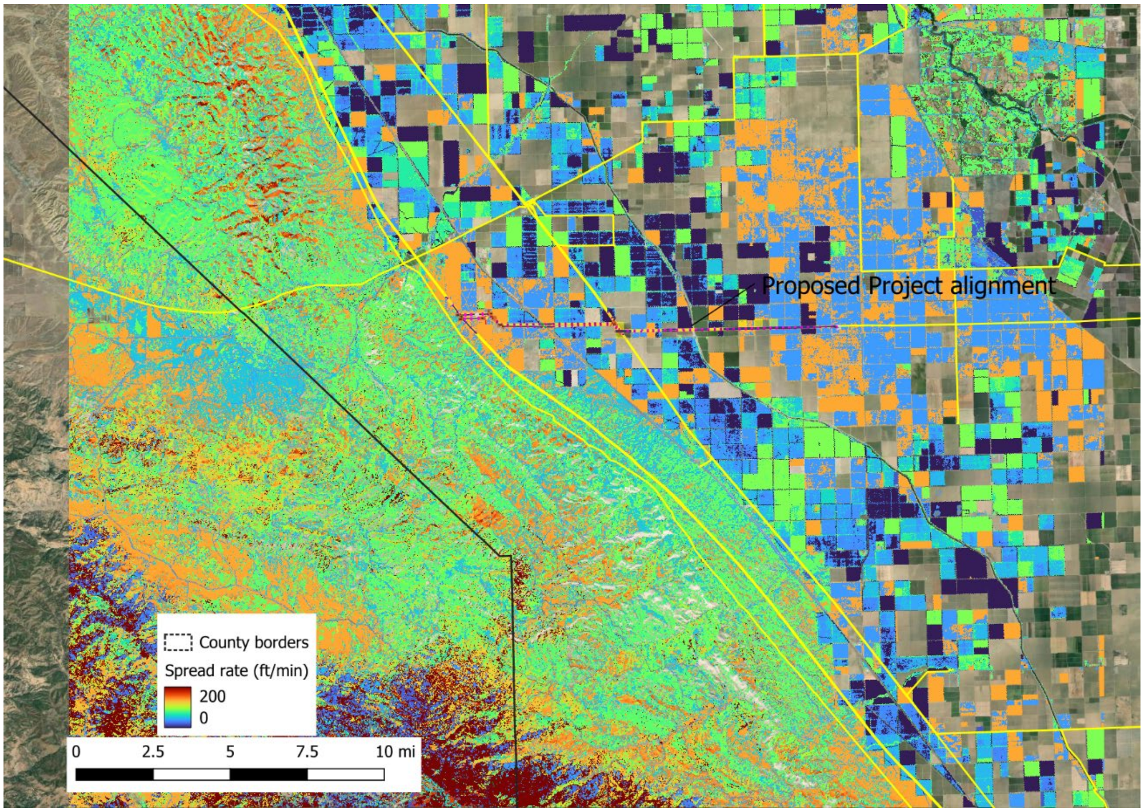

Figure 18. Modeled head fire spread rate near Proposed Project area.

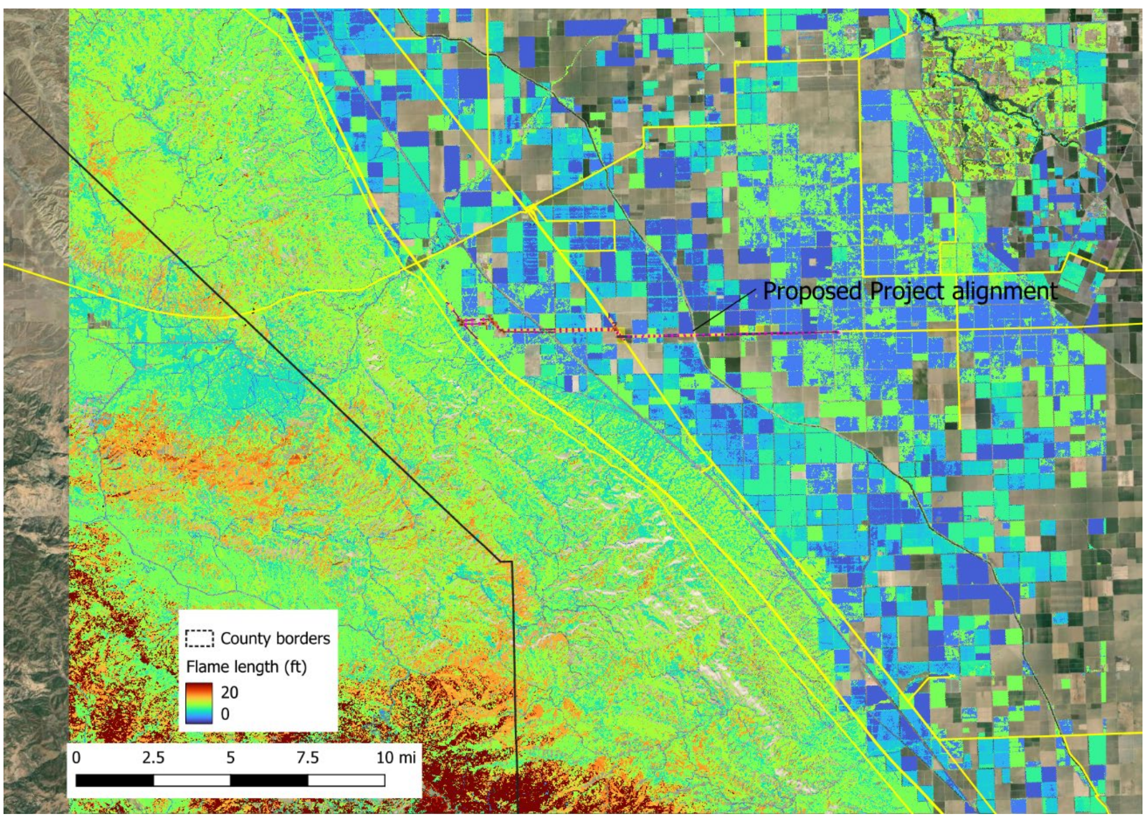

Figure 19. Modeled head fire flame length near Proposed Project area.

8.0 CONCLUSIONS

The analyses presented above show that the Manning 500/230 kV Substation Project presents a very low fire risk. Most of the Proposed Project alignment is east of Interstate 5 where there is no fire history due to discontinuous fuels and good means of ingress allowing for rapid suppression of incipient fires while they are still small. Risk is slightly higher for the portions of the Proposed Project west of Interstate 5 and there are some problematic fuels located southwest of the western extent of the Proposed Project area. However, fire history and the predominant wind direction suggest the probability of a fire starting in the Proposed Project area and spreading to these areas is very low. Additionally, there are very little assets at risk in the area, indicating that the consequence of such fires is expected to be low.