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Document Title:	Appendix I Noise Study_VDPC
Description:	Includes a Noise Study which analyzes the potential noise impacts of the Project and evaluates the short and long term impacts of the Project to noise-sensitive receptors. I.A Assumptions and Calculations; I.B Ambient Noise Data; I.C Construction Noise Modeling Data; I.D Operational Noise Modeling Data; I.E Manufacturer’s specifications
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Appendix I

Noise Study

Vaca Dixon Power Center Project

Noise and Vibration Study

prepared for

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1 Impact Summary and Project Description

1.1 Introduction and Impact Summary

This study analyzes the potential noise and vibration impacts associated with the construction and operation of the Vaca Dixon Power Center Project (Project) in the City of Vacaville and unincorporated Solano County, California. Rincon Consultants, Inc. (Rincon) prepared this study on behalf of the applicant for use in support of environmental documentation pursuant to the California Environmental Quality Act (CEQA) and the study adheres to the California Energy Commission (CEC) requirements for Opt-In Applications (Title 20, California Code of Regulations, Section 1704, Appendix B). The purpose of this study is to analyze the noise and vibration levels related to both temporary construction activity and long-term operation of the Project. Table 1 provides a summary of potential Project impacts.

Table 1 Summary of Impacts

Issue	Proposed Project's Level of Significance
Would the Project generate a substantial temporary or permanent increase in ambient noise levels in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies?	Less Than Significant
Would the Project result in generation of excessive groundborne vibration or groundborne noise levels?	Less Than Significant
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 two 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

1.2 Project Summary

Project Location

The Vaca Dixon Power Center Project battery energy storage system (BESS) facilities are located on Assessor Parcel Number (APN) 133-060-060 in the City of Vacaville. The Project also includes transmission intertie (gen-tie) lines in unincorporated Solano County (Figure 1 and Figure 2).

Figure 1 Regional Location

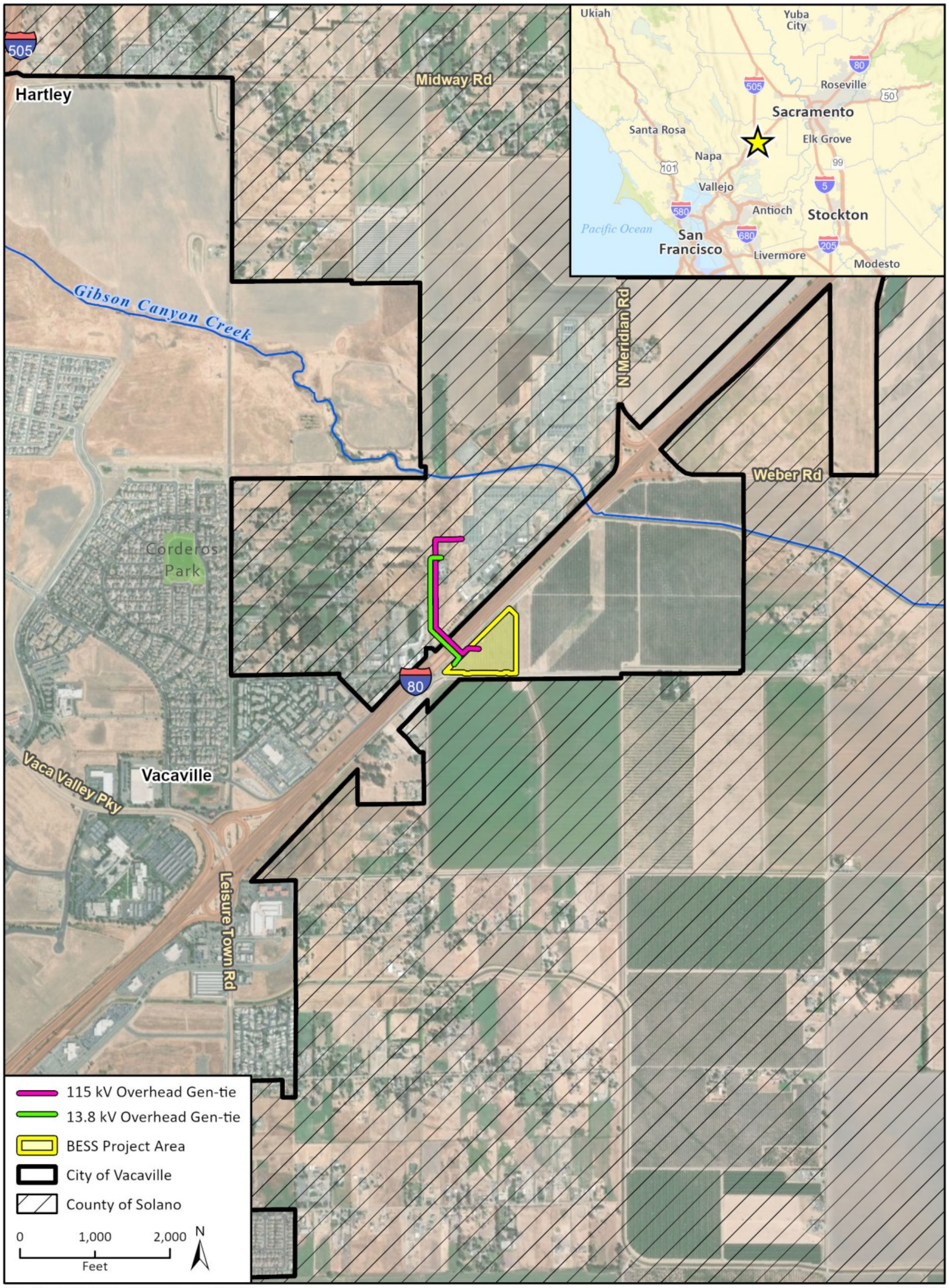

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Fig 2-1 Regional Location_Portrait

Figure 2 Study Area

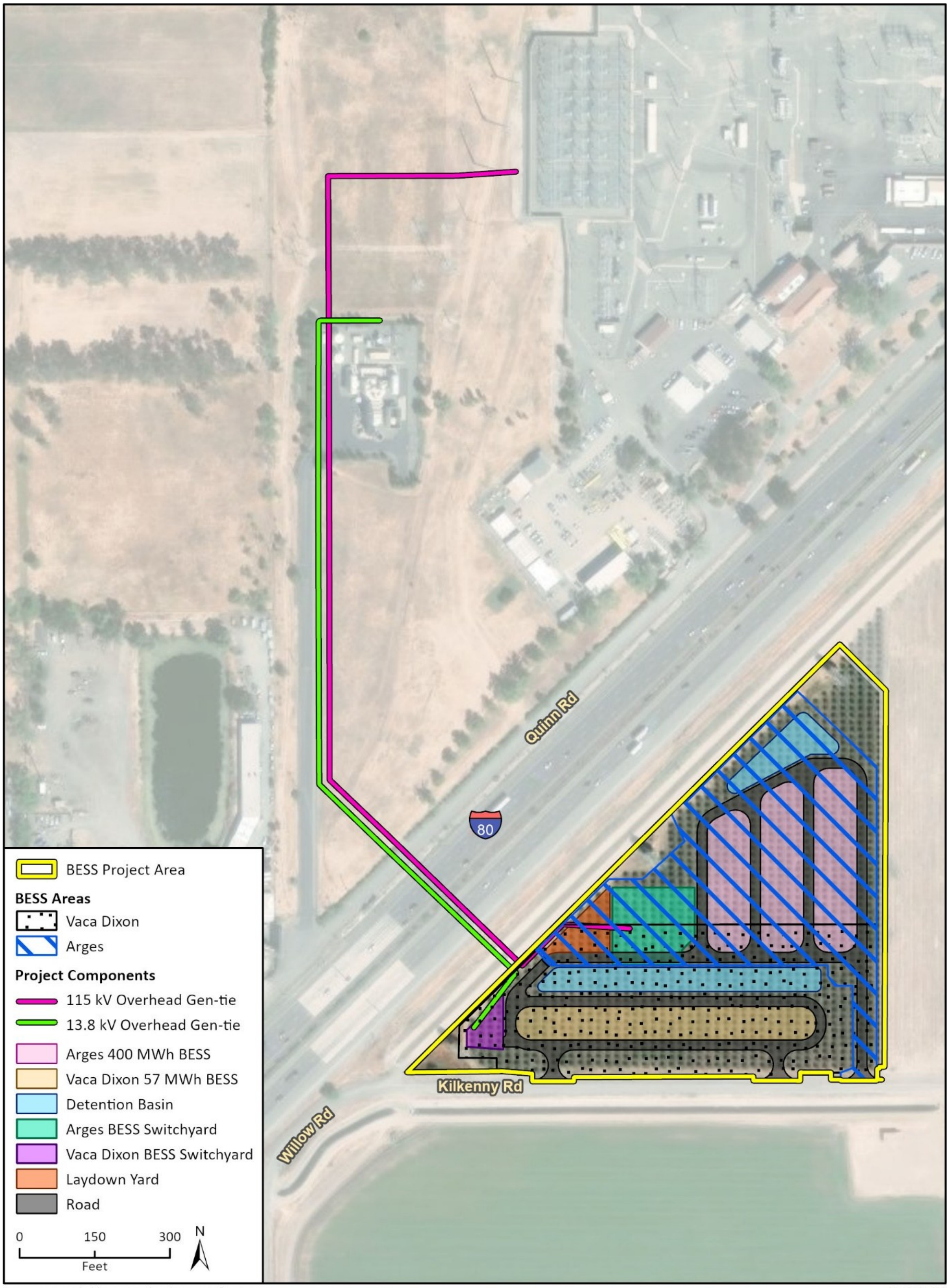

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Fig X Project Site and Components_Portrait

Project Description

Vaca Dixon BESS LLC and Arges BESS LLC (Applicants) propose to construct, operate, and eventually repower or decommission the Vaca Dixon Power Center Project (Project). The BESS facilities are proposed to be installed on an approximately 10-acre site in the City of Vacaville in Solano County, California. The proposed BESS facilities are located on Assessor Parcel Number (APN) 0133-060-060. The Project would operate 7 days a week, 365 days a year, with an up to 35-year anticipated lifespan. The primary Project facility components at the approximately 10-acre combined BESS Project area include:

- Vaca Dixon BESS (57 megawatts [MW], 1-hour duration, 57 MW hour [MWh]), including electrical switchyard
- Arges BESS (100 MW, 4-hour duration, 400 MWh), including electrical substation

The Project also includes gen-tie lines crossing Interstate 80 (I-80) to the north to connect the BESS facilities to the existing Pacific Gas & Electric (PG&E) Vaca-Dixon Substation located on a PG&E-owned parcel. Both BESS components would interconnect to the existing PG&E Vaca-Dixon Substation. The proposed gen-tie components for the Vaca Dixon 57 MWh and Arges BESS 400 MWh BESS facilities would be co-located on shared transmission structures carrying both 13.8 kV and 115 kV conductors for approximately 1,500 feet of the gen-tie lengths, from the vicinity of the BESS switchyards across I-80 and up to the northwest corner of the Vaca Dixon Peaker Plant (VDPP) facility site. From that point, the 13.8 kV gen-tie component for the VD 57 BESS would continue approximately 150 feet to the east for connection to the low side of the 13.8/115 kV GSU at the VDPP. The VDPP GSU is interconnected to the PG&E Vaca-Dixon Substation via an existing 115 kV transmission line. As shown in the figures above, the Arges BESS 400 MWh 115 kV gen-tie continues approximately 725 feet north and east to the connection point at the PG&E Vaca-Dixon Substation. The final design and construction of the I-80 crossing would require approval from the California Department of Transportation (Caltrans).

Construction

Construction site mobilization is currently anticipated to begin in 2027. Typical construction hours are expected to be from 7:00 a.m. to7:00 p.m. Monday through Saturday. Construction equipment to be utilized includes the following: backhoes, bore/drill rigs, compactors, compressors, cranes, dozers, graders, excavators, forklifts, loaders (front-end, rubber-tired, and skid steer), pavers, portable electric generators, rough terrain forklifts, sweepers, welders, dump trucks, and water trucks. Foundation installation may require use of percussion and/or vibratory pile drivers. Gen-tie construction across I-80 may require helicopter use for stringing 13.8 kV and 115 kV conductors across the interstate. Construction equipment would be equipped with Tier 4 Final engines or retrofitted to Tier 4 Final standards. A detailed list of construction equipment is provided in Appendix A.

Operation

Operation of the Vaca Dixon 57 MWh facility will be integrated with the existing VDPP, but the BESS will be charged from the electrical grid and not from the generation output of the VDPP. The Arges BESS 400 MWh facility will be charged from the electrical grid via the PG&E Vaca-Dixon Substation. Operation is currently anticipated to begin in 2028 after completion of Phase 1 (Vaca Dixon BESS component) and full buildout in second quarter of 2029 after completion of Phase 2 (Arges BESS component). Project facilities would be expected to require regular maintenance visits by two workers up to twice per week on average. The planned Project life is 35 years.

2 Setting

2.1 Overview of Sound Measurement

Sound is a vibratory disturbance created by a moving or vibrating source, which is capable of being detected by the hearing organs. Noise is defined as sound that is loud, unpleasant, unexpected, or undesired and may therefore be classified as a more specific group of sounds. The effects of noise on people can include general annoyance, interference with speech communication, sleep disturbance, and, in the extreme, hearing impairment (Caltrans 2013).

Noise levels are commonly measured in decibels (dB) using the A-weighted sound pressure level (dBA). The A-weighting scale is an adjustment to the actual sound pressure levels so that they are consistent with the human hearing response, which is most sensitive to frequencies around 4,000 Hertz and less sensitive to frequencies around and below 100 Hertz. Decibels are measured on a logarithmic scale that quantifies sound intensity in a manner similar to the Richter scale used to measure earthquake magnitudes. A doubling of the energy of a noise source, such as doubling of traffic volume, would increase the noise level by 3 dB; dividing the energy in half would result in a 3 dB decrease (Crocker 2007).

Human perception of noise has no simple correlation with sound energy: the perception of sound is not linear in terms of dBA or in terms of sound energy. Two sources do not “sound twice as loud” as one source. It is widely accepted that the average healthy ear can barely perceive changes of 3 dBA, increase or decrease (i.e., twice the sound energy); that a change of 5 dBA is readily perceptible; and that an increase (or decrease) of 10 dBA sounds twice (half) as loud (Crocker 2007).

Sound changes in both level and frequency spectrum as it travels from the source to the receiver. The most obvious change is the decrease in level as the distance from the source increases. The manner by which noise reduces with distance depends on factors such as the type of sources (e.g., point or line, the path the sound will travel, site conditions, and obstructions). Noise levels from a point source typically attenuate, or drop off, at a rate of 6 dBA per doubling of distance (e.g., construction, industrial machinery, ventilation units). Noise from a line source (e.g., roadway, pipeline, railroad) typically attenuates at about 3 dBA per doubling of distance (Caltrans 2013). The propagation of noise is also affected by the intervening ground, known as ground absorption. A hard site, such as a parking lot or smooth body of water, receives no additional ground attenuation and the changes in noise levels with distance (drop-off rate) result from simply the geometric spreading of the source. An additional ground attenuation value of 1.5 dBA per doubling of distance applies to a soft site (e.g., soft dirt, grass, or scattered bushes and trees) (Caltrans 2013). Noise levels may also be reduced by intervening structures; the amount of attenuation provided by this “shielding” depends on the size of the object and the frequencies of the noise levels. Natural terrain features such as hills and dense woods, and man-made features such as buildings and walls, can substantially alter noise levels. Generally, any large structure blocking the line of sight will provide at least a 5-dBA reduction in source noise levels at the receiver (Federal Highway Administration [FHWA] 2011). Structures can substantially reduce exposure to noise as well. The FHWA’s guidelines indicate that modern building construction generally provides an exterior-to-interior noise level reduction of 20 to 35 dBA with closed windows.

The impact of noise is not a function of loudness alone. The time of day when noise occurs and the duration of the noise are also important factors of Project noise impacts. Most noise that lasts for more than a few seconds is variable in its intensity. Consequently, a variety of noise descriptors have been developed. One of the most frequently used noise metrics is the equivalent noise level (L_{eq}); it considers both duration and sound power level. L_{eq} is defined as the single steady A-weighted level equivalent to the same amount of energy as that contained in the actual fluctuating levels over time.

Noise that occurs at night tends to be more disturbing than that occurring during the day. Community noise is usually measured using Day-Night Average Level (L_{dn}), which is the 24-hour average noise level with a +10 dBA penalty for noise occurring during nighttime (10:00 p.m. to 7:00 a.m.) hours. It is also measured using the Community Noise Equivalent Level (CNEL), which is the 24-hour average noise level with a +5 dBA penalty for noise occurring from 7:00 p.m. to 10:00 p.m. and a +10 dBA penalty for noise occurring from 10:00 p.m. to 7:00 a.m. (Caltrans 2013). Noise levels described by L_{dn} and CNEL usually differ by about 1 dBA. The relationship between the peak-hour L_{eq} value and the L_{dn}/CNEL depends on the distribution of traffic during the day, evening, and night.

2.2 Vibration

Vibration refers to ground-borne noise and perceptible motion. Ground-borne vibration is almost exclusively a concern inside buildings and is rarely perceived as a problem outdoors, where the motion may be discernible, but without the effects associated with the shaking of a building, there is less adverse reaction.

Typical outdoor sources of vibration that propagates through the ground and creates perceptible ground-borne vibration in nearby buildings include construction equipment (e.g., pile drivers, large bulldozers, vibratory rollers, etc), steel-wheeled trains, and traffic on rough roads. If the roadway is fairly smooth, vibration from rubber-tired traffic is rarely perceptible (Federal Transit Administration [FTA] 2018).

Vibration amplitudes are usually expressed in peak particle velocity (PPV), or root mean squared (RMS) vibration velocity. The PPV and RMS velocity are normally described in inches per second (in/sec). PPV is defined as the maximum instantaneous positive or negative peak of a vibration signal. PPV is often used in monitoring construction vibration because it is related to the stresses that are experienced by buildings (Caltrans 2020).

2.3 Sensitive Receptors

Noise exposure goals for various types of land uses reflect the varying noise sensitivities associated with those uses. The Noise Element of the City of Vacaville General Plan (2015) identifies noise-sensitive land uses as residences, schools and hospitals. The CEC identifies residences, hospitals, libraries, schools, places of worship, or other facilities where quiet is an important attribute of the environment as noise-sensitive land uses (Title 20, California Code of Regulations, Section 1704, Appendix B).

Vibration-sensitive receptors, which are similar to noise-sensitive receptors, include residences and institutional uses, such as schools, churches, and hospitals. However, vibration-sensitive receptors also include buildings where vibrations may interfere with vibration-sensitive equipment that is affected by vibration levels that may be well below those associated with human annoyance (e.g., recording studies or medical facilities with sensitive equipment) or historic buildings that could sustain damage from strong vibrations.

The Project site is near sensitive receptors identified in the Vacaville General Plan, the Solano County General Plan and in CEC's requirements for Opt-In Applications (Title 20, California Code of Regulations, Section 1704, Appendix B). The closest noise-sensitive receptors identified near the gen-tie area include the single-family residences in unincorporated Solano County approximately 95 feet to the west. The closest noise-sensitive receptors in the City of Vacaville identified near the BESS Project area include a single-family residence approximately 950 feet southwest of the Project area and multi-family residences approximately 1,250 feet west of the Project area. Additionally, the nearest sensitive receptors to the BESS Project area in unincorporated Solano County are single-family residences approximately 1,050 feet north of the Project area and a single-family residence approximately 1,950 feet to the east of the Project area. The closest vibration-sensitive receptors include a commercial building approximately 160 feet west of the gen-tie installation area and 370 feet northwest of the BESS Project area. Sensitive receptor locations shown in in Figure 3.

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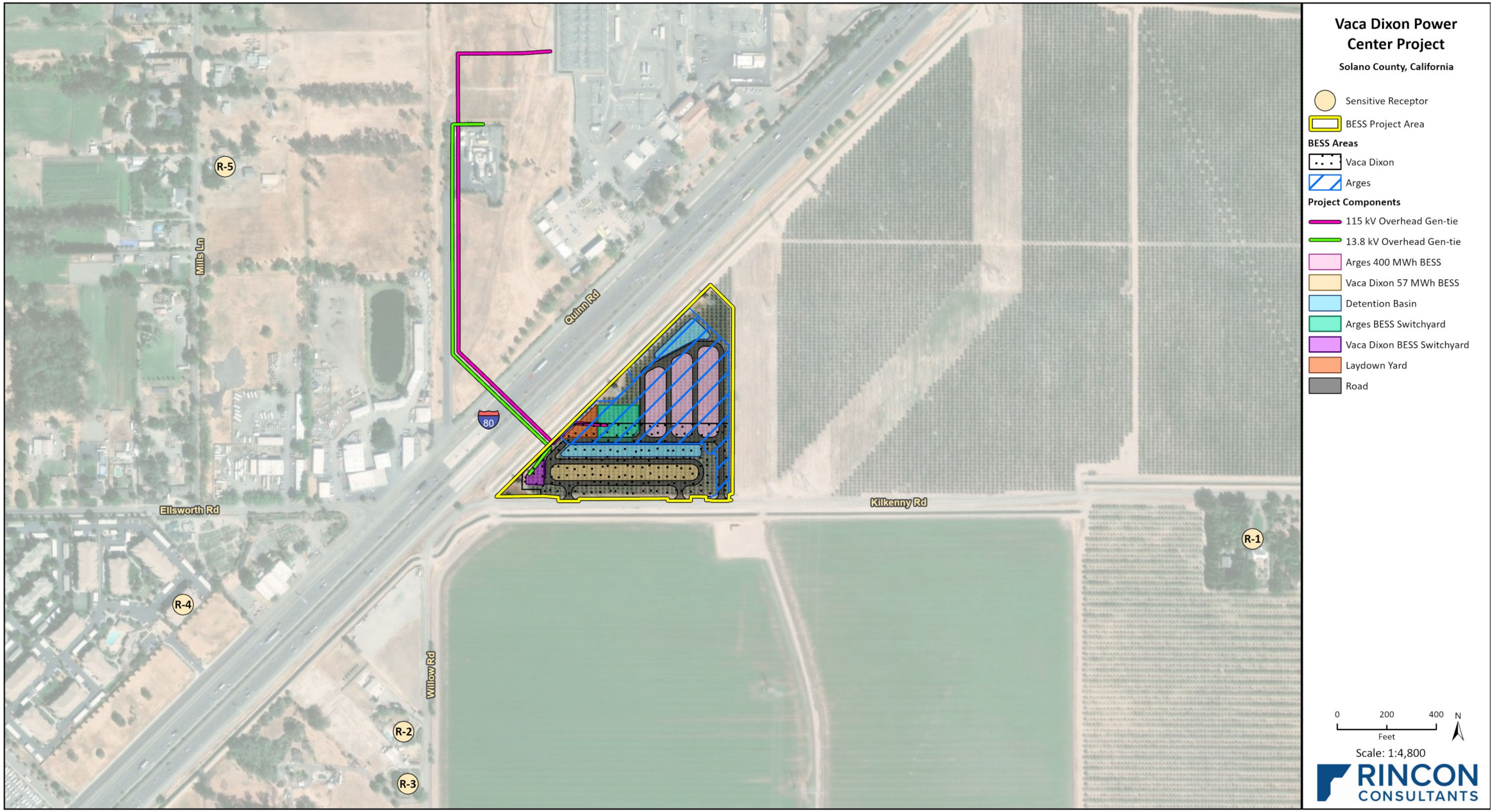
Figure 3 Location of Sensitive Receptors



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2.4 Project Noise Setting

BESS Area Noise Measurements

The most common source of noise in the BESS Site Area vicinity is vehicular traffic from I-80 and nearby industrial uses. To characterize ambient noise levels in the Project vicinity and at the Project site, four short-term (15-minute) and two long term (25-hour) noise level measurements were conducted on July 17 to July 18, 2025, to comply with CEC's requirements for Opt-In Applications (Title 20, California Code of Regulations, Section 1704, Appendix B). The approximate noise measurement locations are shown in Figure 4. Short term noise measurement (ST)-1/long-term measurement (LT)-1 and ST-2/LT-2 were conducted at various single-family residences along Willow Road and Kilkenny Road to capture ambient noise levels at the closest sensitive receptors to the BESS Project site. ST-3 and ST-4 were conducted on the southwest and southeast corners of the Project area to capture ambient noise at the BESS Project site.

The measurements were completed using a Piccolo II sound level meter fitted with a windscreen. The meter complies with American National Standards Institute (ANSI) Standard S1.4. The sound level meters were set to "slow" response and "A" weighting (dBA). The meters were calibrated prior to and after the monitoring period. All measurements were at least five feet above the ground and away from reflective surfaces. Table 2 summarizes the results of the short-term noise measurements. Table 3 and Table 4 summarize the results of long-term noise measurements.

Table 2 Short-Term Noise Level Measurement Results

Measurement Location	Measurement Location	Sample Times	Approximate Distance to Primary Noise Source	L_{eq} (dBA)	L_{min} (dBA)	L_{max} (dBA)
ST-1	Near single-family residence at 6875 Willow Road	12:23 – 12:39 p.m.	Approximately 650 feet to I-80 centerline	72	45	78
ST-2	Near single-family residence at 5310 Kilkenny Road	11:30 – 11:46 a.m.	Approximately 2,100 feet to I-80 centerline	55	44	77
ST-3	Southwest corner of Project area	12:06 – 12:21 p.m.	Approximately 190 feet to I-80 centerline	66	58	88
ST-4	Southeast corner of the Project area	11:49 – 12:04 p.m.	Approximately 840 feet to I-80 centerline	64	54	80

dBA = A-weighted decibels; L_{eq} = equivalent noise level; L_{min} = minimum noise level, L_{max} = maximum noise level

Figure 4 Approximate Noise Measurement Locations

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Fig X Noise Monitoring Locations

Table 3 25-Hour Long-Term (LT-1) Noise Measurement Results

Sample Time	dBA L_{eq}	Sample Time	dBA L_{eq}
25-hour CEC Measurement – July 17-18, 2025			
12:00 AM	55	12:00 PM	59
1:00 AM	54	1:00 PM	61
2:00 AM	53	2:00 PM	64
3:00 AM	57	3:00 PM	64
4:00 AM	59	4:00 PM	61
5:00 AM	63	5:00 PM	61
6:00 AM	62	6:00 PM	59
7:00 AM	61	7:00 PM	61
8:00 AM	59	8:00 PM	62
9:00 AM	59	9:00 PM	61
10:00 AM	59	10:00 PM	62
11:00 AM	58	11:00 PM	58
–	–	12:00 AM	54
25-hour Noise Level (dBA CNEL)			**66**

dBA = A-weighted decibels; L_{eq} = equivalent noise level; CNEL = community equivalent noise level

See Figure 3 for Approximate Noise Measurement Locations; see Appendix B for full measurement details.

Table 4 25-Hour Long-Term (LT-2) Noise Measurement Results

Sample Time	dBA L_{eq}	Sample Time	dBA L_{eq}
25-hour CEC Measurement – July 17-18, 2025			
12:00 AM	52	12:00 PM	58
1:00 AM	52	1:00 PM	58
2:00 AM	**50**[1]	2:00 PM	62
3:00 AM	55	3:00 PM	64
4:00 AM	58	4:00 PM	61
5:00 AM	60	5:00 PM	58
6:00 AM	61	6:00 PM	60
7:00 AM	63	7:00 PM	60
8:00 AM	56	8:00 PM	58
9:00 AM	55	9:00 PM	57
10:00 AM	59	10:00 PM	60
11:00 AM	57	11:00 PM	60
–	–	12:00 AM	61
25-hour Noise Level (dBA CNEL)			**66**

dBA = A-weighted decibels; L_{eq} = equivalent noise level; CNEL = community equivalent noise level

[1] Lowest recorded nighttime hour Leq.

See Figure 3 for Approximate Noise Measurement Locations; see Appendix B for full measurement details.

Gen-Tie Noise Measurements

The most common source of noise in the gen-tie line vicinity is vehicular traffic from I-80 and nearby industrial uses. To characterize ambient noise levels in the gen-tie line vicinity, four short term (15-minute) and one long term (24-hour) noise level measurements were conducted on May 11 and May 12, 2023. The approximate noise measurement locations are shown in Figure 5. Short term noise measurement (ST)-1, ST-2, and ST-3 were conducted at various single-family residences along Mills Lane to capture ambient noise levels at the closest sensitive receptors to the Project site. ST-4 was conducted in the northwest corner of the Project site to capture ambient noise at the Project site. Long term noise measurement (LT) 1 was conducted along Mills Lane to capture ambient noise levels at the closest sensitive receptors to the Project site.

Long-term sound level measurements were taken with an Extech 407780A sound level meter, which satisfies the American National Standards Institute (ANSI) standard for Type 2 instrumentation. The sound level meter was equipped with a windscreen during measurements. The sound level meter was set to “slow” response and “A” weighting (dBA). The meter was calibrated before and after the monitoring period. All measurements were at least five feet above the ground and away from reflective surfaces.

The sound level meter used for short-term noise monitoring (Larson Davis SoundTrack LxT) satisfies the American National Standards Institute (ANSI) standard for Type 1 instrumentation. The sound level meter was set to “slow” response and “A” weighting (dBA). The meter was field calibrated before and after the monitoring period. The measurement was at least five feet above the ground and away from reflective surfaces. During the measurements, the sound level meter was equipped with a windscreen during measurements. Table 5 and Table 6 summarize the results of the short-term and long-term noise measurements.

Figure 5 Approximate Noise Measurement Locations – Gen-Tie

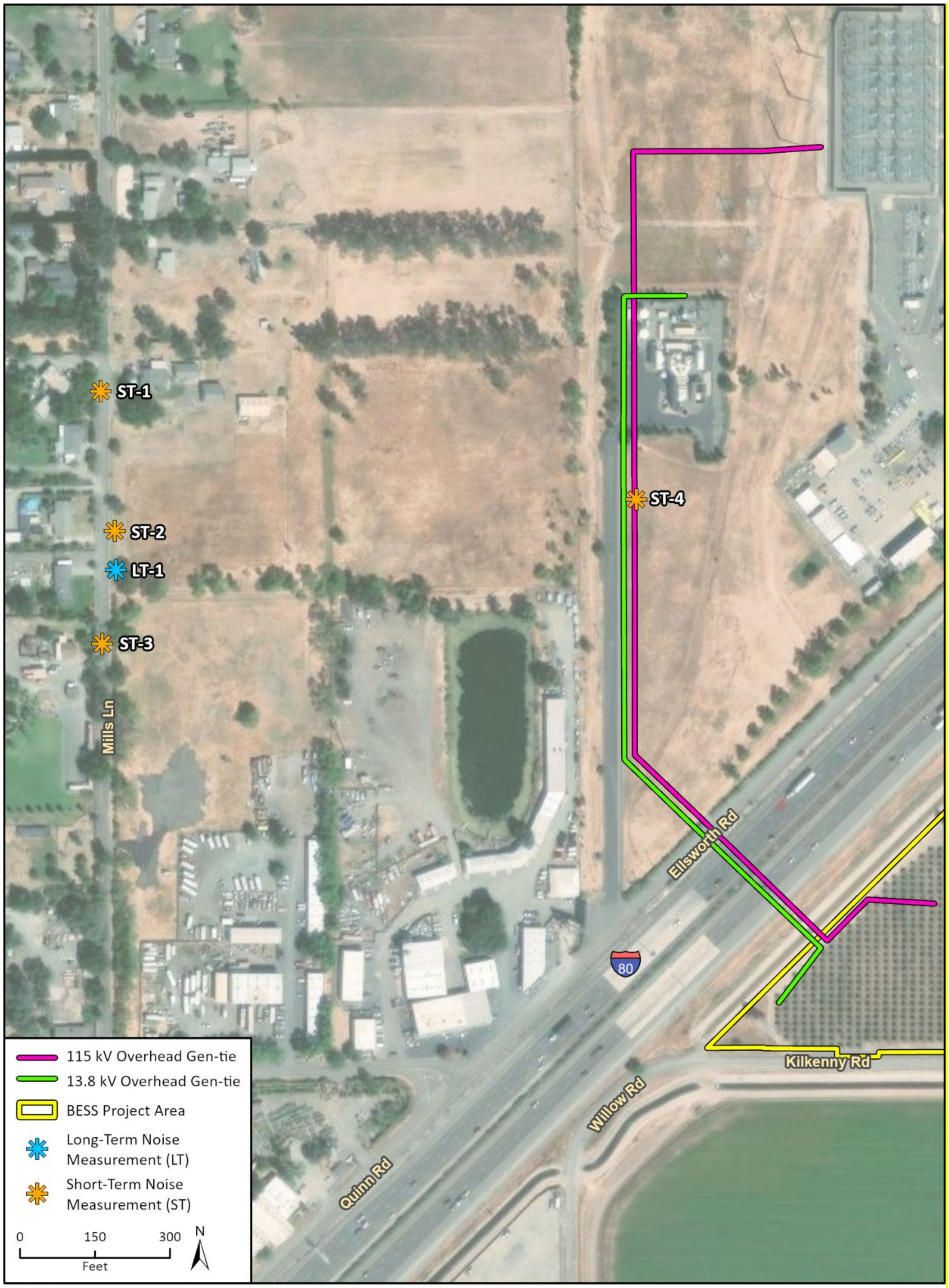

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Fig X Noise Measurement Locations - Gen Tie

Table 5 Short-Term Noise Level Measurement Results

Measurement Location	Measurement Location	Sample Times	Approximate Distance to Primary Noise Source	L_{eq} (dBA)	L_{min} (dBA)	L_{max} (dBA)
ST-1	Single family residence along Mills Lane	10:34 – 10:49 a.m.	Approximately 1,615 feet to I-80 centerline; approximately 630 feet to nearby industrial uses	51	39	70
ST-2	Single family residence along Mills Lane	10:52 – 11:07 a.m.	Approximately 1,380 feet to I-80 centerline; approximately 455 feet to nearby industrial uses	53	40	77
ST-3	Single family residence along Mills Lane	11:08 – 11:23 a.m.	Approximately 1,240 feet to I-80 centerline; approximately 370 feet to nearby industrial uses	55	43	77
ST-4	Northwest corner of the Project site	11:35 – 11:50 a.m.	Approximately 710 feet to I-80 centerline	50	46	63

dBA = A-weighted decibels; L_{eq} = equivalent noise level; L_{min} = minimum noise level, L_{max} = maximum noise level

Table 6 Long-Term Noise Measurement Results

Sample Time	dBA L_{eq}	Sample Time	dBA L_{eq}
24-hour Measurement – May 11-12, 2023			
10:27 a.m.	51	10:27 p.m.	52
11:27 a.m.	46	11:27 p.m.	51
12:27 p.m.	53	12:27 a.m.	50
1:27 p.m.	64	1:27 a.m.	51
2:27 p.m.	53	2:27 a.m.	51
3:27 p.m.	55	3:27 a.m.	53
4:27 p.m.	54	4:27 a.m.	55
5:27 p.m.	53	5:27 a.m.	56
6:27 p.m.	52	6:27 a.m.	60
7:27 p.m.	51	7:27 a.m.	50
8:27 p.m.	50	8:27 a.m.	49
9:27 p.m.	53	9:27 a.m.	47
24-hour Noise Level (dBA CNEL)			**61**

dBA = A-weighted decibels; L_{eq} = equivalent noise level; CNEL = community equivalent noise level

See Figure 5 for Approximate Noise Measurement Locations; see Appendix A for full measurement details.

2.5 Regulatory Setting

Federal

There are no specific federal noise standards that would be applicable to the Project other than federal noise limits for medium and heavy trucks (more than 4.5 tons, gross vehicle weight rating) under 40 Code of Federal Regulations (CFR), Part 205, Subpart B. The federal truck pass by noise standard is 80 dBA at 15 meters (approximately 50 feet) from the vehicle pathway centerline. These controls are implemented through regulatory controls on truck manufacturers.

FTA Transit and Noise Vibration Impact Assessment Manual

The FTA provides reasonable criteria for assessing construction noise impacts based on the potential for adverse community reaction in their *Transit and Noise Vibration Impact Assessment Manual* (FTA 2018). For residential uses, the daytime noise threshold is 80 dBA L_{eq} (8-hour).

State

California regulates freeway noise, sets standards for sound transmission, provides occupational noise control criteria, identifies noise standards, and provides guidance for local land use compatibility. State law requires each county and city to adopt a General Plan that includes a Noise Element prepared per guidelines adopted by the Governor's Office of Planning and Research. The purpose of the Noise Element is to limit the exposure of the community to excessive noise levels. CEQA requires all known environmental effects of a project be analyzed, including environmental noise and vibration impacts.

Local

Vacaville General Plan

The Vacaville General Plan Noise Element (2015) includes noise policies and implementation programs to support the City in establishing a pattern of land uses that minimize the exposure of community residents to excessive noise. The City's noise reduction and abatement strategy focuses on preventative techniques that protect noise-sensitive land uses from noise producing sources. Table 7 below provides noise performance standards for all noise sources for different receiving land uses. An acoustical analysis is required for all proposed projects that would locate noise sensitive land uses where the projected ambient noise level is greater than the respective "normally acceptable" noise level.

Table 7 Vacaville Land Use Compatibility Standards for Community Noise Environments

Type of Proposed Project	Community Noise Exposure in Decibels (CNEL) Day/Night Average Noise Level in Decibels (Ldn)			
	Clearly Acceptable	Normally Acceptable	Conditionally Acceptable	Clearly Unacceptable
Residential Low Density Single Family, Duplex, Mobile Homes	<50-60	55-70	70-72	75-85>
Residential – Multi-Family	<50-65	60-70	70-72	75-85>
Transient Lodging – Motels, Hotels	<50-65	60-70	70-80	80-85>
Schools, Libraries, Churches, Hospitals, Nursing Homes	<50-70	60-70	70-80	80-85>
Auditoriums, Concert Halls, Amphitheaters	–	50-70	–	65-85>
Sports Arenas, Outdoor Spectator Sports	–	50-75	–	70-85>
Playgrounds, Neighborhood Parks	<50-70	–	67.5-75	72.5-85>
Golf Courses, Riding Stables, Water Recreation, Cemeteries	<50-75	–	70-80	80-85>
Office Buildings, Business Commercial and Professional	<50-70	67.5-77.5	75-85>	–
Industrial, Manufacturing, Utilities, Agriculture	<50-75	70-80	80-85>	–

Normally Acceptable: Specified land use is satisfactory, based on the assumption that any buildings involved are of normal conventional construction, without any special insulation requirements.

Conditionally Acceptable: Specified land use may be permitted only after detailed analysis of the noise reduction requirements and needed noise insulation features are included in the design.

Unacceptable: New construction or development should generally not be undertaken

Source: Table NOI-3 of 2035 Vacaville General Plan

Additionally, the following policies are relevant to the Project (City of Vacaville 2015):

Policy NOI-P4.1: Preclude the generation of annoying or harmful noise through conditions of approval on stationary noise sources, such as construction and property maintenance activity and mechanical equipment.

Policy NOI-P4.2: Require the following construction noise control measures:

- Equip all internal combustion engine-driven equipment with intake and exhaust mufflers that are in good condition and appropriate for the equipment.
- Locate stationary noise-generating equipment as far as possible from sensitive receptors when sensitive receptors adjoin or are near a construction area.
- Utilize “quiet” air compressors and other stationary noise sources where technology exists.
- Limit hours of operation of outdoor noise sources through conditions of approval.

City of Vacaville Municipal Code

The City of Vacaville Municipal Code Title 14.09.240.140 Noise (Vacaville 2025) includes noise standards and regulations, shown in Table 8.

Table 8 Vacaville Noise Standards for Non-Transportation Sources

		Exterior Noise Levels		Interior Noise Levels	
Land Use Category	Noise Level Descriptor	Daytime (7 a.m. to 10 p.m.)	Nighttime (7 a.m. to 10 p.m.)	Daytime (7 a.m. to 10 p.m.)	Nighttime (7 a.m. to 10 p.m.)
Residential	Hourly Leq, dBA	50	45	45	35
Residential	Maximum Level, dBA	70	65	-	-

L_{eq} = equivalent or energy-averaged sound level; L_{max} = Highest root-mean-square sound level measured over a given period of time

Each of the noise levels specified above shall be lowered by five dB for simple tone noises, noises consisting primarily of speech or music, or for recurring impulsive noises.

Nontransportation Sources. Two standards apply to nontransportation noise sources: the hourly Leq, dBA, which is an hourly average sound level, and the maximum level, dBA. Table 8 shows the maximum hourly average and the peak daytime and nighttime noise standards for nontransportation sources when located near sensitive land uses. All uses shall comply with these standards. The noise standards for nontransportation sources shall not apply in the following situations:

a. To new uses if the ambient noise levels exceed the hourly Leq or the maximum level of the proposed noise generator, unless the additional noise generated would increase the projected, combined noise levels a minimum of three decibels;
b. To public parks or public playgrounds upon a finding by the decision maker that the location of the facilities within the park or playground reasonably limits the noise impacts upon other land uses;
c. For nuisance abatement related to residential generated noise sources including, but not limited to, children playing, lawn mowers, barking dogs, and musical equipment;
d. To residential caretaker units established in conjunction with nonresidential uses;
e. To construction activity related to public improvement projects where the Director of Community Development has determined that full compliance with these standards cannot practically be achieved.

Source: City of Vacaville Municipal Code, Table 14.09.240.D

As described in VMC Section 8.10.060(O), construction, repair work or grading within 500 feet from any occupied residence is permitted between the hours of seven o’clock p.m. and seven o’clock a.m. Monday through Saturday. No such construction, repair work or grading activities shall be allowed on Sundays or holidays.

Solano County General Plan Public Health and Safety Chapter

The Solano County General Plan Public Health and Safety Chapter includes noise policies and implementation programs to support the County’s vision to create a place where people can live, work, and play in close proximity. The County’s noise reduction and abatement strategy focuses on preventative techniques that protect noise-sensitive land uses from noise producing sources. Table 9 below provides noise performance standards for non-transportation noise sources for different receiving land uses.

Table 9 Solano County Nontransportation Noise Standards

Receiving Land Use	Outdoor Area (dBA) Daytime	Outdoor Area (dBA) Nighttime	Interior (dBA) Day and Night
All Residential	55 L_{eq}/70 L_{max}	50 L_{eq}/65 L_{max}	35 L_{eq}/55 L_{max}
Transient Lodging[3]	55 L_{eq}/75 L_{max}	–	35 L_{eq}/55 L_{max}
Hospitals and Nursing Homes[4,5]	55 L_{eq}/75 L_{max}	–	35 L_{eq}/55 L_{max}
Theaters and Auditoriums[5]	–	–	30 L_{eq}/50 L_{max}
Churches, Meeting Halls, Schools, Libraries, etc.[5]	55 L_{eq}/75 L_{max}	–	35 L_{eq}/60 L_{max}
Office Buildings[5]	60 L_{eq}/75 L_{max}	–	45 L_{eq}/65 L_{max}
Commercial Building[5]	55 L_{eq}/75 L_{max}	–	45 L_{eq}/65 L_{max}
Playgrounds, Parks, etc.[5]	65 L_{eq}/75 L_{max}	–	-
Industry[5]	60 L_{eq}/80 L_{max}	–	50 L_{eq}/70 L_{max}

L_{eq} = equivalent or energy-averaged sound level; L_{max} = Highest root-mean-square sound level measured over a given period of time

[1] The standards shall be reduced by 5 dBA for sounds consisting primarily of speech or music, and for recurring impulsive sounds. If the existing ambient noise level exceeds the standards, then the noise level standards shall be increased at 5-dBA increments to encompass the ambient.

[2] Interior-noise-level standards are applied within noise-sensitive areas of the various land uses, with windows and doors in the closed positions.

[3] Outdoor activity areas of transient lodging facilities are not commonly used during nighttime hours.

[4] Hospitals are often noise-generating uses. The exterior-noise-level standards for hospitals are applicable only at clearly identified areas designated for outdoor relaxation by either hospital staff or patients.

[5] The outdoor activity areas of these uses (if any), are not typically utilized during nighttime hours.

Source: Solano County General Plan Public Health and Safety Chapter, Table HS-5

Additionally, the following Solano County General Plan policies are relevant to the Project (Solano County 2015):

Policy HS.P-48: Consider and promote land use compatibility between noise-sensitive and noise-generating land uses when reviewing new development proposals.

Policy HS.P-51: Develop strategies with residents and businesses to reduce noise conflicts.

Policy HS.P-52: Minimize noise conflicts between current and proposed land uses and transportation networks by encouraging compatible land uses around critical areas with higher noise potential.

3 Methodology

3.1 Construction Noise

Construction noise was estimated using the FHWA Roadway Construction Noise Model (RCNM) (FHWA 2006). RCNM predicts construction noise levels for a variety of construction operations based on empirical data and the application of acoustical propagation formulas. Using RCNM, construction noise levels were estimated at noise sensitive receptors near the Project site. RCNM provides reference noise levels for standard construction equipment, with an attenuation rate of 6 dBA per doubling of distance for stationary equipment.

Variation in power imposes additional complexity in characterizing the noise source level from construction equipment. Power variation is accounted for by describing the noise at a reference distance from the equipment operating at full power to determine the L_{max} of the operation (FHWA 2006). Each phase of construction has a specific equipment mix, depending on the work to be accomplished during that phase. Each phase also has its own noise characteristics; some having higher continuous noise levels than others, and some have high-impact noise levels.

Construction activity would result in temporary noise in the Project site vicinity, exposing surrounding nearby receptors to increased noise levels. Construction noise would be anticipated to be the loudest during activities that involve the installation of foundations and equipment if a pile driver is utilized. Construction noise would be comparatively lower during the other construction phases (i.e., set modules, inverters and switchgear installation, electrical wire installation and finish grading). Typical heavy construction equipment during construction activity could include pile drivers, rollers, dozers, loaders, graders, and dump trucks. It is assumed that diesel engines would power all construction equipment. Construction equipment would not all operate at the same time or location. In addition, construction equipment would not be in constant use during the twelve-hour working day.

Construction equipment is typically dispersed in various areas of a site, with only a limited amount of equipment operating near a given location at a particular time. For this reason, the FTA's *Transit Noise and Vibration Impact Assessment* document (page 177) recommends to “assume that all equipment operates at the center of the project.” Therefore, it is standard industry practice to analyze average construction noise from the center of the project site, which represents the approximate center of where noise would be generated because equipment moves around the project site throughout the workday. For the proposed project, this would be 95 feet from the construction of the gen-tie line and 1,420 feet from the center of all other phases at the BESS site area (RCNM calculations are included in Appendix C).

Noise levels from each phase of construction were modeled in RCNM based on the equipment list provided by the applicant.

3.2 Construction Vibration

The Project does not include any substantial vibration sources associated with operation. Thus, construction activities have the greatest potential to generate ground-borne vibration affecting nearby receptors. The greatest vibratory source during construction would be an impact pile driver (if needed) and large bulldozer. Blasting would not be required for construction of the Project.

Construction vibration estimates are based on vibration levels reported by the FTA (FTA 2018). Table 10 shows typical vibration levels for various pieces of construction equipment used in the assessment of construction vibration.

Table 10 Vibration Levels Measured during Construction Activities

Equipment	PPV at 25 feet (in/sec)
Impact Pile Driver	1.518
Vibratory Roller	0.21
Large Bulldozer	0.089
Loaded Trucks	0.076
Small Bulldozer	0.003
Bore/Drill Rig	0.089
Heavy-Duty Helicopter	0.020

PPV = peak particle velocity; in/sec = inches per second

Source: FTA 2018

3.3 Operational Noise

Under normal operation, the BESS site would be remotely monitored with no personnel on-site except for periodic maintenance and infrequent battery augmentation activities. Maintenance and battery augmentation activities would not generate substantial noise. The noise sources on the Project site after completion of construction would include stationary outdoor equipment such as transformers, inverters, and individual BESS units.

Noise level modeling for the BESS Project's combined worst case operational sources were developed using SoundPLAN noise modeling software, Version 9.0. SoundPLAN incorporates noise propagation algorithms and reference sound levels published by various government agencies and the scientific community. Noise sources and receivers are input using three-dimensional coordinates. Receivers were modeled at the average height of the human ear, which is five feet above ground elevation.

Propagation of modeled stationary noise sources was based on ISO Standard 9613-2, "Attenuation of Sound during Propagation Outdoors, Part 2: General Method of Calculation." The assessment methodology assumes that all receivers would be downwind of stationary sources. This is a worst-case assumption for total noise impacts since only some receivers would be downwind at any one time.

On-site noise sources were modeled based on information provided by the Applicants. Inverters would be Power Electronics Inverters or similar design. Manufacturer's specifications indicate that these units generate a noise level of 75 dBA at 1 meter. Transformers for the Project would also be Power Electronics or similar design. Manufacturer's specifications indicate that these units generate a noise level of 79 dBA at 1 meter with cooling fans. BESS units would be CATL units or similar design. Manufacturer's specifications indicate that these units generate a noise level of 75 dBA at 1 meter. For a conservative scenario, the units were assumed to operate at 100 percent of every hour for 24 hours.

An additional source of operational noise associated with the proposed Project would be corona discharge from the energized transmission lines. The sound of corona is a phenomenon associated with all energized overhead electric power lines and is characteristic of an audible hum or crackling sound. Modern power lines are designed, constructed, and maintained so that, during dry conditions, they operate below the corona-inception voltage and generate a minimum of corona-related noise. Corona levels (and audible noise levels) are highest during heavy rain, when the conductors are wet, but the noise generated by the rainfall is usually greater than the noise generated by corona discharge. During corona activity, transmission lines (primarily those rated at 345 kV and above) can generate a small amount of sound energy (CPUC 1999). Corona sound energy for 13.8 kV and 115 kV lines is generally not perceptible.

3.4 Significance Thresholds

Appendix G of the CEQA Guidelines indicates noise impacts of the Project would be significant if the Project would:

a) Generate a substantial temporary or permanent increase in ambient noise levels 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;
b) Generate excessive groundborne vibration or groundborne noise levels; or
c) For a Project located within the vicinity of a private airstrip or an airport or public use airport, expose people residing or working in the Project area to excessive noise levels.

Construction Noise

The FTA provides reasonable criteria for assessing construction noise impacts based on the potential for adverse community reaction in their *Transit and Noise Vibration Impact Assessment Manual* (FTA 2018). For residential uses, the daytime noise threshold is 80 dBA L_{eq} (8-hour). Additionally, as per VMC Section 8.10.060(O), noise associated with construction activities is required to take place between the hours of 7:00 a.m. and 7:00 p.m., Monday through Saturday, and is not permitted on Sundays or a national holiday. Construction noise would be significant if it exceeds these noise standards or would occur outside of the allowable hours. Since the City of Vacaville or Solano County do not have quantified construction noise limits, the FTA standards are applied to sensitive receptors near the Project site.

Operational Stationary Noise

The Project site would be located in a mainly agricultural area of the County with residences to the southwest, west, north, and east. The City of Vacaville Municipal Code Title 14.09.240.140 Noise (Vacaville 2022) includes noise standards and regulations. The noise standards applicable for the residential areas in the City of Vacaville, shown in Table 8, are 50 dBA L_{eq} between 7:00 a.m. to 10:00 p.m. and 45 dBA L_{eq} between 10:00 p.m. to 7:00 a.m. If the recorded ambient noise level exceeds the hourly L_{eq}, the allowable operational noise level would be three dB above the ambient noise levels. The quietest measured nighttime hourly L_{eq} was 50.1 dBA L_{eq}, resulting in a nighttime exterior noise standard of 53 dBA L_{eq}. The City of Vacaville's more stringent noise standards were conservatively applied to sensitive receptors in Solano County.

Off-site Traffic Noise

During operation of the Project, several operation and maintenance staff would visit the BESS facility twice per week on average. Therefore, this impact is addressed qualitatively.

Construction Vibration

Neither the City of Vacaville nor Solano County have adopted standards to assess vibration impacts during construction and operation. Therefore, vibration limits used in this analysis to determine a potential impact from construction activities are based on those outlined in the FTA *Transit Noise and Vibration Impact Assessment Manual* (FTA 2018). Groundborne vibration levels that could induce potential architectural damage to buildings are identified in Table 11. Based on FTA recommendations, limiting vibration levels to below 0.3 in/sec PPV at engineered concrete and masonry (no plaster), which would apply to commercial structures in the vicinity of the Project area, and below 0.2 in/sec PPV at non-engineered timber and masonry buildings, which would apply to residential structures in the vicinity of the Project area, would prevent architectural damage.

Table 11 Groundborne Vibration Architectural Damage Criteria

Building Category	PPV (in/sec)
I. Reinforced concrete, steel, or timber (no plaster)	0.5
II. Engineered concrete and masonry (no plaster)	0.3
III. Nonengineered timber and masonry buildings	0.2
IV. Buildings extremely susceptible to vibration damage	0.12

in/sec = inches per second; PPV = peak particle velocity

Source: FTA 2018

4 Impact Analysis

Threshold:	Would the Project generate a substantial temporary or permanent increase in ambient noise levels in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies?

The Project-specific noise analysis focuses on the construction and operational impacts to determine if the Project would expose persons to or generate noise levels in excess of established standards.

4.1 Construction

Construction Equipment

The Project is split up into two (2) project phases: Phase 1 is the Vaca Dixon BESS component and Phase 2 is the Arges BESS component. Project construction activities are anticipated to occur over the course of approximately 23 months, from July 1, 2027, to June 1, 2029 (Phase 1 construction is anticipated to be completed in July of 2028). Operation of heavy equipment during construction would result in a temporary noise level increase. Project construction activities would involve the use of a variety of construction equipment throughout various phases of construction; these include transport of personnel and materials to the site, use of heavy machinery in grading and clearing the site, potential operation of pile drivers for pile foundations, drilling/augering equipment for installation of gen-tie pole foundations, use of a heavy-duty helicopter to carry gen-tie lines across I-80 freeway and operation of other equipment used during construction.

To determine construction noise impacts, noise was estimated using the FHWA Roadway Construction Noise Model (RCNM) Version 1.1, shown in Table 12. Over the course of a typical construction day, construction equipment during the gen-tie installation would be located as close as 95 feet to the nearest residential use to the west on Mills Road in unincorporated Solano County and as close as 1,120 feet to the southwest on Willow Road in the City of Vacaville. Additionally, construction equipment used at the Project area would be located approximately 1,420 feet to the nearest residential use to the north in Solano County and approximately 1,470 feet to the nearest residential use to the southwest in the City of Vacaville. This construction would typically be located at an average distance further away over a potential 12-hour work day due to the nature of construction where equipment is mobile throughout the day. Table 12 shows the construction noise levels attributable to each construction phase modeled.

Table 12 Estimated Noise Levels by Construction Phase at Surrounding Land Uses

	L_{eq} dBA			
Construction Activity Phase	RCNM Reference Noise Level	Single Family Residential on Mills Lane to the north	Single-Family Residential on Willow Road to the southwest	Multi-Family Residential on Ellsworth Lane to the west
Distance to BESS Facilities[1] (feet)	**50**	**1,420**	**1,490**	**2,200**
Access Road	80	51	51	47
Site Preparation	84	55	55	51
Grading	84	55	55	51
Install Foundations & Equipment	94	65	65	61
Set Modules, Inverters & Switchgear	73	44	44	40
Electrical Wire Installation & Finish Grading	82	53	53	49
Distance to Gen-Tie[2] (feet)	**50**	**95[3]**	**1,120**	**1,400**
Gen-Tie Installation	81	75	54	52
Distance to Gen-Tie Over Freeway[4] (feet)	**50**	**785**	**1,310**	**1,430**
Electrical Wire Installation & Finish Grading[5]	84	60	56	49

Calculations performed with the FHWA's RCNM software are included in Appendix C.

Noise levels rounded to the nearest whole number.

1. Distance from center of the Project area to the nearest sensitive receptor property line.
2. Distance from the gen-tie line to the nearest sensitive receptor property line
3. Residence located to the west on Mills Lane
4. Distance from nearest electrical pole next to I-80 to sensitive receptors
5. Equipment list from Electrical Wire Installation & Finish Grading with Heavy-Duty Helicopter included.

As shown in Table 12, noise levels at the nearest residential use to the west of the gen-tie installation would be up to 75 dBA L_{eq} (8 hour). Furthermore, noise levels at the nearest residential uses to the north of the BESS Project area would be up to 65 dBA L_{eq} (8 hour) during the install foundations & equipment phase. Therefore, construction noise levels would not exceed the FTA's residential construction noise threshold of 80 dBA L_{eq} (8 hour). In addition, construction would occur within the allowed hours of the City of Vacaville Municipal Code. Therefore, construction noise impacts would be less than significant.

4.2 Operational Noise

On-Site Operational Noise - BESS

Following the methodology discussed in Section 3.3, Project operational noise levels were modeled and noise contours were estimated, as shown in Figure 6. Noise modeling indicates that Project operational noise levels at the nearest residential receiver property line to the southwest in the City of Vacaville would be 47.2 dBA L_{eq}, at residential sensitive receiver R-2, which would not exceed the City of Vacaville's nighttime threshold of 53 dBA, as discussed in Section 3.4 above. Therefore, impacts would be less than significant.

Figure 6 Operational Noise Contours

On-Site Operational Noise – Gen-Tie Corona Discharge

The portion of the Project site nearest to existing sensitive receptors would be the gen-tie line segments running between the BESS area to the Vaca Dixon Peaker Plant (13.8 kV) and the PG&E Vaca-Dixon Substation (115 kV). The gen-tie lines are located as close as approximately 95 feet east of the existing single-family residential property lines. These sensitive receptors are located in unincorporated Solano County, therefore the noise level standards presented in Table 9 above would apply. Corona discharge noise may occur during both daytime and nighttime hours during operation of the Project, therefore the stricter nighttime noise threshold of 50 dBA is applicable. At a distance of 95 feet, corona discharge noise would attenuate and would be imperceptible – i.e., would not exceed the County's nighttime noise threshold of 50 dBA.

Operation of the Project components would not result in the exposure of persons to or generation of noise levels in excess of standards established in the local general plan or noise ordinance, or the applicable standards of other agencies. As a result, operation of the Project would be consistent with all local standards and operational noise impacts would be less than significant.

Off-Site Traffic Noise

During routine operation of the Project, operation and maintenance staff would visit the BESS site periodically for routine maintenance and other operation activities. Maintenance trucks would be utilized to perform routine maintenance, including but not limited to equipment testing, monitoring, repair, routine procedures to ensure service continuity, and standard preventative maintenance.

Routine operations would typically require two workers in a medium duty utility truck to visit the facility up to twice per week. This amount of additional vehicle trips on nearby roadways would result in a negligible addition of roadway traffic noise and impacts would be less than significant.

Mitigation Measures

No mitigation measures would be required.

Threshold:	Would the Project result in generation of excessive groundborne vibration or groundborne noise levels?

The greatest potential source of vibration from construction activity would involve pile drivers if pile driving is needed for foundation installation. Pile driving construction equipment at the Project area may be used within 570 feet of the nearest commercial structure to the northwest and all other construction equipment may be used within 410 feet to the commercial structure to the northwest. Impact pile driving creates approximately 1.518 in/sec PPV at a distance of 25 feet (FTA 2018). These vibration levels would attenuate to 0.14 in/sec PPV for a pile driver at 570 feet and 0.003 in/sec PPV for a vibratory roller at 460 feet. Additionally, during the gen-tie installation, a large bulldozer may be used within 160 feet to the nearest commercial structure to the west. A large bulldozer creates approximately 0.089 in/sec PPV at 25 feet, and would attenuate to 0.005 in/sec at a distance of 160 feet. These vibration levels are lower than the threshold of 0.3 in/sec PPV for commercial structures. The closest residential uses on Mills Lane are located further away and will, therefore, be below the 0.2 in/sec PPV threshold. Therefore, temporary impacts associated with construction would be less than significant.

The Project does not include substantial vibration sources associated with operation. Therefore, Project operation would not generate excessive groundborne vibration or groundborne noise levels. No impact would occur.

Mitigation Measures

No mitigation measures would be required.

Threshold:	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 two 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?

The Project site is not located within an airport land use plan or within two miles of a public or private airport (Solano County 2015). The closest airport is the Nut Tree Airport, which is approximately 2.4 miles southwest of the Project site. Therefore, the Project would not expose people residing or working in the Project area to excessive noise levels related to airstrip/airport operation. No impact would occur.

Mitigation Measures

No mitigation measures would be required.

5 Conclusions

Construction noise would generate unshielded noise levels of up to 75 dBA Leq from the gen-tie installation to the nearest residential property line to the west and up to 65 dBA L_{eq} at the nearest residential use property line to the north from the Project area, which would not exceed the FTA's construction noise standard of 80 dBA L_{eq} (8-hour). In addition, construction would be limited to hours allowed by the City and Municipal Code. Therefore, impacts would be less than significant.

The Project would introduce sources of operational noise to the BESS site, including electrical (modular battery enclosures and transformers) and mechanical equipment (maintenance equipment). These noise levels would not exceed the residential standards from the City of Vacaville's Municipal Code or the Solano County, and impacts would be less than significant.

Project traffic would involve routine maintenance and would increase traffic noise by a negligible amount over existing conditions on surrounding roadways. Therefore, off-site traffic noise impacts would be less than significant.

Operation of the Project would not include any substantial vibration sources. Groundborne vibration from construction activities would not exceed the applicable vibration thresholds. Therefore, vibration impacts would be less than significant.

The Project is not located within the noise contours of any airport. Therefore, the proposed Project would not expose people working in the Project area to excessive aircraft overflight noise levels.

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Appendix A

Assumptions and Calculations

POI Address: 5221 Quinn Road, Vacaville, CA 95688

Constrution Schedule:
Vaca Dixon Phase 1
Arges Phase 2

Estimated Start Date:

Vaca Dixon BESS

Construction Schedule (either list start and end dates or number of days per phase)			Date
Access Road	Start Date	*4-weeks*	7/1/2027
	End Date		7/29/2027
Site Preparation	Start Date	*12-weeks*	7/30/2027
	End Date		10/22/2027
Grading	Start Date	*Part of site prep.*	7/30/2027
	End Date		10/22/2027
Installation of Foundations & Equipment	Start Date	*8-weeks*	10/23/2027
	End Date		12/18/2027
Set Modules, Inverters, & Switchgear	Start Date	*8-weeks*	12/19/2027
	End Date		2/13/2028
Electrical Wire Installation/Finish Grading	Start Date	*8-weeks*	2/14/2028
	End Date		4/10/2028
Commissioning & Testing	Start Date	*12-weeks*	4/11/2028
	End Date		7/4/2028

Arges BESS

Access Road	Start Date	*4-weeks*	6/1/2028
	End Date		6/29/2028
Site Preparation	Start Date	*12-weeks*	6/30/2028
	End Date		9/22/2028
Grading	Start Date	*Part of site prep.*	6/30/2028
	End Date		9/22/2028
Installation of Foundations & Equipment	Start Date	*8-weeks*	9/23/2028
	End Date		11/18/2028
Set Modules, Inverters, & Switchgear	Start Date	*8-weeks*	11/19/2028
	End Date		1/14/2029
Electrical Wire Installation/Finish Grading	Start Date	*8-weeks*	1/15/2029
	End Date		3/12/2029
Commissioning & Testing	Start Date	*12-weeks*	3/13/2029
	End Date		6/5/2029

	Vaca Dixon	Arges
Operational Annual Trips (assumed)	**416**	**416**
Operational Annual VMT (assumed)	**4160**	**4160**

**No soild waste generation

Vaca Dixon BESS Assumptions

Limits of Disturbance = ~ 5 acres

Single unmanned one-story control structure of approximately 1,000 square feet

1. Construction Schedule (approximate start date – approximate end date)

_________July 1, 2027____________________ to ____July 1, 2028____________ _________

Construction Schedule (either list start and end dates or number of days per phase)			# of work days
Access Road	Start Date: End Date:	*4-weeks*	25
Site Preparation	Start Date: End Date:	*12-weeks*	73
Grading	Start Date: End Date:	*Part of site prep.*	73
Installation of Foundations & Equipment	Start Date: End Date:	*8-weeks*	49
Set Modules, Inverters, & Switchgear	Start Date: End Date:	*8-weeks*	48
Electrical Wire Installation/Finish Grading	Start Date: End Date:	*8-weeks*	49
Commissioning & Testing	Start Date: End Date:	*12-weeks*	73

	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
Start Time	7	7	7	7	7	7	-
End time	7	7	7	7	7	7	-

Grading Information	
Total cubic yards (CY) of excavated (cut) soil	*0*
Total CY of cut soil that will be used as fill	*0*
Total CY of soil imported from off-site sources	15,910
Total CY of soil exported	3,640
Total CYs of fill needed	*0*
Total CYs of fill to be imported	*0*
Total CYs of aggregate to be imported	*0*
Total Import (CY)	***0***
Haul truck capacities (default value: 16 CY)	*16*
Total Import + Export Trips	*1,222*

Total One-Way Trips Per Day 25 on average

Haul truck destination (C&D landfills) yes

Equipment	Access Road	Site Preparation	Grading	Install Foundations & Equipment	Set Modules, Inverters & Switchgear	Elec. Wire Install/Finish Grading	Commissioning/Testing
subtotal:	5	5	5	2	1	5	0
Aerial Lifts							
Backhoes		2					
Bore/Drill Rigs				1			
Cement and Mortar Mixers				1			
Concrete/Industrial Saws		1					
Compactors	1		1				
Compressors							
Cranes					1		
Crawler Tractors							
Crushing/Processing Equipment							
Dozers	1		1			1	
Dumpers/Tenders			1				
Excavators		1					
Forklifts							
Generators							
Graders			1				
Loaders, Front End			1				
Loaders, Rubber Tired							
Off-Highway Tractors							
Off-Highway Trucks							
Pavers	1						
Paving Equipment	1						
Pressure Washers							
Pumps							
Rollers	1						
Rough Terrain Forklifts							
Scraper							
Signal Boards							
Skid Steer Loaders							
Surfacing Equipment							
Sweepers/Scrubbers		1				1	

Tractors						1	
Trenchers						1	
Welders						1	
Worker Trips (RT)	40	40	40	40	40	40	40
Vendor Trips (RT)	10	10	10	10	10	10	10
Haul **Truck Trips (**one-way**)**	**25**	**12.7**	**12.7**	**10**	**10**	**10**	**2**

For the peak time of construction activity:

- How long will peak construction time last (months)? 9-months
- Daily number of employees onsite: 40-50
- Daily number of vehicles onsite: 40

- Water exposed areas? How many times daily:
  - 2: x

- Unpaved road moisture content? <11%

- Unpaved road vehicle speed limit? 15 mph

- Other BMPs? silt fence, construction entrance, temporary seeding, designated soil stockpile, concrete washout facility, storm drain inlet protection

Percentage Paved Roads	
Approximate Site Diameter (miles)	0.13
Worker Trip Length (miles)	11.7
% Pave Worker	98%
Vendor Trip Length (miles)	8.4
% Pave Vendor	97%
Haul Trip Length (miles)	20
% Pave Haul	99%

Arges BESS Assumptions

Limits of Disturbance = ~ 5 acres

Single unmanned one-story control structure of approximately 1,000 square feet

BESS sq ft estimate for building construction using Google Earth and most recent site plans.

1. Construction Schedule (approximate start date – approximate end date)

_____June 1, 2028___________________ to _____June 1, 2029__________________ _________

Construction Schedule (either list start and end dates or number of days per phase)			# of work days
Access Road	Start Date: End Date:	*4-weeks*	25
Site Preparation	Start Date: End Date:	*12-weeks*	73
Grading	Start Date: End Date:	*Part of site prep.*	73
Installation of Foundations & Equipment	Start Date: End Date:	*8-weeks*	49
Set Modules, Inverters, & Switchgear	Start Date: End Date:	*8-weeks*	48
Electrical Wire Installation/Finish Grading	Start Date: End Date:	*8-weeks*	49
Commissioning & Testing	Start Date: End Date:	*12-weeks*	73

	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
Start Time	7	7	7	7	7	7	-
End time	7	7	7	7	7	7	-
Work Hours:	10	10	10	10	10	10	

Grading Information	
Total cubic yards (CY) of excavated (cut) soil	*0*
Total CY of cut soil that will be used as fill	*0*
Total CY of soil imported from off-site sources	*34,505*
Total CY of soil exported	*3,880*
Total CYs of fill needed	*0*
Total CYs of fill to be imported	*0*
Total CYs of aggregate to be imported	*0*
Total Import	***0***

Haul truck capacities (default value: 16 CY)	*16*
Total Import + Export Trips	*2,400*
Total One-Way Trips Per Day	*50 on average*
Haul truck destination (C&D landfills)	*yes*

subtotal:	5	5	5	2	1	5	0
Equipment	**Access Road**	**Site Preparation**	**Grading**	**Install Foundations & Equipment**	**Set Modules, Inverters & Switchgear**	**Elec. Wire Install/Finish Grading**	**Commissioning/Testing**
Aerial Lifts							
Backhoes		2					
Bore/Drill Rigs				1			
Cement and Mortar Mixers				1			
Concrete/Industrial Saws		1					
Compactors	1		1				
Compressors							
Cranes					1		
Crawler Tractors							
Crushing/Processing Equipment							
Dozers	1		1			1	
Dumpers/Tenders			1				
Excavators		1					
Forklifts							
Generators							
Graders			1				
Loaders, Front End			1				
Loaders, Rubber Tired							
Off-Highway Tractors							
Off-Highway Trucks							
Pavers	1						
Paving Equipment	1						
Pressure Washers							
Pumps							
Rollers	1						

Rough Terrain Forklifts							
Scraper							
Signal Boards							
Skid Steer Loaders							
Surfacing Equipment							
Sweepers/Scrubbers		1				1	
Tractors						1	
Trenchers						1	
Welders						1	
Worker Trips (RT)	40	40	40	40	40	40	40
Vendor Trips (RT)	10	10	10	10	10	10	10
Haul Truck Trips (RT)	**50**	**25**	**25**	**15**	**15**	**15**	**4**

For the peak time of construction activity:

- How long will peak construction time last (months)? ____9-months______
- Daily number of employees onsite: _____50-60________
- Daily number of vehicles onsite: ____50

- Water exposed areas? How many times daily:
  - 2: __x_

- Unpaved road moisture content? __________<11%________________________

- Unpaved road vehicle speed limit? _____________15 mph_____________________

- Other BMPs? __silt fence, construction entrance, temporary seeding, designated soil stockpile, concrete washout facility, storm drain inlet protection

Percentage Paved Roads	
Site Diameter (miles)	0.1
Worker Trip Length (miles)	11.7
% Pave Worker	98.29%
Vendor Trip Length (miles)	8.4
% Pave Vendor	97.62%
Haul Trip Length (miles)	20
% Pave Haul	99.0%

Arges BESS

SF_6 Emissions Quantifications

SF_6 Emissions Quantification

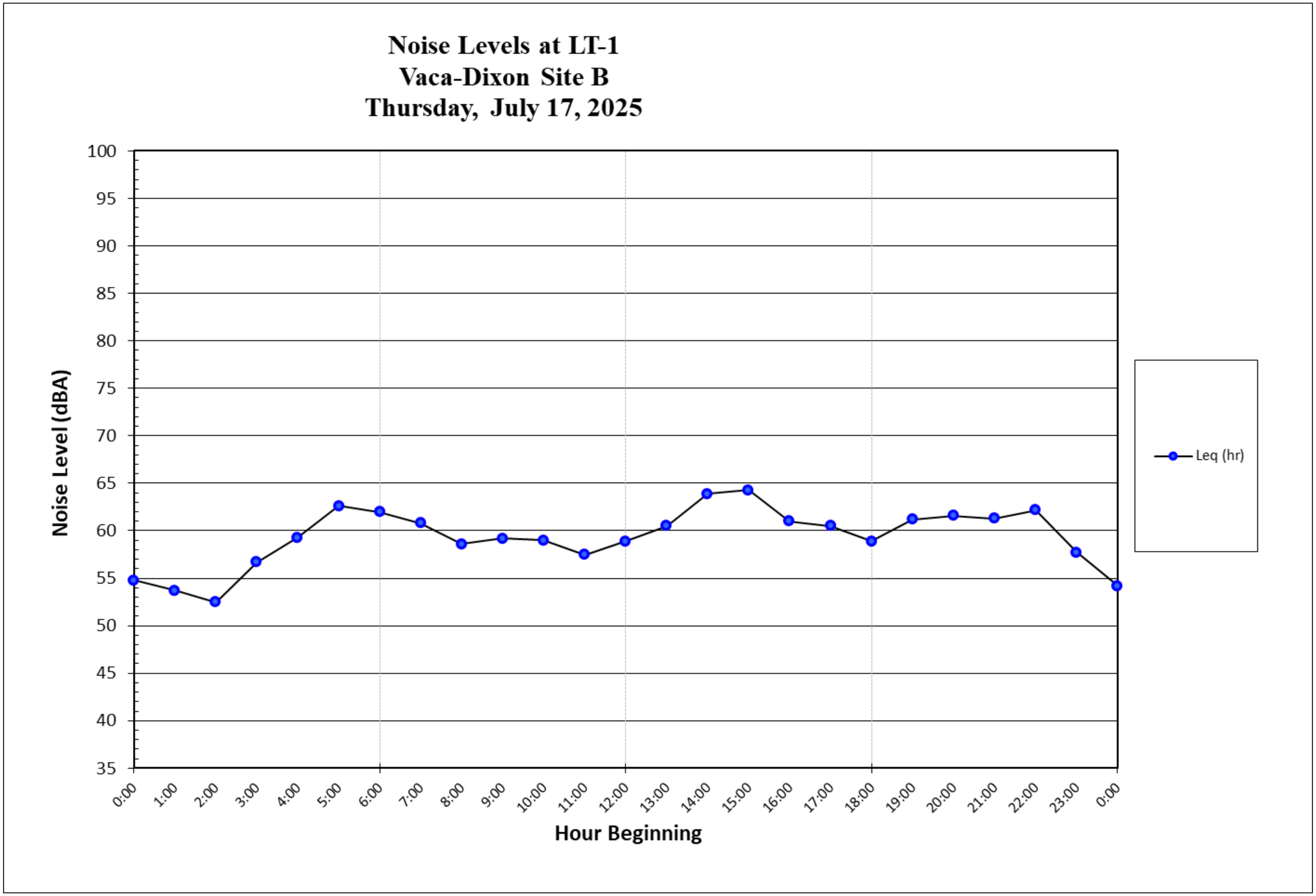
0.50%	*SF_6 leakage percentage per year1*
100	*lbs/ Arges BESS project*
0.5	*SF_6 max lbs leakage per year*
0.000454	*lbs/MT*
0.000227	*SF_6 max MT leakage per year*
24,600	*GWP*
6	*Max MT CO_2 e/year*

1 IEEE (Institute of Electrical and Electronics Engineers). 2018. PC37.122 – Standard for High Voltage GasInsulated Substations Rated Above 52 kV. March 8, 2018. https://standards.ieee.org/project/C37_122.html

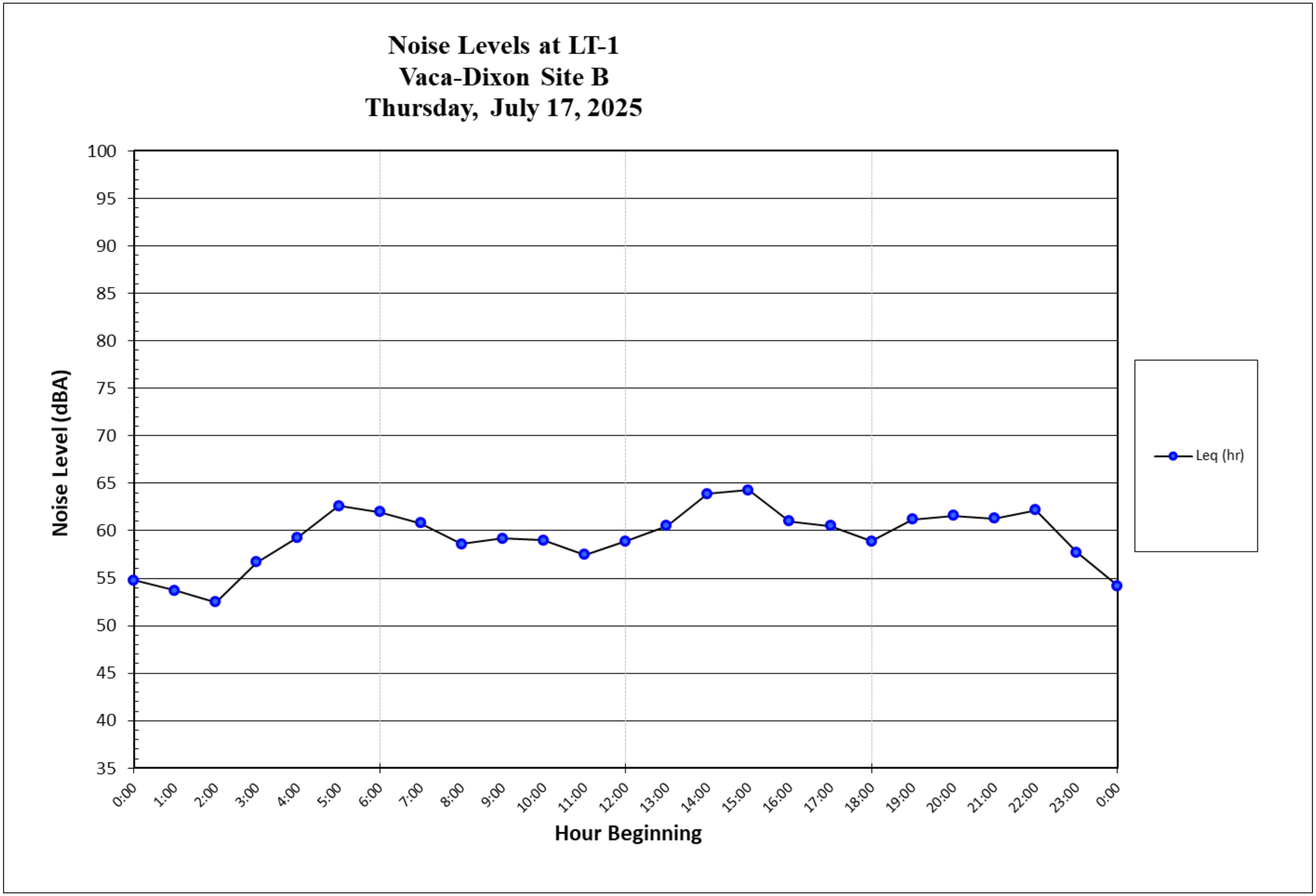
Appendix B

Ambient Noise Data

LT-1 Noise Measurement Data



LT-1 Noise Measurement Data



Appendix C

Construction Noise Modeling Data

Construction Noise

Leq	Noise Level @ 50 ft	Single-Fam Res on Mills Lane to N	Single-Fam Res on Willow Road to SW	Single Family on Kilkenny Road to E	Multi Family to SW
Distance		1420	1490	2200	1960
Access Road	80	50.934	50.516	47.131	48.134
Site Preparation	84	54.934	54.516	51.131	52.134
Grading	84	54.934	54.516	51.131	52.134
Install Foundations & Equipment	94	64.934	64.516	61.131	62.134
Set Modules, Inverters & Switchgear	73	43.934	43.516	40.131	41.134
Electrical Wire Installation & Finish Grading	82	52.934	52.516	49.131	50.134

Construction Vibration

Distance from Project boundary	Vibration @ 25 ft	Commercial (Northwest)
		460
Vibratory Roller	0.21	0.003
Large Bulldozer	0.089	0.001
Loaded Trucks	0.076	0.001
Small Bulldozer	0.003	0.000

Distance from nearest BESS unit	Vibration @ 25 ft	Commercial (Northwest)
		570
Impact Pile Driver	1.518	0.014

Roadway Construction Noise Model (RCNM),Version 1.1

Report date: 08/21/2025
Case Description: Access Road

**** Receptor #1 ****

Description	Land Use	Baselines (dBA) Daytime	Evening	Night
Access Road	Residential	65.0	55.0	50.0

Equipment

Description	Impact Device	Usage (%)	Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Dozer	No	40		81.7	50.0	0.0
Roller	No	20		80.0	50.0	0.0
Paver	No	50		77.2	50.0	0.0

Results

Equipment	Calculated (dBA) Lmax	Leq	Noise Limits (dBA) Day Lmax	Day Leq	Evening Lmax	Evening Leq	Night Lmax	Night Leq	Noise Limit Exceedance (dBA) Day Lmax	Day Leq	Evening Lmax	Evening Leq	Night Lmax	Night Leq
Dozer	81.7	77.7	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Roller	80.0	73.0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Paver	77.2	74.2	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Total	81.7	80.2	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Roadway Construction Noise Model (RCNM),Version 1.1

Report date: 08/21/2025
Case Description: Site Preparation

**** Receptor #1 ****

		Baselines (dBA)		
Description	Land Use	Daytime	Evening	Night
Site Preparation	Residential	65.0	55.0	50.0

Equipment

Description	Impact Device	Usage (%)	Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Concrete Saw	No	20		89.6	50.0	0.0
Excavator	No	40		80.7	50.0	0.0
Backhoe	No	40		77.6	50.0	0.0

Results

	Calculated (dBA)		Noise Limits (dBA) Day		Evening		Night		Noise Limit Exceedance (dBA) Day		Evening		Night	
Equipment	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq
Concrete Saw	89.6	82.6	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Excavator	80.7	76.7	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Backhoe	77.6	73.6	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Total	89.6	84.0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Roadway Construction Noise Model (RCNM),Version 1.1

Report date: 08/21/2025
Case Description: Grading

**** Receptor #1 ****

Description	Land Use	Baselines (dBA) Daytime	Evening	Night
Grading	Residential	65.0	55.0	50.0

Equipment

Description	Impact Device	Usage (%)	Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Dozer	No	40		81.7	50.0	0.0
Dozer	No	40		81.7	50.0	0.0
Grader	No	40	85.0		50.0	0.0

Results

	Calculated (dBA)		Noise Limits (dBA) Day		Evening		Night		Noise Limit Exceedance (dBA) Day		Evening		Night	
Equipment	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq
Dozer	81.7	77.7	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Dozer	81.7	77.7	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Grader	85.0	81.0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Total	85.0	83.9	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Roadway Construction Noise Model (RCNM),Version 1.1

Report date: 08/21/2025
Case Description: Set Modules_Inverters & Switchgear

**** Receptor #1 ****

Description	Land Use	Baselines (dBA) Daytime	Evening	Night
Set Modules_Inverters & Switchgear	Residential	65.0	55.0	50.0

Equipment

Description	Impact Device	Usage (%)	Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Crane	No	16		80.6	50.0	0.0

Results

	Calculated (dBA)		Noise Limits (dBA) Day		Evening		Night		Noise Limit Exceedance (dBA) Day		Evening		Night	
Equipment	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq
Crane	80.6	72.6	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Total	80.6	72.6	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Roadway Construction Noise Model (RCNM),Version 1.1

Report date: 08/21/2025
Case Description: Electrical Wire Install_Finish Grading

**** Receptor #1 ****

Description	Land Use	Baselines (dBA) Daytime	Evening	Night
Electrical Wire Install_Finish Grading	Residential	65.0	55.0	50.0

Equipment

Description	Impact Device	Usage (%)	Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Dozer	No	40		81.7	50.0	0.0
Tractor	No	40	84.0		50.0	0.0
Vacuum Street Sweeper	No	10		81.6	50.0	0.0

Results

	Calculated (dBA)		Noise Limits (dBA) Day		Evening		Night		Noise Limit Exceedance (dBA) Day		Evening		Night	
Equipment	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq
Dozer	81.7	77.7	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Tractor	84.0	80.0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Vacuum Street Sweeper	81.6	71.6	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Total	84.0	82.4	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Roadway Construction Noise Model (RCNM),Version 1.1

Report date: 08/21/2025
Case Description: Install Foundations & Equipment

**** Receptor #1 ****

Description	Land Use	Baselines (dBA) Daytime	Evening	Night
Install Foundations & Equipment	Residential	65.0	55.0	50.0

Equipment

Description	Impact Device	Usage (%)	Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Impact Pile Driver	Yes	20		101.3	50.0	0.0
Drum Mixer	No	50		80.0	50.0	0.0

Results

	Calculated (dBA)		Noise Limits (dBA) Day		Evening		Night		Noise Limit Exceedance (dBA) Day		Evening		Night	
Equipment	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq
Impact Pile Driver	101.3	94.3	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Drum Mixer	80.0	77.0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Total	101.3	94.4	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Appendix D

Operational Noise Modeling Data

Operational Noise Results Table – SoundPLAN

Receiver	Usage	Fl	Ldn dB(A)	Leq,d dB(A)	Leq,n dB(A)
R-1	SCR	G	50.1	43.7	43.7
R-2	SCR	G	53.6	47.2	47.2
R-3	SCR	G	52.6	46.2	46.2
R-4	SCR	G	51.1	44.7	44.7
R-4	SCR	F2	51.2	44.8	44.8
R-5	SCR	G	55	48.5	48.5