3.10 - Noise

3.10.1 - Introduction

This section describes the existing noise setting and potential effects from project implementation on the site and its surrounding area. Descriptions and analysis in this section are based on noise modeling performed by FirstCarbon Solutions (FCS). The noise modeling input assumptions and output data are included in this Draft Environmental Impact Report (Draft EIR) as Appendix K.

3.10.2 - Environmental Setting

Characteristics of Noise

Noise is generally defined as unwanted or objectionable sound. Sound becomes unwanted when it interferes with normal activities, when it causes actual physical harm or when it has adverse effects on health. The effects of noise on people can include general annoyance, interference with speech communication, sleep disturbance, and in the extreme, hearing impairment. Noise effects can be caused by pitch or loudness. *Pitch* is the number of complete vibrations or cycles per second of a wave that result in the range of tone from high to low; higher-pitched sounds are louder to humans than lower-pitched sounds. *Loudness* is the intensity or amplitude of sound.

Sound is produced by the vibration of sound pressure waves in the air. Sound pressure levels are used to measure the intensity of sound and are described in terms of decibels. The decibel (dB) is a logarithmic unit, which expresses the ratio of the sound pressure level being measured to a standard reference level. The 0 point on the dB scale is based on the lowest sound level that the healthy, unimpaired human ear can detect. Changes of 3 dB or less are only perceptible in laboratory environments. Audible increases in noise levels generally refer to a change of 3 dB or more, as this level has been found to be barely perceptible to the human ear in outdoor environments. Only audible changes in existing ambient or background noise levels are considered potentially significant.

The human ear is not equally sensitive to all frequencies within the audible sound spectrum, so sound pressure level measurements can be weighted to better represent frequency-based sensitivity of average healthy human hearing. One such specific "filtering" of sound is called "A-weighting." A-weighted decibels (dBA) approximate the subjective response of the human ear to a broad frequency noise source by discriminating against very low and very high frequencies of the audible spectrum. They are adjusted to reflect only those frequencies that are audible to the human ear. Because decibels are logarithmic units, they cannot be added or subtracted by ordinary arithmetic means. For example, if one noise source produces a noise level of 70 dB, the addition of another noise source with the same noise level would not produce 140 dB; rather, they would combine to produce a noise level of 73 dB.

Noise Descriptors

There are many ways to rate noise for various intervals, but an appropriate rating of ambient noise affecting humans also accounts for the annoying effects of sound. Equivalent continuous sound level (L_{eq}) is the total sound energy of time-varying noise over a sample period. However, the predominant rating scales for human communities in the State of California are the L_{eq} and Community Noise

Equivalent Level (CNEL) or the day-night average level (L_{dn}) based on dBA. CNEL is the time-varying noise over a 24-hour period, with a 5 dBA weighting factor applied to the hourly L_{eq} for noises occurring from 7:00 p.m. to 10:00 p.m. (defined as relaxation hours) and a 10 dBA weighting factor applied to noise occurring from 10:00 p.m. to 7:00 a.m. (defined as sleeping hours). L_{dn} is similar to the CNEL scale but without the adjustment for events occurring during the evening hours. CNEL and L_{dn} are within one dBA of each other and are normally exchangeable. The noise adjustments are added to the noise events occurring during the more sensitive hours.

Other noise rating scales of importance when assessing the annoyance factor include the maximum noise level (L_{max}), which is the highest exponential time-averaged sound level that occurs during a stated time period. The noise environments discussed in this analysis are specified in terms of maximum levels denoted by L_{max} for short-term noise impacts. L_{max} reflects peak operating conditions and addresses the annoying aspects of intermittent noise.

Noise Propagation

From the noise source to the receiver, noise changes both in level and frequency spectrum. The most obvious is the decrease in noise as the distance from the source increases. The manner in which noise reduces with distance depends on whether the source is a point or line source, as well as ground absorption, atmospheric conditions (wind, temperature gradients, and humidity) and refraction, and shielding by natural and manmade features. Sound from point sources, such as an air conditioning condenser, a piece of construction equipment, or an idling truck, radiates uniformly outward as it travels away from the source in a spherical pattern.

The attenuation or sound drop-off rate is dependent on the conditions of the land between the noise source and receiver. To account for this ground-effect attenuation (absorption), two types of site conditions are commonly used in noise models: soft-site and hard-site conditions. Soft-site conditions account for the sound propagation loss over natural surfaces such as normal earth and ground vegetation. For point sources, a drop-off rate of 7.5 dBA per each doubling of the distance (dBA/DD) is typically observed over soft ground with landscaping, as compared with a 6 dBA/DD drop-off rate over hard ground such as asphalt, concrete, stone and very hard packed earth. For line sources, such as traffic noise on a roadway, a 4.5 dBA/DD is typically observed for soft-site conditions compared to the 3 dBA/DD drop-off rate for hard-site conditions. Table 3.10-1 briefly defines these measurement descriptors and other sound terminology used in this section.

Table 3.10-1: Sound Terminology

Term	Definition
Sound	A vibratory disturbance created by a vibrating object which, when transmitted by pressure waves through a medium such as air, can be detected by a receiving mechanism such as the human ear or a microphone.
Noise	Sound that is loud, unpleasant, unexpected, or otherwise undesirable.

Term	Definition
Ambient Noise	The composite of noise from all sources near and far in a given environment.
Decibel (dB)	A unitless measure of sound on a logarithmic scale, which represents the squared ratio of sound pressure amplitude to a reference sound pressure. The reference pressure is 20 micropascals, representing the threshold of human hearing (0 dB).
A-Weighted Decibel (dBA)	An overall frequency-weighted sound level that approximates the frequency response of the human ear.
Equivalent Noise Level (L_{eq})	The average sound energy occurring over a specified time period. In effect, L_{eq} is the steady-state sound level that in a stated period would contain the same acoustical energy as the time-varying sound that actually occurs during the same period.
Maximum and Minimum Noise Levels (L_{max} and L_{min})	The maximum or minimum instantaneous sound level measured during a measurement period.
Day-Night Level (DNL or L_{dn})	The energy average of the A-weighted sound levels occurring during a 24-hour period, with 10 dB added to the A-weighted sound levels occurring between 10:00 p.m. and 7:00 a.m. (nighttime).
Community Noise Equivalent Level (CNEL)	The energy average of the A-weighted sound levels occurring during a 24-hour period, with 5 dB added to the A-weighted sound levels occurring between 7:00 p.m. and 10:00 p.m. and 10 dB added to the A-weighted sound levels occurring between 10:00 p.m. and 7:00 a.m.
Source: Data compiled by FirstCarbon Solutions (FCS) 2019.	

Traffic Noise

The level of traffic noise depends on the three primary factors: (1) the volume of the traffic, (2) the speed of the traffic, and (3) the number of trucks in the flow of traffic. Generally, the loudness of traffic noise is increased by heavier traffic volumes, higher speeds, and greater number of trucks. Vehicle noise is a combination of the noise produced by the engine, exhaust, and tires. Because of the logarithmic nature of noise levels, a doubling of the traffic volume (assuming that the speed and truck mix do not change) results in a noise level increase of 3 dBA. Based on the Federal Highway Administration (FHWA) community noise assessment criteria, this change is "barely perceptible." For reference, a doubling of perceived noise levels would require an increase of approximately 10 dBA. The truck mix on a given roadway also has an effect on community noise levels. As the number of heavy trucks increases and becomes a larger percentage of the vehicle mix, adjacent noise levels increase.

Stationary Noise

A stationary noise producer is any entity in a fixed location that emits noise. Examples of stationary noise sources include machinery, engines, energy production, and other mechanical or powered equipment and activities such as loading and unloading or public assembly that may occur at commercial, industrial, manufacturing, or institutional facilities. Furthermore, while noise generated by the use of motor vehicles over public roads is preempted from local regulation, the use of these vehicles is considered a stationary noise source when operated on private property such as at a construction site, a truck terminal, or warehousing facility. The emitted noise from the producer can be mitigated to acceptable levels either at the source or on the adjacent property through the use of proper planning, setbacks, block walls, acoustic-rated windows, dense landscaping, or by changing the location of the noise producer.

The effects of stationary noise depend on factors such as characteristics of the equipment and operations, distance and pathway between the generator and receptor, and weather. Stationary noise sources may be regulated at the point of manufacture (e.g., equipment or engines), with limitations on the hours of operation, or with provision of intervening structures, barriers or topography.

Construction activities are a common source of stationary noise. Construction-period noise levels are higher than background ambient noise levels but eventually cease once construction is complete. Construction is performed in discrete steps, each of which has its own mix of equipment and, consequently, its own noise characteristics. These various sequential phases would change the character of the noise generated on each construction site and, therefore, would change the noise levels as construction progresses. Despite the variety in the type and size of construction equipment, similarities in the dominant noise sources and patterns of operation allow construction-related noise ranges to be categorized by work phase. Table 3.10-2 shows typical noise levels of construction equipment as measured at a distance of 50 feet from the operating equipment.

Table 3.10-2: Typical Construction Equipment Maximum Noise Levels, L_{max}

Type of Equipment	Impact Device? (Yes/No)	Specification Maximum Sound Levels for Analysis (dBA at 50 feet)
Impact Pile Driver	Yes	95
Auger Drill Rig	No	85
Vibratory Pile Driver	No	95
Jackhammers	Yes	85
Pneumatic Tools	No	85
Pumps	No	77
Scrapers	No	85
Cranes	No	85
Portable Generators	No	82
Rollers	No	85
Bulldozers	No	85
Tractors	No	84

Type of Equipment	Impact Device? (Yes/No)	Specification Maximum Sound Levels for Analysis (dBA at 50 feet)
Front-End Loaders	No	80
Backhoe	No	80
Excavators	No	85
Graders	No	85
Air Compressors	No	80
Dump Truck	No	84
Concrete Mixer Truck	No	85
Pickup Truck	No	55

Notes:
dBA = A-weighted decibel
Source: Federal Highway Administration (FHWA) 2006. Highway Construction Noise Handbook, August.

Noise from Multiple Sources

Because sound pressure levels in decibels are based on a logarithmic scale, they cannot be added or subtracted in the usual arithmetical way. Therefore, sound pressure levels in decibels are logarithmically added on an energy summation basis. In other words, adding a new noise source to an existing noise source, both producing noise at the same level, will not double the noise level. Instead, if the difference between two noise sources is 10 dBA or more, the louder noise source will dominate, and the resultant noise level will be equal to the noise level of the louder source. In general, if the difference between two noise sources is 0–1 dBA, the resultant noise level will be 3 dBA higher than the louder noise source, or both sources if they are equal. If the difference between two noise sources is 2–3 dBA, the resultant noise level will be 2 dBA above the louder noise source. If the difference between two noise sources is 4–10 dBA, the resultant noise level will be 1 dBA higher than the louder noise source.

Characteristics of Vibration

Groundborne vibration consists of rapidly fluctuating motion through a solid medium, specifically the ground, which has an average motion of zero and in which the motion’s amplitude can be described in terms of displacement, velocity, or acceleration. The effects of groundborne vibration typically only causes a nuisance to people, but in extreme cases, excessive groundborne vibration has the potential to cause structural damage to buildings. Groundborne noise is an effect of groundborne vibration and only exists indoors, since it is produced from noise radiated from the motion of the walls and floors of a room, and may also consist of the rattling of windows or dishes on shelves.

Several different methods are used to quantify vibration amplitude such as the maximum instantaneous peak in the vibrations velocity, which is known as the peak particle velocity (PPV) or the root mean square (rms) amplitude of the vibration velocity. Because of the typically small amplitudes of vibrations, vibration velocity is often expressed in decibels—denoted as LV—and is based on the reference quantity of 1 microinch per second. To distinguish vibration levels from noise levels, the unit is written as "VdB."

Although groundborne vibration can be felt outdoors, it is typically only an annoyance to people indoors where the associated effects of the shaking of a building can be notable. When assessing annoyance from groundborne vibration, vibration is typically expressed as root mean square (rms) velocity in units of decibels of 1 microinch per second, with the unit written in VdB. Typically, developed areas are continuously affected by vibration velocities of 50 VdB or lower. Human perception to vibration starts at levels as low as 67 VdB. Annoyance due to vibration in residential settings starts at approximately 70 VdB.

Off-site sources that may produce perceptible vibrations are usually caused by construction equipment, steel-wheeled trains, and traffic on rough roads, while smooth roads rarely produce perceptible groundborne noise or vibration. Construction activities, such as blasting, pile driving and operating heavy earthmoving equipment, are common sources of groundborne vibration. Construction vibration impacts on building structures are generally assessed in terms of PPV. Typical vibration source levels from construction equipment are shown in Table 3.10-3.[1]

Table 3.10-3: Vibration Levels of Construction Equipment

Construction Equipment	PPV at 25 Feet (inches/second)	rms Velocity in Decibels (VdB) at 25 Feet
Water Trucks	0.001	57
Scraper	0.002	58
Bulldozer—small	0.003	58
Jackhammer	0.035	79
Concrete Mixer	0.046	81
Concrete Pump	0.046	81
Paver	0.046	81
Pickup Truck	0.046	81
Auger Drill Rig	0.051	82
Backhoe	0.051	82
Crane (Mobile)	0.051	82
Excavator	0.051	82
Grader	0.051	82
Loader	0.051	82
Loaded Trucks	0.076	86
Bulldozer—large	0.089	87
Caisson drilling	0.089	87
Vibratory Roller (small)	0.101	88

[1] Federal Highway Administration (FHWA). 2006. Highway Construction Noise Handbook. August.

Construction Equipment	PPV at 25 Feet (inches/second)	rms Velocity in Decibels (VdB) at 25 Feet
Compactor	0.138	90
Clam shovel drop	0.202	94
Vibratory Roller (large)	0.210	94
Pile Driver (impact-typical)	0.644	104
Pile Driver (impact-upper range)	1.518	112

Notes:
PPV = peak particle velocity
rms = root mean square
VdB = velocity in decibels
Source: Compilation of scientific and academic literature, generated by the Federal Transit Administration (FTA) and Federal Highway Administration (FHWA).

The propagation of groundborne vibration is not as simple to model as airborne noise. This is because noise in the air travels through a relatively uniform medium, while groundborne vibrations travel through the earth, which may contain significant geological differences. Factors that influence groundborne vibration include:

- **Vibration source:** Type of activity or equipment, such as impact or mobile, and depth of vibration source;
- **Vibration path:** Soil type, rock layers, soil layering, depth to water table, and frost depth; and
- **Vibration receiver:** Foundation type, building construction, and acoustical absorption.

Among these factors that influence groundborne vibration, there are significant differences in the vibration characteristics when the source is underground compared to at the ground surface. In addition, soil conditions are known to have a strong influence on the levels of groundborne vibration. Among the most important factors are the stiffness and internal damping of the soil and the depth to bedrock. Vibration propagation is more efficient in stiff clay soils than in loose sandy soils, and shallow rock seems to concentrate the vibration energy close to the surface and can result in groundborne vibration problems at large distance from the source. Factors such as layering of the soil and depth to the water table can have significant effects on the propagation of groundborne vibration. Soft, loose, sandy soils tend to attenuate more vibration energy than hard, rocky materials. Vibration propagation through groundwater is more efficient than through sandy soils. There are three main types of vibration propagation: surface, compression, and shear waves. Surface waves, or Rayleigh waves, travel along the ground's surface. These waves carry most of their energy along an expanding circular wave front, similar to ripples produced by throwing a rock into a pool of water. P-waves, or compression waves, are body waves that carry their energy along an expanding spherical wave front. The particle motion in these waves is longitudinal (i.e., in a "push-pull" fashion). P-waves are analogous to airborne sound waves. S-waves, or shear waves, are also body waves that carry energy along an expanding spherical wave front. However, unlike P-waves, the particle motion is transverse, or side-to-side and perpendicular to the direction of propagation.

As vibration waves propagate from a source, the vibration energy decreases in a logarithmic nature and the vibration levels typically decrease by 6 VdB per doubling of the distance from the vibration source. As stated above, this drop-off rate can vary greatly depending on the soil type, but it has been shown to be effective enough for screening purposes, in order to identify potential vibration impacts that may need to be studied through actual field tests. The vibration level (calculated below as "PPV") at a distance from a point source can generally be calculated using the vibration reference equation:

$$PPV = PPV_{ref} * (25/D)^n \text{ (in/sec)}$$

Where:

> PPV_{ref} = reference measurement at 25 feet from vibration source
> D = distance from equipment to the receptor
> n = vibration attenuation rate through ground

According to Chapter 12 of the Federal Transit Administration (FTA) Transit Noise and Vibration Impact Assessment Manual, an "n" value of 1.5 is recommended to calculate vibration propagation through typical soil conditions.[2]

Existing Noise Levels

Traffic noise along State Route (SR) 12, Petersen Road, and Walters Road are the dominant transportation noise sources on the project site, with Travis Air Force Base aviation noise dominating during those individual overflight events. The existing ambient noise environment is described as follows.

Existing Traffic Noise

The most significant noise source in the project vicinity is traffic on local roadways, including Walters Road and SR-12. Existing traffic noise levels along roadway segments in the project vicinity were calculated using the FHWA Highway Traffic Noise Prediction Model (FHWA-RD-77-108). This model requires parameters, including traffic volumes, vehicle mix, vehicle speed, and roadway geometry to compute typical equivalent noise levels during daytime, evening, and nighttime hours. The Average Daily Traffic (ADT) volumes for the modeled roadway segments were obtained from the traffic analysis prepared by W-Trans. (These volumes are available in Appendix I). The traffic volumes correspond to the existing conditions traffic scenario as described in the transportation analysis. The model inputs and outputs—including the 60 dBA, 65 dBA, and 70 dBA L_{dn} noise contour distances for existing traffic conditions—are provided in Appendix K of this document. A summary of the modeling results is shown in Table 3.10-4.

The modeling results show that traffic noise levels on Walters Road adjacent to the project site range up to 64 dBA L_{dn} as measured at 50 feet from the centerline of the outermost travel lane; and on SR-12 nearest the site range up to 66.4 dBA L_{dn} as measured at 50 feet from the centerline of the outermost travel lane.

[2] Federal Transit Administration (FTA). 2006. Transit Noise and Vibration Impact Assessment. May.

Table 3.10-4: Existing Traffic Noise Levels

Roadway	From	To	Average Daily Traffic	Centerline to 70 L_{dn} (feet)	Centerline to 65 L_{dn} (feet)	Centerline to 60 L_{dn} (feet)	L_{dn} (dBA) 50 feet from Centerline of Outermost Lane
Walters Road	Bella Vista Drive	Pintail Drive	1,600	< 50	65	132	64.0
Walters Road	Pintail Drive	Montebello Drive	1,500	< 50	62	126	63.7
Walters Road	Montebello Drive	Petersen Road	1,600	< 50	65	132	64.0
SR-12	Sunset Avenue	Emperor Drive	2,900	< 50	104	219	67.4
SR-12	Emperor Drive	Walters Road	2,300	< 50	90	188	66.4

Notes:
L_{dn} = day/night average sound level
dBA = A-weighted decibel
Source: FirstCarbon Solutions (FCS) 2021.

Existing Aircraft Noise

The project site is located southwest of the Travis Air Force Base. The Solano County Airport Land Use Commission (ALUC) adopted the Travis Air Force Airport Land Use Compatibility Plan on October 8, 2015. The plan shows the existing and projected future year noise contours for the air base. Exhibit 3.10-1 shows the Travis Air Force Base noise contours for 2015. Based on the noise contour, the entire proposed development area of the project site is exposed to a CNEL of less 65 dBA or less.

Noise-Sensitive Land Uses

Noise-sensitive land uses generally consist of those uses where exposure to noise would result in adverse effects, as well as uses for which quiet is an essential element of their intended purpose. Residential dwellings are of primary concern, because of the potential for increased and prolonged exposure of individuals to both interior and exterior noise levels. Other typical noise-sensitive land uses include hospitals, convalescent facilities, hotels, religious institutions, libraries, and other uses where low noise levels are essential.

The closest off-site noise-sensitive land use are single-family residences southwest of the project site, approximately 200 feet from the nearest project boundary.

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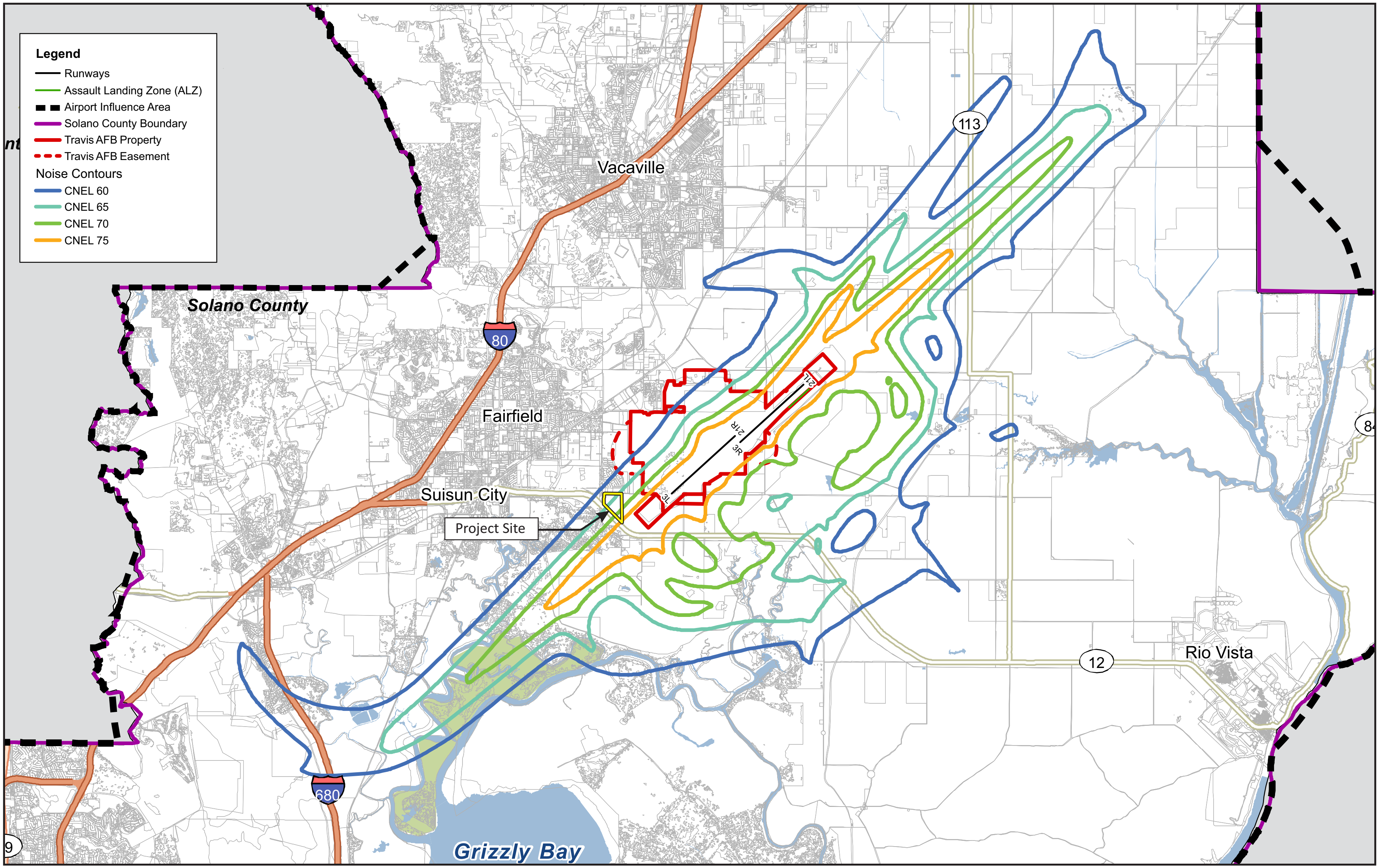

Source: Mead & Hunt, 2015: ESA Airports, 2015; ESRI

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Exhibit 3.10-1
2015 Aviation Noise Contours

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3.10.3 - Regulatory Framework

Federal

Noise Control Act

The adverse impact of noise was officially recognized by the federal government in the Noise Control Act of 1972, which serves three purposes:

- Promulgating noise emission standards for interstate commerce
- Assisting state and local abatement efforts
- Promoting noise education and research

The Federal Office of Noise Abatement and Control (ONAC) was initially tasked with implementing the Noise Control Act. However, the ONAC has since been eliminated, leaving the development of federal noise policies and programs to other federal agencies and interagency committees.

Among the agencies now regulating noise are the Occupational Safety and Health Administration (OSHA), which limits noise exposure of workers to 90 dB L_{eq} or less for 8 continuous hours or 105 dB L_{eq} or less for 1 continuous hour; the United States Department of Transportation (USDOT), which assumed a significant role in noise control through its various operating agencies; and the Federal Aviation Administration (FAA), which regulates noise of aircraft and airports. Surface transportation system noise is regulated by a host of agencies, including the FTA. Transit noise is regulated by the federal Urban Mass Transit Administration, while freeways that are part of the interstate highway system are regulated by the FHWA. Finally, the federal government actively advocates that local jurisdictions use their land use regulatory authority to arrange new development in such a way that "noise-sensitive" uses are either prohibited from being sited adjacent to a highway, or alternatively, that developments are planned and constructed in a manner that minimize potential noise impacts.

Since the federal government has preempted the setting of standards for noise levels that can be emitted by transportation sources, local jurisdictions are limited to regulating the noise generated by the transportation system through nuisance abatement ordinances and land use planning.

Federal Transit Administration Standards and Guidelines

FTA has established industry accepted standards for vibration impact criteria and impact assessment. These guidelines are published in its Transit Noise and Vibration Impact Assessment document (FTA 2006). The FTA guidelines include thresholds for construction vibration impacts for various structural categories as shown in Table 3.10-5.

Table 3.10-5: Federal Transit Administration Construction Vibration Impact Criteria

Building Category	PPV (in/sec)	Approximate VdB
I. Reinforced-Concrete, Steel or Timber (no plaster)	0.5	102
II. Engineered Concrete and Masonry (no plaster)	0.3	98
III. Nonengineered Timber and Masonry Buildings	0.2	94
IV. Buildings Extremely Susceptible to Vibration Damage	0.12	90

Building Category	PPV (in/sec)	Approximate VdB
Notes: PPV = peak particle velocity VdB = velocity in decibels Source: Federal Aviation Administration (FAA). 2006. Transit Noise and Vibration Impact Assessment.		

State

California General Plan Guidelines

Established in 1973, the California Department of Health Services Office of Noise Control was instrumental in developing regularity tools to control and abate noise for use by local agencies. One significant model is the "Land Use Compatibility for Community Noise Environments Matrix," which allows the local jurisdiction to delineate compatibility of sensitive uses with various incremental levels of noise.[3]

Government Code Section 65302 mandates that the legislative body of each county and city in California adopt a noise element as part of its comprehensive general plan. The Governor' s Office of Planning and Research (OPR) has issued and periodically updated advisory General Plan Guidelines that provide suggestions regarding how agencies may want to comply with this statutory requirement. The latest version of the General Plan Guidelines was issued in 2020. It contains an Appendix (D), with Noise Element Guidelines which were developed in 1976 by the former Department of Health Services Office of Noise Control pursuant to former Health and Safety Code Section 46050.1. These Guidelines represent "an additional resource that local governments may consult in addition to this chapter to develop noise elements" (OPR, General Plan Guidelines, p. 130, 2020). The local noise element must recognize the land use compatibility guidelines published by the State Department of Health Services. The guidelines rank noise/land use compatibility in terms of normally acceptable, conditionally acceptable, normally unacceptable, and clearly unacceptable. The proposed project is also subject to review under the State of California Environmental Quality Act (CEQA). Appendix G of the CEQA Guidelines includes noise-related questions from which lead agencies frequently derive impact thresholds for potential noise and vibration impacts. The City of Suisun City has developed its own CEQA thresholds, which are listed in the Thresholds of Significance section below.

California Building Standards Code

The State of California has established noise insulation standards for new hotels, motels, apartment houses, and dwellings (other than single-family detached housing). These requirements are provided in the 2016 California Building Standards Code (CBC) (California Code of Regulations [CCR] Title 24).[4] As provided in the CBC, the noise insulation standards set forth an interior standard of 45 dBA CNEL as measured from within the structure's interior. When such structures are located within a 65-dBA CNEL (or greater) exterior noise contour associated with a traffic noise along a roadway, an acoustical analysis is required to ensure that interior levels do not exceed the 45 dBA CNEL threshold. Title 24 standards are typically enforced by local jurisdictions through the building permit application process.

3 California Department of Health Services Office of Noise Control, "Land Use Compatibility for Community Noise Environments Matrix," 1976.

4 California Building Standards Commission. 2017. California Building Standards Code (CCR Title 24), January 1.

Local

City of Suisun City

General Plan

The City of Suisun City establishes noise policies to control noise associated with new development in Chapter 9 of the City's General Plan.[5] The policies that are applicable to this warehouse development project are listed below.

Policy PHS-1.1 Large-scale commercial land uses that could require 50 or more large truck trips per day shall route truck traffic to SR 12 or Arterials and avoid Collectors and Local Streets.

Policy PHS-1.2 New development shall be designed to disperse vehicular traffic onto a network of fully connected smaller roadways.

Policy PHS-1.3 Industrial and other noise-generating land uses should be located away from noise-sensitive land uses or should use noise attenuation methods, such as enclosing substantial noise sources within buildings or structures, using muffling devices, or incorporating other technologies designed to reduce noise levels.

Policy PHS-1.4 The City will use all feasible means to reduce the exposure of sensitive land uses to excessive noise levels and mitigate where noise levels exceed those specified in Table 3.10-6.

Table 3.10-6: Maximum Allowable Noise Exposure from Transportation Noise Sources at Noise-Sensitive Land Uses

Land Use	Outdoor Activity Area (dBA L_{dn})	Interior Spaces	
		dBA L_{dn}	dBA L_{eq}
Residential	60	45	–
Residential (in Downtown Waterfront Specific Plan Area or other Mixed-Use Designations)	70	45	–
Transient Lodging	60	45	–
Hospitals, Nursing Homes	60	45	–
Theaters, Auditoriums, Music Halls	–	–	35
Churches, Meeting Halls	60	–	40
Office Buildings	–	–	45
School, Libraries, Museums	60	–	45
Playgrounds, Neighborhoods	70	–	–
Notes: dBA = A-weighted decibel			

[5] City of Suisun City, 1992. General Plan. Public Health and Safety Element.

Land Use	Outdoor Activity Area (dBA L_{dn})	Interior Spaces	
		dBA L_{dn}	dBA L_{eq}

L_{dn} = day/night average sound level
L_{eq} = equivalent sound level
Noise-sensitive land uses include schools, hospitals, rest homes, long-term care, mental care facilities, residences, and other similar land uses. Outdoor activity areas are considered to be the portion of a noise-sensitive property where outdoor activities would normally be expected (i.e., patios of residences and outdoor instructional areas of schools). Outdoor activity areas for the purposes of this element do not include gathering spaces alongside transportation corridors or associated public right-of-way. Where development projects or roadway improvement projects could potentially create noise impacts, an acoustical analysis shall be required as part of the environmental review process so that noise mitigation may be included in the project design. Such analysis shall be the financial responsibility of the applicant and be prepared by a qualified person experienced in the fields of environmental noise assessment and architectural acoustics. Mitigation strategies shall include site planning and design over other types of mitigation.
Source: City of Suisun City. 1992. General Plan. Public Health and Safety Element, Table 9-1.

Policy PHS-1.6 Lands within the 65 CNEL noise contour of Travis AFB shall be maintained in agricultural, open space, commercial, industrial, or other uses permitted by Travis AFB Land Use Compatibility Plan (LUCP) and consistent with the recommendations of the Travis AFB Protection Element, including noise contours associated with future air base operations, as appropriate.

Policy PHS-1.8 Sound walls are prohibited as a method for reducing noise exposure that could be addressed through other means, such as, site design, setbacks, earthen berms, or a combination of these techniques.

Policy PHS-1.9 New developments shall implement feasible noise mitigation to reduce construction noise and vibration impacts. Projects that incorporate feasible mitigation will not be considered by the City to have significant impacts for the purposes of California Environmental Quality Act review.

Program PHS 1.2 Review and Conditioning of Noise-Generating New Uses. New developments that generate noise will be reviewed and feasible mitigation will be required to reduce effects on existing noise-sensitive land uses. Methods may include, but are not limited to operating at less noise-sensitive parts of the day, better distribution of vehicle traffic to avoid large volumes on any one street, traffic calming, buffering, sound insulation, and other methods deemed effective by the City. The maximum noise level resulting from new sources and ambient noise shall not exceed the standards in Table 3.10-7, as measured at outdoor activity areas of any affected noise-sensitive land use except:

- If the ambient noise level exceeds the standard in Table 3. 10-7, the standard becomes the ambient level plus 5 dBA.
- Reduce the applicable standards in Table 3. 10-7 by 5 decibels if they exceed the ambient level by 10 or more decibels.
- The City shall exempt all school related events and City sponsored events from noise standards outlined in this chapter.

Policy PHS-2.2 New developments that would generate substantial long-term vibration shall provide analysis and mitigation, as feasible, to achieve velocity levels, as experienced at habitable structures of vibration-sensitive land uses, of less than 78 vibration decibels.

Table 3.10-7: Noise Level Performance Standards for Non-Transportation Noise Sources

Cumulative Duration of a Noise Event[1] (Minutes)	Maximum Exterior Noise Level Standards[2]	
	Daytime[3,5]	Nighttime[4,5]
30–60	50	45
15–30	55	50
5–15	60	55
1–5	65	60
0–1	65	65

Notes:
1 Cumulative duration refers to time within any on-our period.
2 Noise level standards measured in dBA.
3 Daytime = Hours between 7:00 a.m. and 10:00 p.m.
4 Nighttime = Hours between 10:00 p.m. and 7:00 a.m.
5 Each of the noise level standard specified may be reduced by 5 dBA for tonal noise (i.e., a signal which has a particular and unusual pitch) or for noises consisting primarily of speech or for recurring impulsive noises (i.e., sounds of short duration, usually less than one second, with an abrupt onset and rapid decay such as the discharge of firearms).
Source: City of Suisun City. 1992. General Plan. Public Health and Safety Element, Table 9-3.

City Code

Suisun City also contains noise performance standards in the Suisun City Code.[6] Code Chapter 15.04.075 establishes limits on hours of construction activities. Anyone engaging in construction or demolition work is responsible to restrict hours of work activity on-site. Construction equipment shall not be operated within 600 feet of an occupied residence except during the hours of 7:00 a.m. and 8:00 p.m., Monday through Friday, and 8:00 a.m. and 8:00 p.m. on Saturday and Sunday. For the purposes of construction machinery for earthwork, trenching, concrete, or paving, the hours of work activity on the site shall be restricted to between the hours of 7:00 a.m. and 6:00 p.m., Monday through Friday, and between the hours of 9:00 a.m. and 5:00 p.m. on Saturday. Work is prohibited on Sundays and holidays, with the exception of the operation of water trucks for the purpose of dust control between the hours of 9:00 a.m. and 6:00 p.m. on Sundays and holidays. These provisions are typical of City and County noise ordinances and reflect the recognition that construction-related noise is temporary in character, is generally acceptable when limited to daylight hours, and is part of what residents of urban areas expect as part of a typical urban noise environment (along with sirens, etc.).

6 Suisun City, 2020. Suisun City Code – 1983. November 17. Website: https://library.municode.com/ca/suisun_city/codes/code_of_ordinances?nodeId=SUISUN_CODE1983. Accessed September 10, 2021.

In addition to these policies, Suisun City has not adopted any noise regulations or standards as part of their Municipal Code.

3.10.4 - Methodology

Construction Noise Analysis Methodology

A worst-case scenario was analyzed assuming each piece of modeled equipment would operate simultaneously at the nearest reasonable locations to the closest noise-sensitive receptor for the loudest phase of construction. Noise emission levels recommended by FHWA's Highway Construction Noise Handbook were used to ascertain the noise generated by specific types of construction equipment. The construction noise impact was evaluated in terms of maximum levels (L_{max}). Analysis requirements were based on the sensitivity of nearby receptors and the Noise Ordinance specifications.

Traffic Noise Modeling Methodology

The FHWA Highway Traffic Noise Prediction Model (FHWA-RD-77-108) was used to evaluate traffic-related noise conditions in the vicinity of the project site. Traffic data used in the model was obtained from the traffic impact analysis prepared for this Draft EIR by W-Trans (Refer to Section 3.12 Transportation). The resultant noise levels were weighted and summed over a 24-hour period in order to determine the L_{dn} values. The FHWA-RD-77-108 Model arrives at a predicted noise level through a series of adjustments to the Reference Energy Mean Emission Level. Adjustments are then made to the Reference Energy Mean Emission Level to account for the roadway active width (i.e., the distance between the center of the outermost travel lanes on each side of the roadway); the total ADT; and the percentage of ADT that flows during the day, evening, and night; the travel speed; the vehicle mix on the roadway; a percentage of the volume of automobiles, medium trucks, and heavy trucks; the roadway grade; the angle of view of the observer exposed to the roadway; and the site conditions ("hard" or "soft") as they relate to the absorption of the ground, pavement, or landscaping.

The level of traffic noise depends on the three primary factors: (1) the volume of the traffic, (2) the speed of the traffic, and (3) the number of trucks in the flow of traffic. Generally, the loudness of traffic noise is increased by heavier traffic volumes, higher speeds, and greater number of trucks. Vehicle noise is a combination of the noise produced by the engine, exhaust, and tires. Because of the logarithmic nature of traffic noise levels, a doubling of the traffic volume (assuming that the speed and truck mix do not change) results in a noise level increase of 3 dBA. Based on the FHWA community noise assessment criteria, this change is considered "barely perceptible."

The model analyzed the noise impacts from the nearby roadways onto the project vicinity, which consists of the area that has the potential of being impacted from the on-site noise sources as well as the project-generated traffic on the nearby roadways**.** The roadways were analyzed based on a single-lane-equivalent noise source combining both directions of travel. A single-lane-equivalent noise source is when the vehicular traffic from all lanes is combined into a theoretical single-lane that has a width equal to the distance between the two outside lanes of a roadway, which provides almost identical results to analyzing each lane separately where elevation changes are minimal. The modeling assumes a direct line of sight to the roadway and flat terrain conditions.

Stationary Noise Source Analysis Methodology

The proposed project would generate noise from parking lot activities, new exterior mechanical equipment sources, such as rooftop ventilation systems on proposed industrial uses, and from truck loading and unloading activities. To provide a conservative analysis, the highest end of the range of reference noise levels for these stationary noise sources was used to calculate the reasonable worst-case hourly average noise levels from each noise source. These hourly averages were then assumed to occur for every hour for a 24-hour period to calculate the reasonable worst-case 24-hour average L_{dn} noise levels as measured at the nearest sensitive receptor land use. These individual source noise levels were then combined to calculate the reasonable worst-case combined stationary source 24-hour L_{dn} noise level as measured at the nearest sensitive receptor land use. These noise levels were then compared to the City's applicable noise performance threshold to determine whether these noise sources would result in a substantial increase in excess of this standard.

Vibration Impact Analysis Methodology

The City does not have adopted criteria for construction groundborne vibration impacts. Therefore, the FTA's vibration impact criteria and modeling and analysis methodology utilized to evaluate potential vibration impacts. The FTA has established industry accepted standards for vibration impact criteria and impact assessment. These guidelines are published in its Transit Noise and Vibration Impact Assessment document,[7] and are summarized in Table 3.10-3 in the regulatory discussion above. However, in Policy PHS-2.2 of the General Plan the City has established an operational groundborne vibration performance threshold of 78 VdB as measured at any habitable structure.

3.10.5 - Thresholds of Significance

Appendix G to the CEQA Guidelines is a sample Initial Study Checklist that includes questions for determining whether noise impacts are significant. These questions were developed by planning and environmental professionals at the OPR and the California Natural Resources Agency, based on input from stakeholder groups and experts in various other governmental agencies, nonprofits, and leading environmental consulting firms. As a result, many lead agencies derive their significance criteria from the questions posed in Appendix G. The City has chosen to do so here. Thus, noise impacts resulting from the implementation of the proposed project would be considered significant if the project would cause:

a) Generation of 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) Generation of a substantial permanent increase in ambient noise levels in noise-sensitive locations in the project vicinity;

c) Generation of excessive groundborne vibration or groundborne noise levels; or

d) 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, the project would expose people residing or working in the project area to excessive noise levels.

[7] Federal Transit Administration (FTA). 2006. Transit Noise and Vibration Impact Assessment. May.

3.10.6 - Project Impacts and Mitigation Measures

This section discusses potential impacts associated with the development of the project and provides mitigation measures where appropriate.

Substantial Noise Increase in Excess of Standards

Impact NOI-1:	**The proposed project could 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.**

Impact Analysis

Construction

Construction activities associated with implementation of the project could result in a temporary increase in ambient noise levels in the project vicinity. Noise impacts from construction activities associated with the proposed project would be a function of the noise generated by construction equipment, equipment location, sensitivity of nearby land uses, and timing and duration of the construction activities. A significant impact would occur if the project exposed people to temporary or periodic noise levels that exceed noise levels permitted under the General Plan or Noise Ordinance. General construction activity is restricted to the hours of 7:00 a.m. and 8:00 p.m., Monday through Friday, and 8:00 a.m. and 8:00 p.m. on Saturday and Sunday. Construction activity for earthwork, trenching, concrete, or paving, the hours of work activity on the site shall be restricted to between the hours of 7:00 a.m. and 6:00 p.m., Monday through Friday, and between the hours of 9:00 a.m. and 5:00 p.m. on Saturday. Work is prohibited on Sundays and holidays, with the exception of the operation of water trucks for the purpose of dust control between the hours of 9:00 a.m. and 6:00 p.m. on Sundays and holidays. These provisions are typical of City and County noise ordinances and reflect the recognition that construction-related noise is temporary in character, is generally acceptable when limited to daylight hours, and is part of what residents of urban areas expect as part of a typical urban noise environment (along with sirens, etc.).

Construction-related Traffic Noise

Noise impacts from construction activities associated with the project would be a function of the noise generated by construction equipment, equipment location, sensitivity of nearby land uses, and the timing and duration of the construction activities. One type of short-term noise impact that could occur during project construction would result from the increase in traffic flow on local streets, associated with the transport of workers, equipment, and materials to and from the project site. The transport of workers and construction equipment and materials to the project site would incrementally increase noise levels on access roads leading to the site. Because workers and construction equipment would use existing routes, noise from passing trucks would be similar to existing vehicle-generated noise on these local roadways. Typically, a doubling of the ADT hourly volumes on a roadway segment is required in order to result in an increase of 3 dBA in traffic noise levels; which, as discussed in the characteristics of nose discussion above, is the lowest change that can be perceptible to the human ear in outdoor environments. Based on the air quality modeling assumptions, project-related construction trips would generate up to 335 average daily trips during the phase of construction with the highest trip generation, which would not double the daily traffic volumes (shown in Table 3.10-4) along any roadway segment in the project vicinity. For this reason, short-term intermittent noise from construction trips would not be expected to result in a perceptible increase in hourly- or daily-average traffic noise levels in the project vicinity. Therefore, short-term construction-related noise impacts associated with the transportation of workers and equipment to the project site would be less than significant.

Construction Equipment Operational Noise

The second type of short-term noise impact is related to noise generated during construction on the project site. Construction is completed in discrete steps, each of which has its own mix of equipment and, consequently, its own noise characteristics. These various sequential phases would change the character of the noise generated on the site and, therefore, the noise levels surrounding the site as construction progresses. Despite the variety in the type and size of construction equipment, similarities in the dominant noise sources and patterns of operation allow construction-related noise ranges to be categorized by work phase. Table 3.10-2 lists typical construction equipment noise levels, based on a distance of 50 feet between the equipment and a noise receptor. Typical operating cycles for these types of construction equipment may involve 1 or 2 minutes of full-power operation followed by 3 or 4 minutes at lower power settings. Impact equipment such as pile drivers are not expected to be used during construction of this project.

The site preparation phase, which includes excavation and grading of the site, tends to generate the highest noise levels because the noisiest construction equipment is earthmoving equipment. Earthmoving equipment includes excavating machinery and compacting equipment, such as bulldozers, draglines, backhoes, front loaders, roller compactors, scrapers, and graders. Typical operating cycles for these types of construction equipment may involve 1 or 2 minutes of full-power operation followed by 3 or 4 minutes at lower power settings.

Construction of the project is expected to require the use of scrapers, bulldozers, water trucks, haul trucks, and pickup trucks. Based on the information provided in Table 3.10-2, the maximum noise level generated by each scraper is assumed to be 85 dBA L_{max} at 50 feet from this equipment. Each bulldozer would also generate 85 dBA L_{max} at 50 feet. The maximum noise level generated by graders is approximately 85 dBA L_{max} at 50 feet. A characteristic of sound is that each doubling of sound sources with equal strength increases a sound level by 3 dBA. Assuming that each piece of construction equipment operates at some distance from the other equipment, a reasonable worst-case combined noise level during this phase of construction would be 90 dBA L_{max} at a distance of 50 feet from the acoustic center of a construction area. This would result in a reasonable worst-case hourly average of 86 dBA L_{eq}. The acoustic center reference is used because construction equipment must operate at some distance from one another on a project site, and the combined noise level as measured at a point equidistant from the sources (acoustic center) would be the worst-case maximum noise level. The effect on sensitive receptors is evaluated below.

The closest off-site noise-sensitive land use are single-family residences southwest of the project site, located approximately 200 feet from the nearest construction area. At this distance, unmitigated noise levels from project-related construction activities would attenuate to 70 dBA L_{eq} with maximum noise levels of 77 dBA L_{max}. This is above the acceptable 65 dBA noise conditions for residential land uses, and construction will be occurring closer than the allowed 600 feet from a residence. Therefore, compliance with the City's permissible hours of noise-producing construction activities, as well as compliance with standard construction noise reduction measures, would ensure that construction noise impacts would not result in a substantial temporary increase at the nearest off-site sensitive receptors above standards established in the General Plan or Municipal Code.

Therefore, with the implementation of multi-part Mitigation Measure NOI-1, construction noise impacts would be reduced to a level of less than significant.

Operation

Implementation of the project would result in mobile and stationary operational noise sources. Potential noise impacts with these project-related sources are analyzed below.

Mobile Source Operational Noise Impacts

Significant noise impacts to off-site receptors would occur if the project would result in a substantial increase in ambient noise levels, compared with noise levels existing without the project. A change of 3 dB is the lowest change that can be perceptible to the human ear in outdoor environments. Therefore, for purposes of this analysis, an increase of 3 dBA or greater in ambient noise levels is considered a substantial increase.

The FHWA Highway Traffic Noise Prediction Model (FHWA-RD-77-108) was used to evaluate traffic-related noise conditions in the vicinity of the project site. Traffic data used in the model was obtained from the traffic impact analysis prepared by W-Trans for the proposed project. The model inputs and outputs—including the 60 dBA, 65 dBA, and 70 dBA L_{dn} noise contour distances–without and with the project are provided in Appendix K of this document and are summarized in Table 3.10-8 and

Table 3.10-9 below. The modeling assumptions assume a direct line of sight, with no reductions assumed for fencing or structural screening.

The greatest increases in traffic noise levels with implementation of the project would occur along Walters Road from Pintail Drive to Montebello Drive. This roadway segment would experience an increase of 0.4 dBA under conditions with the project compared to conditions without the project.

This increase is considered to be less than perceptible increases to the human ear in outdoor environments (less than a 3 dBA increase), and therefore would not be considered a substantial increase in ambient noise levels. Therefore, project-related traffic noise impacts to off-site receptors would be less than significant.

Table 3.10-8: Near-Term Scenario Modeled Roadway Noise Levels

Roadway	From	To	L_{dn} (dBA) 50 feet from Centerline of Outermost Lane		
			Near-Term	Near-Term with Project	Net Increase (dBA)
Walters Road	Bella Vista Drive	Pintail Drive	64.5	64.7	0.2
Walters Road	Pintail Drive	Montebello Drive	64.3	64.7	0.4

Roadway	From	To	L_{dn} (dBA) 50 feet from Centerline of Outermost Lane		
			Near-Term	Near-Term with Project	Net Increase (dBA)
Walters Road	Montebello Drive	Petersen Road	64.7	65.0	0.3
SR-12	Sunset Avenue	Emperor Drive	68.0	68.1	0.1
SR-12	Emperor Drive	Walters Road	66.9	67.1	0.2

Notes:
dBA = A-weighted decibel
L_{dn} = day/night average sound level
Source: FirstCarbon Solutions (FCS) 2021.

Table 3.10-9: Cumulative Modeled Roadway Noise Levels

Roadway	From	To	L_{dn} (dBA) 50 feet from Centerline of Outermost Lane		
			Cumulative	Cumulative with Project	Net Increase (dBA)
Walters Road	Bella Vista Drive	Pintail Drive	65.9	66.1	0.2
Walters Road	Pintail Drive	Montebello Drive	65.4	65.8	0.4
Walters Road	Montebello Drive	Petersen Road	65.8	66.1	0.3
SR-12	Sunset Avenue	Emperor Drive	68.7	68.8	0.1
SR-12	Emperor Drive	Walters Road	65.9	68.3	0.1

Notes:
dBA = A-weighted decibel
L_{dn} = day/night average sound level
Source: FirstCarbon Solutions (FCS). 2021.

Stationary Source Operational Noise Impacts

A significant impact would occur if operational noise levels generated by stationary noise sources at the proposed project site would result in a substantial permanent increase in ambient noise levels in excess of the City's noise performance standards. The City's maximum exterior noise level standards for stationary noise sources are outlined in Table 3.10-7. The most restrictive of these standards are 50 dBA and 45 dBA hourly L_{eq} for daytime and nighttime respectively, as measured at outdoor active use areas of the residential land uses.

The proposed project would generate noise from parking lot activities, new exterior mechanical equipment sources, such as rooftop ventilation systems on proposed industrial uses, and from truck loading and unloading activities. Potential impacts from these noise sources are discussed below.

Truck Unloading

The highest stationary source noise levels associated with the proposed project would be generated by truck loading/unloading activities at the loading areas of the proposed warehouse facility. The primary noise sources associated with loading dock areas would be the heavy trucks stopping (air brakes), backing into the loading docks (backup alarms), trailer coupling and decoupling, pulling out of the loading docks (engines accelerating) and potential refrigeration unit operation. Heavy-truck trailer unloading will occur directly from the inside of the trailer while docked in the recessed bays.

Typical noise levels from larger delivery truck loading and unloading activities are documented to range up to 75 dBA to 85 dBA L_{max} as measured at 50 feet. The typical truck unloading process takes an average of 15 to 20 minutes. A typical busy nighttime hour of loading dock activities yielded average noise levels 5 dB lower than those measured during daytime hours. The proposed loading dock configurations of the nearest buildings would locate the effective noise center of the loading docks approximately 630 feet from the nearest residences located to the northwest of the project site, and approximately 875 feet from the nearest residences located to the southwest of the project site. Assuming that the loudest loading/unloading activities were simultaneously occurring at multiple loading bays closest to these off-site receptors, the noise levels for these worst-case loading dock activities would attenuate to below 38 dBA L_{eq} at the nearest residences. The calculation sheets detailing input assumptions are included in Appendix K.

Therefore, these stationary operational noise levels would be below the City's most restrictive daytime and nighttime hourly noise level standards of 50 dBA L_{eq} and 45 dBA L_{eq}, respectively, for new operational noise (see Table 3.10-7). As a result, this impact is considered less than significant.

Mechanical Equipment Noise

The heating, ventilation, and air conditioning (HVAC) systems for the warehouse uses will likely consist of packaged rooftop air conditioning systems. Such units are typically evenly distributed across the roof of the buildings. Packaged rooftop HVAC units typically stand about 4–5 feet tall. Noise levels from typical rooftop mechanical ventilation equipment range up to approximately 60 dBA L_{eq} at a distance of 25 feet. The closest noise-sensitive land use to potential rooftop mechanical ventilation systems would be the residences located to the southwest of the proposed project. Rooftop mechanical ventilation systems could be located as close as 510 feet from the nearest residential property line northwest of the project site, and approximately 285 feet from the nearest residential property line southwest of the project site. At this distance, noise from rooftop mechanical ventilation equipment operation would attenuate to approximately 37 dBA L_{eq}. at the nearest residential property line. The calculation sheets detailing input assumptions are included in Appendix K.

Therefore, these stationary operational noise levels would be below the City's most restrictive daytime and nighttime hourly noise level standards of 50 dBA L_{eq} and 45 dBA L_{eq}, respectively, for new operational noise. As a result, this impact is considered less than significant.

Parking Lot Activity Noise

According to the project site plans, parking spaces are proposed as close as 435 feet from the nearest residential property line northwest of the project site, and approximately 260 feet from the nearest residential property line southwest of the project site. The existing 6-foot high soundwalls along the residential property lines would provide a minimum of 5 dBA of shielding from ground level parking activity noise levels. Representative parking activities, such as vehicles cruising at slow speeds, door slamming, cars starting, would generate approximately 60 dBA to 70 dBA L_{max} at 50 feet. Typical parking events take an average of less than one minute. Assuming each of the parking spaces within approximately 500 feet of the nearest residential property would incur one parking event in a maximum use hour, the combined parking lot activity would generate an hourly average noise levels of up to 39 dBA L_{eq} at the nearest residential property line. The calculation sheets detailing input assumptions are included in Appendix K.

Therefore, these stationary operational noise levels would be below the City's most restrictive daytime and nighttime hourly noise level standards of 50 dBA L_{eq} and 45 dBA L_{eq}, respectively, for new operational noise. As a result, this impact would be less than significant.

Level of Significance Before Mitigation

Potentially Significant Impact

Based on the above analysis, impacts from noise generated from stationary operational noise sources would be less than significant. However, project construction activity noise impacts, which could result in a temporary increase in ambient noise levels in the project vicinity that could result in annoyance or sleep disturbance of nearby sensitive receptors, would be reduced to less than significant levels with implementation of the following multi-part mitigation measure.

Mitigation Measures

MM NOI-1 Implementation of the following multi-part mitigation measure is required to reduce potential construction-period noise impacts:

- The construction contractor shall ensure that all equipment driven by internal combustion engines shall be equipped with mufflers, which are in good condition and appropriate for the equipment.
- The construction contractor shall ensure that unnecessary idling of internal combustion engines (i.e., idling in excess of 5 minutes) is prohibited.
- The construction contractor shall utilize "quiet" models of air compressors and other stationary noise sources where technology exists.
- At all times during project grading and construction, the construction contractor shall ensure that stationary noise-generating equipment shall be located as far as practicable from sensitive receptors and placed so that emitted noise is directed away from adjacent residences.
- The construction contractor shall ensure that the construction staging areas shall be located to create the greatest feasible distance between the staging area and noise-sensitive receptors nearest the project site.
- The construction contractor shall ensure that general construction activity, including loading and unloading and warm up of equipment, shall be restricted to the hours of 7:00 a.m. and 8:00 p.m., Monday through Friday, and 8:00 a.m. and 8:00 p.m. on Saturday and Sunday. Construction activity for earthwork, trenching, concrete, or paving, the hours of work activity on the site shall be restricted to between the hours of 7:00 a.m. and 6:00 p.m., Monday through Friday, and between the hours of 9:00 a.m. and 5:00 p.m. on Saturday.

Level of Significance After Mitigation

Less than significant.

Substantial Permanent Noise Increase

Impact NOI-2: The proposed project would not generate a substantial permanent increase in ambient noise levels in noise-sensitive locations in the project vicinity.

Impact Analysis

Construction

As identified under Impact NOI-1 discussion above, the closest off-site noise-sensitive land use are single-family residences southwest of the project site, adjacent to SR-12. At this distance, unmitigated reasonable worst-case noise levels from the loudest phase of project-related construction activities would attenuate to 70 dBA L_{eq} with maximum noise levels of 77 dBA L_{max}. However, these noise impacts would only be temporary; these reasonable worst-case construction noise levels would only occur when site preparation construction activity occurs close to the project boundary nearest these off-site sensitive receptors. Subsequent phases of construction would result in substantially lower noise levels, since the loudest pieces of construction equipment are the heavy equipment used for site preparation. In addition, all construction noise would cease once construction is complete and would not remain as a permanent noise source in the project vicinity. Therefore, because construction is a temporary activity, related noise impacts would not result in a substantial permanent increase in ambient noise levels as measured at the nearest off-site sensitive receptors.

Operation

A change of 3 dB is the lowest change that can be perceptible to the human ear in outdoor environments. Therefore, for the purposes of this analysis, a permanent increase of 3 dBA or greater in ambient noise levels is considered a substantial permanent increase.

Implementation of the proposed project would result in mobile and stationary operational noise sources. Potential noise impacts with these project-related sources are analyzed below.

Mobile Source Operational Noise

As noted above, the closest off-site noise-sensitive land use are single-family residences southwest of the project site, adjacent to SR-12. Existing traffic noise levels along SR-12 adjacent to these nearest off-site noise-sensitive receptors are shown in Table 3.10-4 to range up to 66.4 dBA L_{dn} as measured at 50 feet from the centerline of the outermost travel lane.

The loudest project-related traffic noise levels would occur under cumulative plus project conditions. As shown in Table 3.10-9, traffic noise levels on SR-12 adjacent to these nearest off-site noise-sensitive receptors would range up to 68.3 dBA L_{dn} as measured at 50 feet from the centerline of the outermost travel lane. This would constitute a 1.9 dBA increase in traffic noise levels compared to existing conditions on this roadway segment adjacent to the nearest noise-sensitive receptors. This is below the 3 dBA increase that would be considered significant. Therefore, project-related traffic noise increases would be a less than significant permanent increase.

Stationary Source Operational Noise Impacts

As noted above, the closest off-site noise-sensitive land use are single-family residences southwest of the project site, adjacent to SR-12. The existing ambient noise levels near these residences is documented by the modeled existing traffic noise levels along SR-12 adjacent to these nearest off-site noise-sensitive receptors. Existing traffic noise levels are shown in Table 3.10-4 to range up to 66.4 dBA L_{dn} as measured at 50 feet from the centerline of the outermost travel lane.

As identified under Impact NOI-1 discussion above the calculated reasonable worst-case loading dock activity noise levels would attenuate to below 38 dBA L_{eq} at the nearest residences; calculated noise from rooftop mechanical ventilation equipment operation would attenuate to approximately 37 dBA L_{eq} at the nearest residential property line; and combined parking lot activity would generate an hourly average noise levels of up to 39 dBA L_{eq} at the nearest residential property line. These combined reasonable worst-case operational noise levels would range up to 42.8 dBA L_{eq} at the nearest residential property line. These noise levels are well below the documented existing traffic noise levels and would not result in any increase in ambient noise levels as measured at the nearest noise-sensitive receptors. Therefore, project-related stationary source operational noise increases would be a less than significant permanent increase.

Level of Significance Before Mitigation

Less than significant impact.

Mitigation Measures

No mitigation necessary.

Level of Significance After Mitigation

Less than significant impact.

Groundborne Vibration/Noise Levels

Impact NOI-3:	**The proposed project would not result in generation of excessive groundborne vibration or groundborne noise levels.**

Impact Analysis

This section analyzes both construction and operational groundborne vibration and noise impacts. Groundborne vibrations consist of rapidly fluctuating motions within the ground that have an average motion of zero. Vibrating objects in contact with the ground radiate vibration waves through various soil and rock strata to the foundations of nearby buildings. Groundborne noise is generated when vibrating building components radiate sound, or noise generated by groundborne vibration. In general, if groundborne vibration levels do not exceed levels considered to be perceptible, then groundborne noise levels would not be perceptible in most interior environments. Therefore, this analysis focuses on determining exceedances of groundborne vibration levels.

Suisun City has not established quantitative groundborne vibration thresholds for construction. Therefore, for the purposes of this analysis, the FTA's vibration impact criteria are utilized to analyze vibration impacts. The FTA has established industry accepted standards for vibration impact criteria and impact assessment. These guidelines are published in its Transit Noise and Vibration Impact

Assessment Manual.[8] The construction vibration impact criteria are summarized in Table 3.10-5.

The City's has established an operational groundborne vibration performance threshold of 78 VdB as measured at any habitable structure.

Construction

A significant impact would occur if implementation of the project resulted in groundborne vibration levels in excess of established standards or that would expose existing structures to vibration levels in excess of established vibration damage criteria. The FTA has established industry accepted standards for vibration impact criteria and impact assessment. These guidelines are published in its Transit Noise and Vibration Impact Assessment document.[9] The FTA guidelines include thresholds for construction vibration impacts for various structural categories.

Project construction can generate varying degrees of groundborne vibration, depending on the construction procedure and the construction equipment used. Operation of construction equipment generates vibrations that spread through the ground and diminish in amplitude with distance from the source. The effect on buildings located in the vicinity of the construction site often varies depending on soil type, ground strata, and construction characteristics of the receiver building(s). In extreme cases, excessive groundborne vibration has the potential to cause structural damage to buildings.

Of the variety of equipment used during construction, the vibratory rollers that are anticipated to be used in the site preparation phase of construction would produce the greatest groundborne vibration levels. Impact equipment such as pile drivers is not expected to be used during construction of this project. Vibratory rollers produce groundborne vibration levels ranging up to 0.210 inch per second (in/sec) PPV at 25 feet from the operating equipment.

Based on the proposed site plan, the nearest off-site structure to the proposed construction areas where heavy construction equipment would operate would be the self-storage office building and storage structures located north of the project site on Petersen Road, approximately 110 feet from the nearest construction footprint where heavy equipment would operate. At this distance, groundborne vibration levels could range up to 0.02 PPV from operation of a large vibratory roller. This is well below the industry standard vibration damage criteria of 0.2 PPV for structures of nonengineered timber from which these buildings are constructed. Therefore, construction-related groundborne vibration impacts would be considered less than significant.

Operational

Upon completion of construction, the project would not include any permanent stationary sources of groundborne vibrations. Mobile sources would include loaded truck movements on access roadways to the project site. According to the FTA's Transit Noise and Vibration Impact Assessment document, heavy trucks traveling on paved roadways can generate vibration levels up to 65 VdB at 50 feet. All off-site sensitive structures are located a minimum of 50 feet from proposed project access roadways. Therefore, vibration levels from project truck passings would be below the City's established operational threshold for vibration impacts of 78 VdB. As such, implementation of the proposed project would not expose persons within the project vicinity to excessive groundborne

[8] Federal Transit Administration (FTA). 2018. Transit Noise and Vibration Impact Assessment Manual. September.
[9] Federal Highway Administration (FHWA). 2006. Highway Construction Noise Handbook. August.

vibration levels. Therefore, project-related groundborne vibration impacts would be considered less than significant.

Level of Significance Before Mitigation

Less than significant impact.

Mitigation Measures

No mitigation necessary.

Level of Significance After Mitigation

Less than significant impact.

Excessive Noise Levels from Airport Activity

Impact NOI-4:	**The proposed project would not expose people residing or working in the project area to excessive noise levels 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.**

Impact Analysis

The project site is located within the airport planning boundary of Travis Air Force Base. The site is located under the flight path of Runway 3L/21R. The southwestern portion of the project site lies within the airport's 65-70 dBA CNEL noise contour, while the rest of the project site lies within the 60-65 dBA CNEL noise contour.

In compliance with Caltrans' Airport Land Use Planning Handbook guidelines, the Solano County ALUC has adopted a Land Use Compatibility Plan (LUCP) for the Travis Air Force Base. Table 2A of the Travis Air Force Base LUCP identifies acceptable aviation noise levels by land use. For service commercial, warehouse, and light industrial uses, aviation noise levels up to 65 dBA CNEL are listed as "clearly acceptable," up to 70 dBA CNEL as "normally acceptable" and above 70 dBA CNEL as "marginally acceptable." The proposed project's uses would be consistent with the noise standards of the Airport LUCP, and, therefore, the proposed project would not expose individuals working or residing in the project vicinity to excessive aviation noise. As a result, this impact would be less than significant.

Level of Significance Before Mitigation

Less than significant impact.

Mitigation Measures

No mitigation is necessary.

Level of Significance After Mitigation

Less than significant impact.

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