Acoustical Assessment
Vallejo Ferry Terminal Reconfiguration Project
City of Vallejo, California

Prepared by:

Kimley»Horn
Expect More. Experience Better.

Kimley-Horn and Associates, Inc.
660 South Figueroa Street, Suite 2050
Los Angeles, CA 90017
Contact: Noemi Wyss

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LIST OF ABBREVIATED TERMS

APN	Assessor's Parcel Number
ADT	average daily traffic
ASTM	American Society for Testing and Materials
dBA	A-weighted sound level
CEQA	California Environmental Quality Act
CSMA	California Subdivision Map Act
CNEL	community equivalent noise level
L_{dn}	day-night noise level
dB	decibel
du/ac	dwelling units per acre
L_{eq}	equivalent noise level
FHWA	Federal Highway Administration
FTA	Federal Transit Administration
HVAC	heating ventilation and air conditioning
Hz	hertz
in/sec	inches per second
LUD	Land Use Designation
L_{max}	maximum noise level
µPa	micropascals
L_{min}	minimum noise level
PPV	peak particle velocity
RMS	root mean square
STC	Sound Transmission Class
sf	square feet
TNM	Traffic Noise Model
VdB	vibration velocity level

1 INTRODUCTION

This report documents the results of an Acoustical Assessment completed for the Vallejo Ferry Terminal Reconfiguration Project ("Project" or "proposed Project"). The purpose of this Acoustical Assessment is to evaluate the Project's potential construction and operational noise and vibration levels associated with the Project and determine the level of impact the Project would have on the environment.

1.1 PROJECT LOCATION

The Project site is located at 289 Mare Island Way in the City of Vallejo (City), Solano County, California. The Project includes the existing Vallejo Ferry Terminal, which consists of a steel float structure, aluminum gangway, and covering. The Project site is accessible by vehicle via Mare Island Way, and by ferry. See Figure 1: Regional Location and Figure 2: Vicinity Map.

Additional uses in this area along the Mare Island Strait include the Vallejo Tourism Information Center and commercial retail uses to the east and northeast, Independence Park to the southeast, Barbara Kondylis Waterfront Green to the northwest, a currently vacant office building to the south, and parking areas surrounding the site. Parking is currently provided to the east within waterfront parking lots on the eastern side of Mare Island Way, across the street from terminal site. The existing parking lots and garage areas adjacent to the proposed Project site accommodate Vallejo Ferry Terminal and Transit Center passengers and employees, guests and employees of the Tourism Information Center building and surrounding restaurants, and public users..

1.2 PROJECT DESCRIPTION

The proposed Project would be located on the eastern shore of the Mare Strait, within the footprint of the existing ferry terminal and basin area. The proposed terminal would remove and replace 5,322 square feet (sf) of existing gangway, passenger float, and piles with a new reconfigured gangway, passenger float, and piles. The new Water Emergency Transportation Authority (WETA) Standard float would be approximately 134.5 feet by 42 feet and would accommodate both sides of the float for passenger loading and unloading. No new structures are proposed. Passenger waiting areas would be located along a portion of the San Francisco Bay Trail in a designated outdoor queuing area adjacent to the proposed gangway entry gate. Figure 3: Project Site Plan -- Preferred Project, Figure 4: Project Site Plan -- Configuration Option 1, and Figure 5: Project Site Plan -- Configuration Option 2 depict the overall site plan of each alternative for the proposed Project.

The Project site is zoned as Waterfront Mixed-Use and is located in an urban area with a mix of uses including recreational, commercial, office, and medium to high density residential uses. The surrounding project site is designated under the Parks, Recreation, and Open Space land use, and is zoned Waterfront Mixed-Use.

Construction is anticipated to begin in Summer 2025 with an anticipated completion date of late Winter 2025. Construction methods would include demolition of the existing piles, gangway, and float, site preparation, ground improvements, utility installation or reconfiguration, Bay fill removal (existing piles), and placement for installation of pilings for the new float and donut fenders, and fixed pier support.

The proposed Project would not result in any changes to the existing operational uses of the Project site. The proposed Project would result in the reconfiguration of the existing ferry terminal. Therefore, the proposed facilities would have the same uses that are currently used for standard WETA ferry operations that transport passengers to San Francisco Bay ferry terminals.

Source: ESRI, 2023

Figure 1: Regional Map

WETA Vallejo Ferry Terminal Reconfiguration Project

Not to scale

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Source: Nearmap, 2023

Figure 2: Vicinity Map

WETA Vallejo Ferry Terminal Reconfiguration Project

N Not to scale

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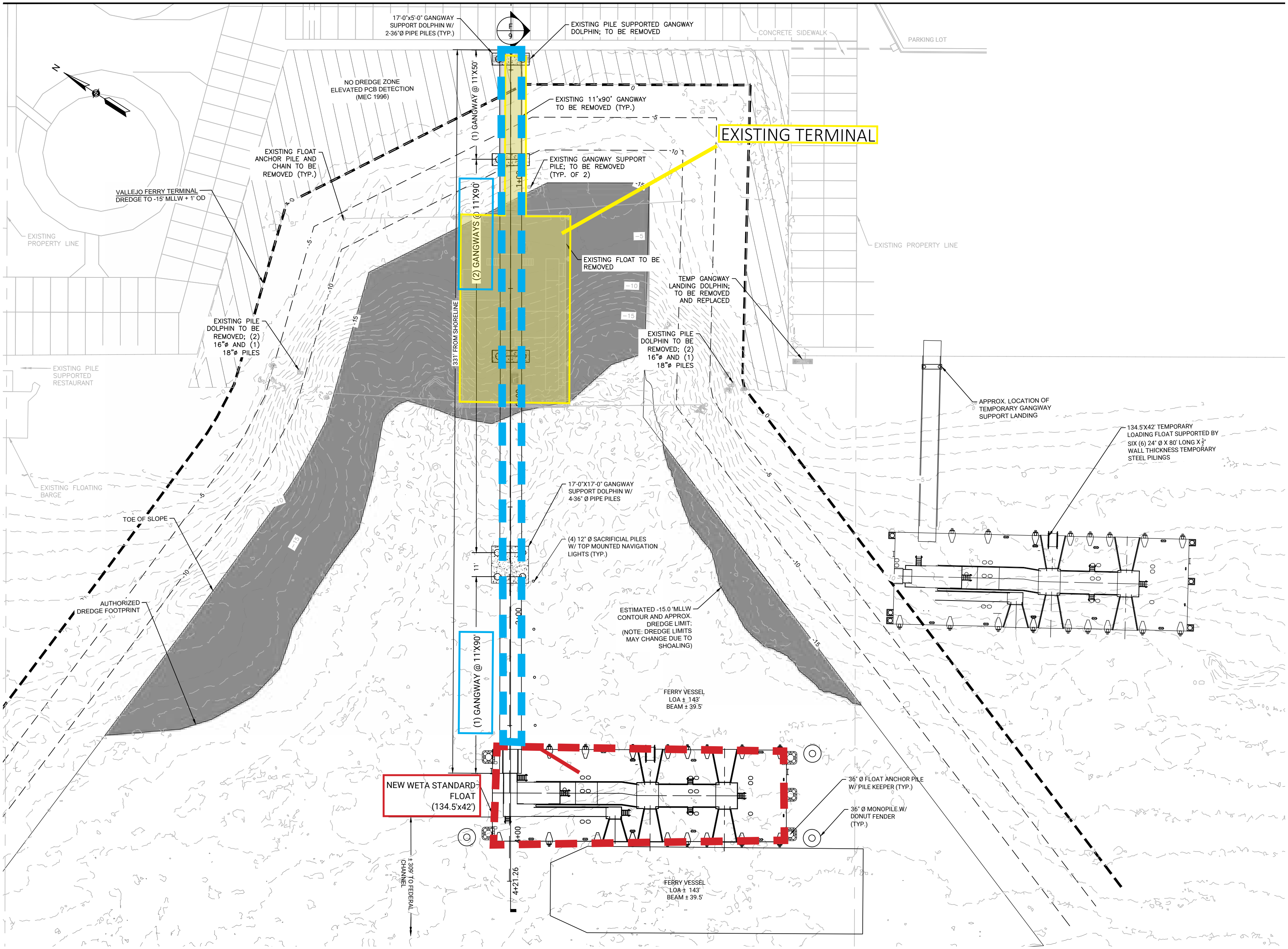

Source: Foth, 2023

Figure 3: Project Site Plan -- Preferred Project

WETA Vallejo Ferry Terminal Reconfiguration Project

Not to scale

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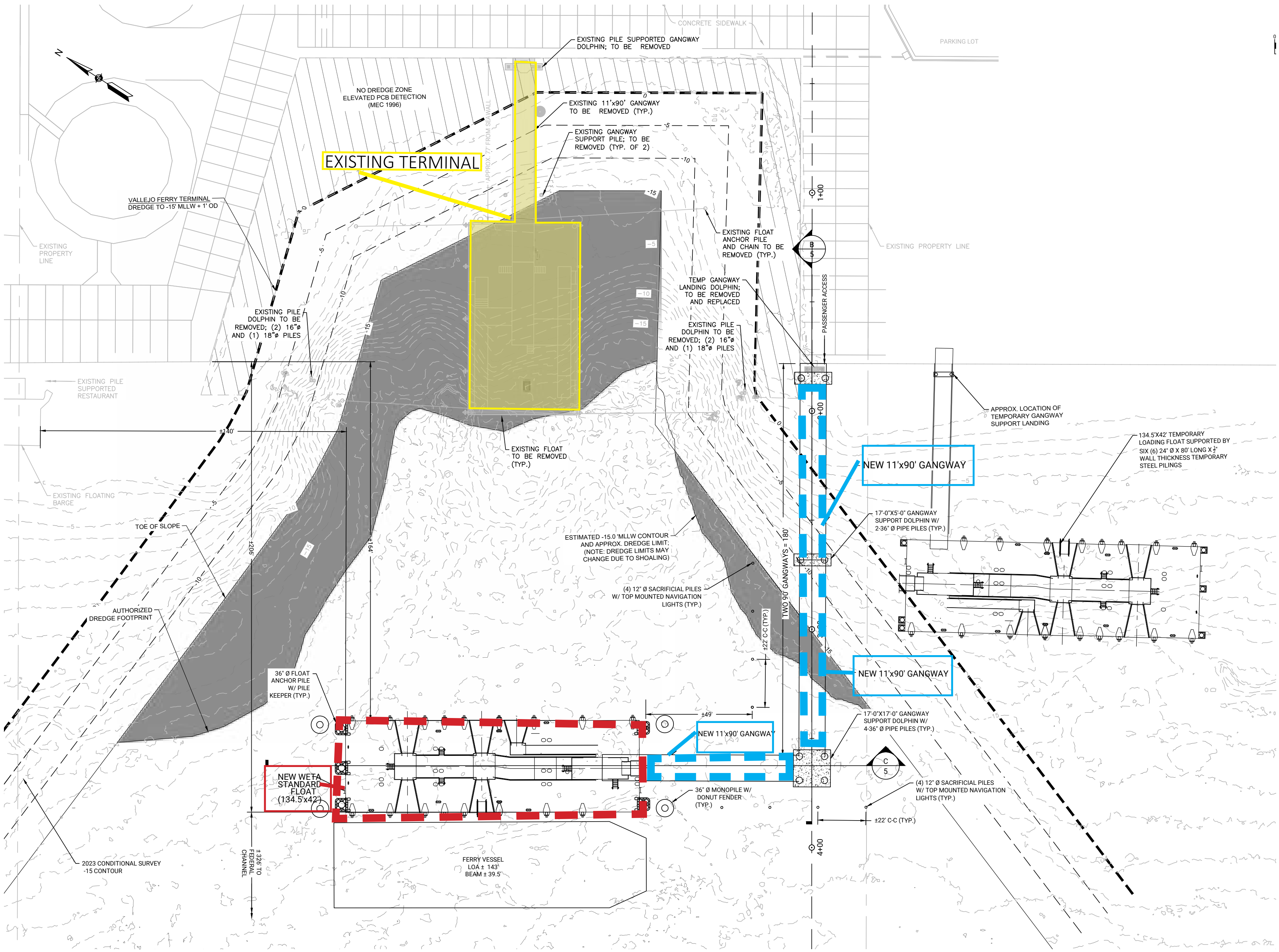
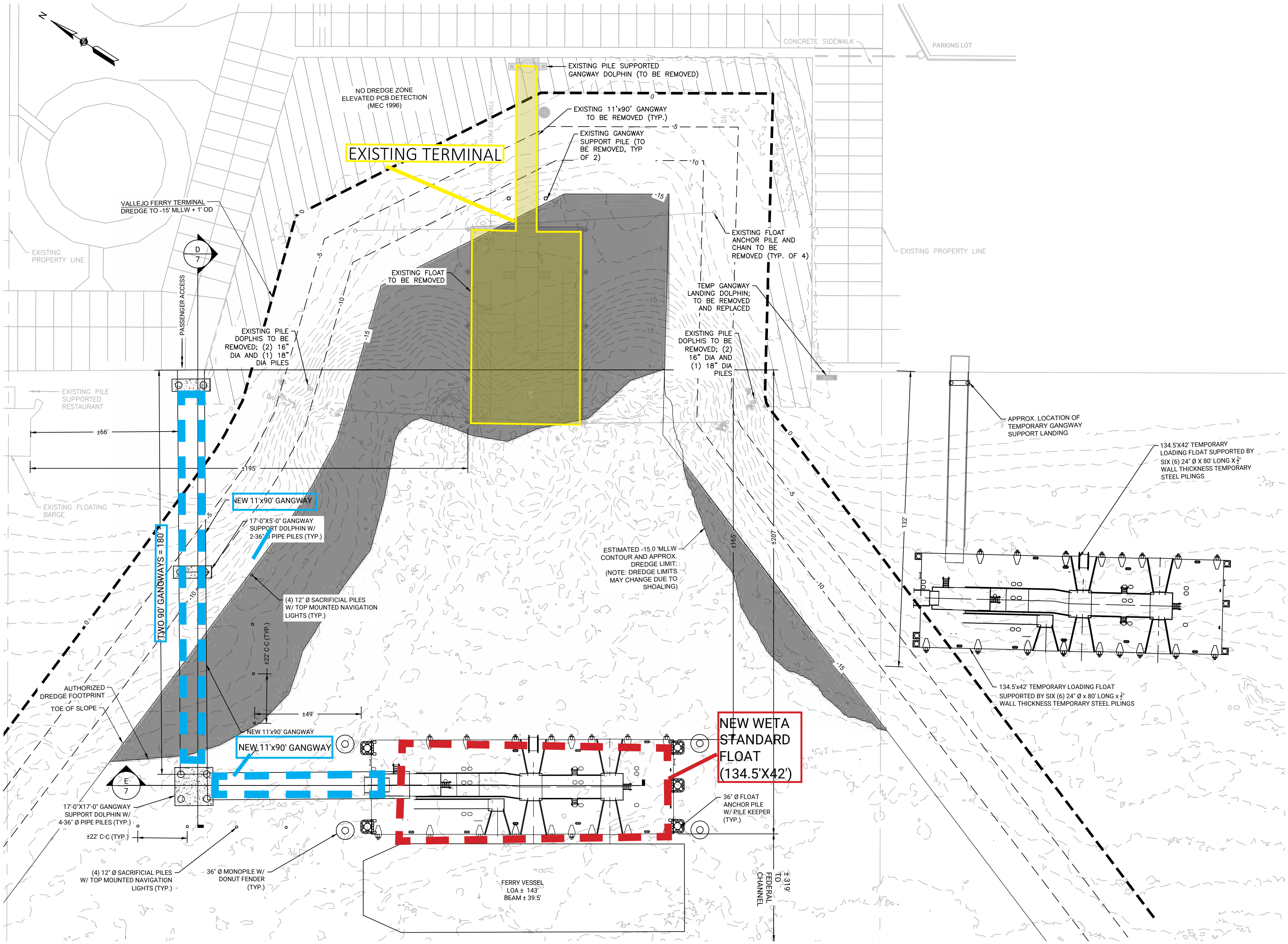


Source: Foth, 2023

Figure 4: Project Site Plan -- Configuration Option 1

WETA Vallejo Ferry Terminal Reconfiguration Project

Not to scale



Source: Foth, 2023

Figure 5: Project Site Plan -- Configuration Option 2

WETA Vallejo Ferry Terminal Reconfiguration Project

Not to scale

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2 ACOUSTIC FUNDAMENTALS

2.1 SOUND AND ENVIRONMENTAL NOISE

Acoustics is the science of sound. Sound can be described as the mechanical energy of a vibrating object transmitted by pressure waves through a medium (e.g. air) to human (or animal) ear. If the pressure variations occur frequently enough (at least 20 times per second), they can be heard and are called sound. The number of pressure variations per second is called the frequency of sound and is expressed as cycles per second, or hertz (Hz).

Noise is defined as loud, unexpected, or annoying sound. The fundamental acoustics model consists of a noise source, receptor, and the propagation path between the two. The loudness of the noise source, obstructions, or atmospheric factors affecting the propagation path, determine the perceived sound level and noise characteristics at the receptor. Acoustics deal primarily with the propagation and control of sound. A typical noise environment consists of ambient noise that is the sum of many distant and indistinguishable noise sources. Superimposed on this ambient noise is the sound from individual local sources. These sources can vary from an occasional aircraft or train passing by to continuous noise from traffic on a major highway. Perceptions of sound and noise are highly subjective from person to person.

Measuring sound directly in terms of pressure would require a large range of numbers. To avoid this, the decibel (dB) scale was devised. The dB scale uses the hearing threshold of 20 micropascals (μPa) as a point of reference, defined as 0 dB. Other sound pressures are then compared to this reference pressure, and the logarithm is taken to keep the numbers in a practical range. The dB scale allows a million-fold increase in pressure to be expressed as 120 dB, and changes in levels correspond closely to human perception of relative loudness. Table 1: Typical Noise Levels provides typical noise levels.

Table 1: Typical Noise Levels

Common Outdoor Activities	Noise Level (dBA)	Common Indoor Activities
	– 110 –	Rock Band
Jet fly-over at 1,000 feet		
	– 100 –	
Gas lawnmower at 3 feet		
	– 90 –	
Diesel truck at 50 feet at 50 miles per hour		Food blender at 3 feet
	– 80 –	Garbage disposal at 3 feet
Noisy urban area, daytime		
Gas lawnmower, 100 feet	– 70 –	Vacuum cleaner at 10 feet
Commercial area		Normal Speech at 3 feet
Heavy traffic at 300 feet	– 60 –	
		Large business office
Quiet urban daytime	– 50 –	Dishwasher in next room
Quiet urban nighttime	– 40 –	Theater, large conference room (background)
Quiet suburban nighttime		
	– 30 –	Library
Quiet rural nighttime		Bedroom at night, concert hall (background)
	– 20 –	
		Broadcast/recording studio
	– 10 –	
Lowest threshold of human hearing	– 0 –	Lowest threshold of human hearing

Source: California Department of Transportation, *Technical Noise Supplement to the Traffic Noise Analysis Protocol*, September 2013.

Noise Descriptors

The dB scale alone does not adequately characterize how humans perceive noise. The dominant frequencies of a sound have a substantial effect on the human response to that sound. Several rating scales have been developed to analyze the adverse effect of community noise on people. Because environmental noise fluctuates over time, these scales consider that the effect of noise on people is largely dependent on the total acoustical energy content of the noise, as well as the time of day when the noise occurs. The equivalent noise level (L_{eq}) is the average noise level averaged over the measurement period, while the day-night noise level (L_{dn}) and Community Equivalent Noise Level (CNEL) are measures of energy average during a 24-hour period, with dB weighted sound levels from 7:00 p.m. to 7:00 a.m. Most commonly, environmental sounds are described in terms of L_{eq} that has the same acoustical energy as the summation of all the time-varying events. Each is applicable to this analysis and defined Table 2: Definitions of Acoustical Terms.

Table 2: Definitions of Acoustical Terms

Term	Definitions
Decibel (dB)	A unit describing the amplitude of sound, equal to 20 times the logarithm to the base 10 of the ratio of the pressure of the sound measured to the reference pressure. The reference pressure for air is 20.
Sound Pressure Level	Sound pressure is the sound force per unit area, usually expressed in µPa (or 20 micronewtons per square meter), where 1 pascals is the pressure resulting from a force of 1 newton exerted over an area of 1 square meter. The sound pressure level is expressed in dB as 20 times the logarithm to the base 10 of the ratio between the pressures exerted by the sound to a reference sound pressure (e.g. 20 µPa). Sound pressure level is the quantity that is directly measured by a sound level meter.
Frequency (Hz)	The number of complete pressure fluctuations per second above and below atmospheric pressure. Normal human hearing is between 20 Hz and 20,000 Hz. Infrasonic sound are below 20 Hz and ultrasonic sounds are above 20,000 Hz.
A-Weighted Sound Level (dBA)	The sound pressure level in dB as measured on a sound level meter using the A-weighting filter network. The A-weighting filter de-emphasizes the very low and very high frequency components of the sound in a manner similar to the frequency response of the human ear and correlates well with subjective reactions to noise.
Equivalent Noise Level (L_{eq})	The average acoustic energy content of noise for a stated period of time. Thus, the L_{eq} of a time-varying noise and that of a steady noise are the same if they deliver the same acoustic energy to the ear during exposure. For evaluating community impacts, this rating scale does not vary, regardless of whether the noise occurs during the day or the night.
Maximum Noise Level (L_{max}) Minimum Noise Level (L_{min})	The maximum and minimum dBA during the measurement period.
Exceeded Noise Levels (L_1, L_{10}, L_{50}, L_{90})	The dBA values that are exceeded 1%, 10%, 50%, and 90% of the time during the measurement period.
Day-Night Noise Level (L_{dn})	A 24-hour average L_{eq} with a 10 dBA weighting added to noise during the hours of 10:00 p.m. to 7:00 a.m. to account for noise sensitivity at nighttime. The logarithmic effect of these additions is that a 60 dBA 24-hour L_{eq} would result in a measurement of 66.4 dBA L_{dn}.
Community Noise Equivalent Level (CNEL)	A 24-hour average Leq with a 5 dBA weighting during the hours of 7:00 a.m. to 10:00 a.m. and a 10 dBA weighting added to noise during the hours of 10:00 p.m. to 7:00 a.m. to account for noise sensitivity in the evening and nighttime, respectively. The logarithmic effect of these additions is that a 60 dBA 24-hour L_{eq} would result in a measurement of 66.7 dBA CNEL.
Ambient Noise Level	The composite of noise from all sources near and far. The normal or existing level of environmental noise at a given location.

Term	Definitions
Intrusive	That noise which intrudes over and above the existing ambient noise at a given location. The relative intrusiveness of a sound depends on its amplitude, duration, frequency, and time of occurrence and tonal or informational content as well as the prevailing ambient noise level.

The A-weighted decibel (dBA) sound level scale gives greater weight to the frequencies of sound to which the human ear is most sensitive. Because sound levels can vary markedly over a short period of time, a method for describing either the average character of the sound or the statistical behavior of the variations must be used. Most commonly, environmental sounds are described in terms of an average level that has the same acoustical energy as the summation of all the time-varying events.

The scientific instrument used to measure noise is the sound level meter. Sound level meters can accurately measure environmental noise levels to within about plus or minus 1 dBA. Various computer models are used to predict environmental noise levels from sources, such as roadways and airports. The accuracy of the predicted models depends on the distance between the receptor and the noise source.

A-Weighted Decibels

The perceived loudness of sounds is dependent on many factors, including sound pressure level and frequency content. However, within the usual range of environmental noise levels, perception of loudness is relatively predictable and can be approximated by dBA values. There is a strong correlation between dBA and the way the human ear perceives sound. For this reason, the dBA has become the standard tool of environmental noise assessment. All noise levels reported in this document are in terms of dBA, but are expressed as dB, unless otherwise noted.

Addition of Decibels

The dB scale is logarithmic, not linear, and therefore sound levels cannot be added or subtracted through ordinary arithmetic. Two sound levels 10 dB apart differ in acoustic energy by a factor of 10. When the standard logarithmic dB is A-weighted, an increase of 10 dBA is generally perceived as a doubling in loudness. For example, a 70-dBA sound is half as loud as an 80-dBA sound and twice as loud as a 60-dBA sound. When two identical sources are each producing sound of the same loudness, the resulting sound level at a given distance would be 3 dBA higher than one source under the same conditions. Under the dB scale, three sources of equal loudness together would produce an increase of 5 dBA.

Sound Propagation and Attenuation

Sound spreads (propagates uniformly outward in a spherical pattern, and the sound level decreases (attenuates) at a rate of approximately 6 dB for each doubling of distance from a stationary or point source. Sound from a line source, such as a highway, propagates outward in a cylindrical pattern. Sound levels attenuate at a rate of approximately 3 dB for each doubling of distance from a line source, such as a roadway, depending on ground surface characteristics. No excess attenuation is assumed for hard surfaces like a parking lot or a body of water. Soft surfaces, such as soft dirt or grass, can absorb sound, so an excess ground-attenuation value of 1.5 dB per doubling of distance is normally assumed. For line sources, an overall attenuation rate of 3 dB per doubling of distance is assumed.

Noise levels may also be reduced by intervening structures; generally, a single row of buildings between the receptor and the noise source reduces the noise level by about 5 dBA, while a solid wall or berm reduces noise levels by 5 to 10 dBA. The way older homes in California were constructed generally provides a reduction of exterior-to-interior noise levels of about 20 to 25 dBA with closed windows. The exterior-to-interior reduction of newer residential units is generally 30 dBA or more.

Human Response to Noise

The human response to environmental noise is subjective and varies considerably from individual to individual. Noise in the community has often been cited as a health problem, not in terms of actual physiological damage, such as hearing impairment, but in terms of inhibiting general well-being and contributing to undue stress and annoyance. The health effects of noise in the community arise from interference with human activities, including sleep, speech, recreation, and tasks that demand concentration or coordination. Hearing loss can occur at the highest noise intensity levels.

Noise environments and consequences of human activities are usually well represented by median noise levels during the day or night or over a 24-hour period. Environmental noise levels are generally considered low when the CNEL is below 60 dBA, moderate in the 60 to 70 dBA range, and high above 70 dBA. Examples of low daytime levels are isolated, natural settings with noise levels as low as 20 dBA and quiet, suburban, residential streets with noise levels around 40 dBA. Noise levels above 45 dBA at night can disrupt sleep. Examples of moderate-level noise environments are urban residential or semi-commercial areas (typically 55 to 60 dBA) and commercial locations (typically 60 dBA). People may consider louder environments adverse, but most will accept the higher levels associated with noisier urban residential or residential-commercial areas (60 to 75 dBA) or dense urban or industrial areas (65 to 80 dBA). Regarding increases in dBA, the following relationships should be noted:

- Except in carefully controlled laboratory experiments, a 1-dBA change cannot be perceived by humans.
- Outside of the laboratory, a 3-dBA change is considered a just-perceivable difference.
- A minimum 5-dBA change is required before any noticeable change in community response would be expected. A 5-dBA increase is typically considered substantial.
- A 10-dBA change is subjectively heard as an approximate doubling in loudness and would almost certainly cause an adverse change in community response.

Effects of Noise on People

Hearing Loss. While physical damage to the ear from an intense noise impulse is rare, a degradation of auditory acuity can occur even within a community noise environment. Hearing loss occurs mainly due to chronic exposure to excessive noise but may be due to a single event such as an explosion. Natural hearing loss associated with aging may also be accelerated from chronic exposure to loud noise. The Occupational Safety and Health Administration has a noise exposure standard that is set at the noise threshold where hearing loss may occur from long-term exposures. The maximum allowable level is 90 dBA averaged over 8 hours. If the noise is above 90 dBA, the allowable exposure time is correspondingly shorter.

Annoyance. Attitude surveys are used for measuring the annoyance felt in a community for noises intruding into homes or affecting outdoor activity areas. In these surveys, it was determined that causes for annoyance include interference with speech, radio and television, house vibrations, and interference with sleep and rest. The L_{dn} as a measure of noise has been found to provide a valid correlation of noise level and the percentage of people annoyed. People have been asked to judge the annoyance caused by aircraft noise and ground transportation noise. There continues to be disagreement about the relative annoyance of these different sources. A noise level of about 55 dBA L_{dn} is the threshold at which a substantial percentage of people begin to report annoyance[1].

2.2 GROUNDBORNE VIBRATION

Sources of groundborne vibrations include natural phenomena (earthquakes, volcanic eruptions, sea waves, landslides, etc.) or man-made causes (explosions, machinery, traffic, trains, construction equipment, etc.). Vibration sources may be continuous (e.g. factory machinery) or transient (e.g. explosions). Ground vibration consists of rapidly fluctuating motions or waves with an average motion of zero. Several different methods are typically used to quantify vibration amplitude. One is the peak particle velocity (PPV); another is the root mean square (RMS) velocity. The PPV is defined as the maximum instantaneous positive or negative peak of the vibration wave. The RMS velocity is defined as the average of the squared amplitude of the signal. The PPV and RMS vibration velocity amplitudes are used to evaluate human response to vibration.

Table 3: Human Reaction and Damage to Buildings for Continuous or Frequent Vibration, displays the reactions of people and the effects on buildings produced by continuous vibration levels. The annoyance levels shown in the table should be interpreted with care since vibration may be found to be annoying at much lower levels than those listed, depending on the level of activity or the sensitivity of the individual. To sensitive individuals, vibrations approaching the threshold of perception can be annoying. Low-level vibrations frequently cause irritating secondary vibration, such as a slight rattling of windows, doors, or stacked dishes. The rattling sound can give rise to exaggerated vibration complaints, even though there is very little risk of actual structural damage. In high noise environments, which are more prevalent where groundborne vibration approaches perceptible levels, this rattling phenomenon may also be produced by loud airborne environmental noise causing induced vibration in exterior doors and windows.

Table 3: Human Reaction and Damage to Buildings for Continuous or Frequent Intermittent Vibration

Maximum PPV (in/sec)	Vibration Annoyance Potential Criteria	Vibration Damage Potential Threshold Criteria	FTA Vibration Damage Criteria
0.008	-	Extremely fragile historic buildings, ruins, ancient monuments	-
0.01	Barely Perceptible	-	-
0.04	Distinctly Perceptible	-	-
0.1	Strongly Perceptible	Fragile buildings	-
0.12	-	-	Buildings extremely susceptible to vibration damage
0.2	-	-	Non-engineered timber and masonry buildings
0.25	-	Historic and some old buildings	-
0.3	-	Older residential structures	Engineered concrete and masonry (no plaster)
0.4	Severe	-	-
0.5	-	New residential structures, Modern industrial/commercial buildings	Reinforced-concrete, steel, or timber (no plaster)
PPV = peak particle velocity; in/sec = inches per second; FTA = Federal Transit Administration			
Source: California Department of Transportation, Transportation and Construction Vibration Guidance Manual, 2020 and Federal Transit Administration; Transit Noise and Vibration Assessment Manual, 2018.			

1 Federal Interagency Committee on Noise, *Federal Agency Review of Selected Airport Noise Analysis Issues*, August 1992.

Ground vibration can be a concern in instances where buildings shake, and substantial rumblings occur. However, it is unusual for vibration from typical urban sources such as buses and heavy trucks to be perceptible. Common sources for groundborne vibration are planes, trains, and construction activities such as earth-moving which requires the use of heavy-duty earth moving equipment. For the purposes of this analysis, a PPV descriptor with units of inches per second (in/sec) is used to evaluate construction-generated vibration for building damage and human complaints.

3 REGULATORY SETTING

To limit population exposure to physically or psychologically damaging as well as intrusive noise levels, the Federal government, the State of California, various county governments, and most municipalities in the state have established standards and ordinances to control noise.

3.1 STATE OF CALIFORNIA

California Government Code

California Government Code Section 65302(f) mandates that the legislative body of each county and city adopt a noise element as part of its comprehensive general plan. The local noise element must recognize the land use compatibility guidelines established 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" noise levels for various land use types. Single-family homes are "normally acceptable" in exterior noise environments up to 60 CNEL and "conditionally acceptable" up to 70 CNEL. Multiple-family residential uses are "normally acceptable" up to 65 CNEL and "conditionally acceptable" up to 70 CNEL. Schools, libraries, and churches are "normally acceptable" up to 70 CNEL, as are office buildings and business, commercial, and professional uses.

Title 24 – Building Code

The State's noise insulation standards are codified in the California Code of Regulations, Title 24: Part 1, Building Standards Administrative Code, and Part 2, California Building Code. These noise standards are applied to new construction in California for interior noise compatibility from exterior noise sources. The regulations specify that acoustical studies must be prepared when noise-sensitive structures, such as residential buildings, schools, or hospitals, are located near major transportation noise sources, and where such noise sources create an exterior noise level of 65 dBA CNEL or higher. Acoustical studies that accompany building plans must demonstrate that the structure has been designed to limit interior noise in habitable rooms to acceptable noise levels. For new multi-family residential buildings, the acceptable interior noise limit for new construction is 45 dBA CNEL.

3.2 LOCAL

City of Vallejo General Plan

The Vallejo General Plan (General Plan) identifies goals, policies, and implementations in the Noise Element. The Noise Element provides a basis for comprehensive local programs to regulate environmental noise and protect citizens from excessive exposure. Table 4: California Land-Use Compatibility Guidelines for Community Noise Environments highlights five land-use categories and the outdoor noise compatibility guidelines.

Table 4: California Land-Use Compatibility Guidelines for Community Noise Environments

Land-Use Category	Exterior Noise Exposure (DNL), in dBA			
	Normally Acceptable[1]	Conditionally Acceptable[2]	Normally Unacceptable[3]	Clearly Unacceptable[4]
Residential – Low Density Single-Family, Duplex, Mobile Homes	Up to 60	>55 to 70	>70 to 75	<75
Residential – Multiple Family	Up to 65	>60 to 70	>70 to 75	<75
Transient Lodging, Motels, Hotels	Up to 65	>60 to 70	>70 to 80	<80
Schools, Libraries, Churches, Hospitals, Nursing Homes	Up to 70	-	>70 to 80	<80
Auditoriums, Concert Halls, Amphitheaters	-	>50 to 70	-	<65
Sports Arena, Outdoor Spectator Sports	-	>50 to 75	-	<70
Playgrounds, Neighborhood Parks	Up to 70	>68 to 75	-	<73
Golf Courses, Riding Stables, Water Recreation, Cemeteries	Up to 75	>70 to 80	-	<80
Office Buildings, Businesses, Commercial, and Professional	Up to 70	>68 to 78	>75 to 85	-
Industrial, Manufacturing, Utilities, Agricultural	Up to 75	>70 to 80	>75 to 85	-

Source: City of Vallejo, 2017.
1. Normally Acceptable – Specified land use is satisfactory, based upon the assumption that any buildings involved are of normal conventional construction. There are no special noise insulation requirements.
2. Conditionally Acceptable – New construction should be undertaken only after a detailed analysis of the noise reduction requirement is conducted and needed noise insulation features included in the design. Conventional construction, but with closed windows and fresh air supply systems or air conditioning will normally suffice
3. Normally Unacceptable – New construction or development should generally be discouraged. If new construction does proceed, a detailed analysis of the noise reduction requirements must be made and needed noise insulation features included in the design.
4. Clearly Unacceptable –New construction or development generally should not be undertaken.

Project relevant General Plan goals and policies related to noise are listed below:

Policy NBE-5.13: Noise Control. Ensure that noise does not affect quality of life in the community.

Action NBE-5.13C: Update City regulations to restrict the allowable hours to between 7 AM and 7 PM on weekdays for construction, demolition, maintenance, and loading/unloading activities that may impact noise-sensitive land uses.

Policy NBE-5.14: Vibration Control. Ensure that vibration does not affect quality of life in the community.

Action NBE-5.14A: Update City regulations to establish quantified vibration level limits similar to commonly used guidelines found in the Federal Transit Administration document "Transit Noise and Vibration Impact Assessment" (2006).

Policy NBE-5.15: Noise Compatibility Standards. Apply the General Plan noise and land use compatibility standards to all new residential, commercial, and mixed-use development and redevelopment.

Action NBE-5.15E: When approving new development, limit project-related noise increases to the following for permanent stationary and transportation-related noise sources:

- No more than 10 dB in non-residential areas;
- No more than 5 dB in residential areas where the with-project noise level is less than the maximum "normally acceptable" level in the Noise and Land Use Compatibility figure; and
- No more than 3 dB where the with-project noise level exceeds the "normally acceptable" level in the Noise and Land Use Compatibility figure.

Action NBE-5.15F: Require acoustical studies with appropriate mitigation measures for projects that are likely to be exposed to noise levels that exceed the "normally acceptable" standard and for any other projects that are likely to generate noise in excess of these standards.

City of Vallejo Municipal Code

The Vallejo Municipal Code, Section 16.502.09 establishes the exterior noise standards applicable to certain uses and facilities. Table 5: Vallejo Maximum Noise Level by Noise Zone shows the maximum exterior noise standard allowed by the City's Municipal Code.

Table 5: Vallejo Maximum Noise Level by Noise Zone

Noise Zone Districts	Maximum Noise Level in dBA (level not to exceeded more than 30 minutes in any hour)		Maximum Noise Level in dBA (level not to be exceeded more than 5 minutes in any hour)
	Measured at Property Line or District Boundary	Measured at Any Boundary of a Residential Zone	Between 10 PM and 7 AM, Measured at any Boundary of a Residential Zone
Single-Unit Residential	60	60	-
Multiple-Unit Residential	65	65	-
Commercial and Mixed-Use, Medical, Office	70	60	50 or Ambient Level
Light Industrial	75	65	50 or Ambient Level
General Industrial	75	65	50 or Ambient Level
Public Facilities and Community Use	65	60	50 or Ambient Level
Open Space and Recreational Districts	65	60	50 or Ambient Level
Source: City of Vallejo Municipal Code, 2023.			

The standard exterior noise limits listed in Table 5, would be adjusted by five decibels for noise that contains a stead pure tone, such as a screech or hum, or impulsive sound, such as hammering or riveting, or contains music or speech, as described below.

- Any type of noise, other than construction and related activities between 7 AM and 10 PM would allow for a plus 5 dBA adjustment;

- Any noise of unusual impulsive character (e.g., hammering or drilling) would have an exterior noise limit reduction of 5 dBA;

- Any noise of unusual periodic character (e.g., screeching or hammering) would have an exterior noise limit reduction of 5 dBA.

According to Vallejo Municipal Code, Section 16.502.09.D, construction hours in a residential or mixed-use zoning district are limited to the hours of 7 AM to 7 PM, when noise levels are exceeding the limits shown in Table 6: Maximum Noise Level for Temporary Construction Activity.

Table 6: Maximum Noise Level for Temporary Construction Activity

Time	Rural Residential (RR), Residential Low Density (RLD)	Residential Medium Density (RMD), Residential High Density (RHD), Neighborhood Mixed-Use (NMX), Neighborhood Commercial (NC)	Commercial (Including medical and office) and Industrial
Mobile Construction Equipment – nonscheduled, intermittent, and short term for less than 15 days			
Weekdays 7 AM to 6 PM	75 dBA	80 dBA	85 dBA
Saturdays 9 AM to 6 PM	60 dBA	65 dBA	70 dBA
Sundays and Legal Holidays	None	None	None
Stationary Construction Equipment			
Weekdays 7 AM to 6 PM	60 dBA	65 dBA	70 dBA
Saturdays 9 AM to 6 PM	60 dBA	65 dBA	70 dBA
Sundays and Legal Holidays	None	None	None
Source: City of Vallejo Municipal Code, 2023.			

4 EXISTING CONDITIONS

4.1 EXISTING NOISE SOURCES

The City of Vallejo is impacted by various noise sources. Mobile sources of noise, particularly cars and trucks, are the most common and significant sources of noise in most communities. Other sources of noise are the various land uses (e.g., residential, commercial, institutional, and recreational and parks activities) throughout the City that generate stationary-source noise.

Noise Measurements

To determine ambient noise levels in the Project area, four 10-minute noise measurements were taken using a Larson Davis SoundExpert® LxT Sound Level Meter between 9:33 a.m. and 10:45 a.m. on December 5, 2023; refer to Appendix A for existing noise measurement data and Figure 6: Noise Measurement Locations. Noise Measurement 1 (NM-1) was taken to represent the ambient noise level in the existing residential neighborhood on Maine Street southeast of the Project site, while NM-2 was taken to represent the ambient noise level at the southeast edge of the Project site. NM- 3 was taken to represent the ambient noise level at the northeast edge of the Project site, while NM-4 was taken to represent the existing public facilities on Georgia Street northeast of the Project site. The primary noise sources during all four measurements were traffic on Mare Island Way, Maine Street, and Georgia Street and operational noise from existing ferry operations. Table 7: Noise Measurements, provides the ambient noise levels measured at these locations.

Table 7: Noise Measurements

Site No.	Location	L_{eq} (dBA)	L_{min} (dBA)	L_{max} (dBA)	Time
NM-1	101-201 Maine Street	61.6	45.1	46.8	9:33 a.m.
NM-2	285 Mare Island Way	59.4	49.8	70.5	10:13 a.m.
NM-3	289 Mare Island Way	61.4	47.9	75.3	9:58 a.m.
NM-4	155 Georgia Street	58.2	44.1	70.5	10:35 a.m.
Source: Noise Measurements taken by Kimley-Horn on December 5, 2023.					

Existing Mobile Noise

There is existing mobile noise from surrounding roadways: Mare Island Way, Georgia Street, and Maine Street. Further, mobile noise is generated by the ferries operating at the existing ferry terminal.

Existing Stationary Noise

The primary sources of stationary noise in the Project vicinity are those associated with the operations of the existing ferry terminal, nearby residential uses to the southeast of the site, and existing commercial northwest and east of the Project site. The noise associated with these sources may represent a single-event noise occurrence, short-term noise, or long-term/continuous noise.

4.2 SENSITIVE RECEPTORS

Noise exposure standards and guidelines for various types of land uses reflect the varying noise sensitivities associated with each of these uses. Residences, hospitals, schools, guest lodging, libraries, and churches are treated as the most sensitive to noise intrusion and therefore have more stringent noise exposure targets than do other uses, such as manufacturing or agricultural uses that are not subject to impacts such as sleep disturbance. As shown in Table 8: Sensitive Receptors and Figure 7: Sensitive Receptors, sensitive receptors near the Project site include a multi-family residential community approximately 545 feet southeast and the Vallejo John F. Kennedy Library approximately 615 feet east. The nearest school is the Pathways Charter School approximately 2,155 feet east. These distances are from the Project site to the sensitive receptor property line.

Table 8: Sensitive Receptors

Receptor Description	Distance and Direction from the Project Site
Multi-family residential community	545 feet southeast
Vallejo John F. Kennedy Library	615 feet east
Pathways Charter School	2,155 feet east
1. Distances are measured from the Project site boundary to the property line. Source: Google Earth, 2023.	

Source: ESRI, 2023

Figure 6: Noise Measurement Locations

WETA Vallejo Ferry Terminal Reconfiguration Project

Not to scale

Kimley»Horn

Source: ESRI, 2023

Figure 7: Sensitive Receptors

WETA Vallejo Ferry Terminal Reconfiguration Project

N Not to scale

Kimley»Horn

5 SIGNIFICANCE CRITERIA AND METHODOLOGY

5.1 CEQA THRESHOLDS

Appendix G of the California Environmental Quality Act (CEQA) Guidelines contains analysis guidelines related to noise impacts. These guidelines have been used by the City to develop thresholds of significance for this analysis. A project would create a significant environmental impact if it would:

NOI-1 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;

NOI-2 Generate excessive groundborne vibration or groundborne noise levels; and

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

5.2 METHODOLOGY

Construction

Construction noise estimates are based upon typical noise levels generated by construction equipment published by the Federal Transit Administration (FTA) and Federal Highway Administration (FHWA). Construction noise is assessed in dBA L_{eq}. This unit is appropriate because L_{eq} can be used to describe noise level from operation of each piece of equipment separately, and levels can be combined to represent the noise level from all equipment operating during a given period. Section 16.502.09D of the Vallejo Municipal Code limits construction hours between 7 AM and 6 PM on weekdays and 9 AM to 6 PM on Saturday s and restricts construction noise to the levels listed in Table 6. Since construction is anticipated to occur for more than 15 days, the stationary construction equipment thresholds apply to construction of the Project.

Reference noise levels are used to estimate noise levels at nearby sensitive receptors based on a standard noise attenuation rate of 6 dB per doubling of distance (line-of-sight method of sound attenuation for point sources of noise). Construction noise level estimates do not account for the presence of intervening structures or topography, which may reduce noise levels at receptor locations. Therefore, the noise levels presented herein represent a conservative, reasonable worst-case estimate of actual temporary construction noise.

Operations

Operational noise levels would remain similar to existing conditions. The proposed Project would not add any new sources of stationary noise or additional traffic on nearby roadway segments. Therefore, operational noise would not change with implementation of the project.

Vibration

Groundborne vibration levels associated with construction-related activities for the Project were evaluated utilizing typical groundborne vibration levels associated with construction equipment, obtained from FTA published data for construction equipment. Potential groundborne vibration impacts related to structural damage and human annoyance were evaluated, considering the distance from construction activities to nearby land uses and typically applied criteria for structural damage and human annoyance. Vibration levels are evaluated based on the FTA's 0.20 inch-per-second peak particle velocity (PPV) architectural damage threshold listed in the "Transit Noise and Vibration Impact Assessment" and the 0.04 inch-per-second PPV perceptible threshold in accordance with the California Department of Transportation (Caltrans) guidance.[2]

[2] California Department of Transportation, Transportation and Construction Vibration Guidance Manual, Table 20, September 2013.

6 POTENTIAL IMPACTS AND MITIGATION

6.1 ACOUSTICAL IMPACTS

Threshold 6.1 Would the Project 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?

Construction

Construction noise typically occurs intermittently and varies depending on the nature or phase of construction (e.g. land clearing, grading, excavation, paving). Noise generated by construction equipment, including earth movers, material handlers, and portable generators, can reach high levels. During construction, exterior noise levels could affect the residential neighborhoods surrounding the construction site. Project construction would occur approximately 545 feet from existing multi-family residences to the southeast of the Project site, along Maine Street. However, construction activities would occur throughout the Project site and would not be concentrated at a single point near sensitive receptors. Noise levels typically attenuate (or drop off) at a rate of 6 dB per doubling of distance from point sources, such as industrial machinery. During construction, exterior noise levels have a low potential to affect the residential neighborhoods near the construction site.

The Project would require Bay fill removal (existing piles) and placement for installation of pilings for the new float, donut fenders, and fixed pier support. It is estimated that approximately 116 to 126 square feet of 16 to 17 pilings would be installed. Further, the existing steel dolphins within the basin and terminal area would be removed. Overwater construction would include the installation of all of the approach sections, concrete dolphins, and utility installation. Installation of concrete dolphins would require barges, a concrete mixer, a concrete pump, a concrete vibrator, and a crane.

Demolition of the existing facility would be required prior to installation of any new waterside terminal components. The demolition work includes removal of the piles, gangway, and float. This work would be conducted from barges, one for materials storage and one outfitted with demolition equipment (crane and clamshell bucket or vibratory impact pile driver for pulling of piles and a crane for gangway removal). Diesel power tugboats would bring the barges to the Project site, where the barges would be anchored. Pile driving would be limited to the environmental work window of August 1 through October 15. Piles would be removed by either pulling the pile or cutting the piles off below the mud line. The in-water demolition work would include the removal of the existing piles, pile dolphins, and floats.

Landside construction activities include minor demolition and building construction. Construction equipment would include a small backhoe and bulldozer/bobcat, haul trucks, material delivery trucks, a crane, and delivery and support trucks. Operating cycles for these types of construction equipment may involve one or two minutes of full-power operation followed by three to four minutes at lower power settings. Other primary sources of noise would be shorter-duration incidents, such as dropping large pieces of equipment or the hydraulic movement of machinery lifts, which would last less than one minute. It should be noted that only a limited amount of equipment can operate near a given location at a particular time.

It should be noted that the majority of construction would take place on barges above the water rather than on land. The noise levels shown below assume that construction equipment is located at the closest point to sensitive receptors and do not account for any attenuating structures or surfaces. Typical noise levels associated with individual construction equipment are listed in Table 9: Typical Construction Noise Levels. As shown in Table 9, construction equipment noise levels at the closest sensitive receptor, located 545 feet away, would not reach levels exceeding 65 dBA L_{eq} except for impact pile driving equipment. At the closest commercial receptor, located approximately 50 feet away, all construction equipment would exceed the 70 dBA L_{eq} construction noise standard. Thus, implementation of Mitigation Measure (MM) NOI-1 would be required to reduce noise levels below the construction standards in Section 16.502.09D of the Vallejo Municipal Code. Implementation of MM NOI-1 would require the project to use noise reduction technology on construction equipment, construct temporary sound barriers at the project property line, and prohibit the idling of stationary equipment. Noise levels associated with construction would collectively reduce by 20 to 30 decibels with the implementation of MM NOI-1. With this reduction, construction equipment noise levels would adhere to the Vallejo Municipal Code Construction Standards except for pile driving equipment noise at the nearest commercial receptors. However, as mentioned previously, pile driving would operate from barges above the water rather than at the closest point to sensitive receptors. In reality, pile driving equipment would be located approximately 150 feet away from the nearest commercial uses and would produce a noise level of 91 dBA L_{eq} at this distance. With implementation of MM NOI-1, noise levels associated with pile driving at the nearest commercial uses would be below the construction equipment noise standards listed in Section 16.502.09D of the Vallejo Municipal Code. Thus, impacts would be less than significant with the implementation of MM NOI-1.

Table 9: Typical Construction Noise Levels

Equipment	Typical Noise Level (dBA) at 50 feet from Source[1]	Noise Level (dBa) at 545 feet from Source
Air Compressor	80	59
Backhoe	80	59
Concrete Mixer	85	64
Concrete Pump	82	61
Concrete Vibrator	76	55
Crane, Mobile	83	62
Dozer	85	64
Generator	82	61
Impact Wrench	85	64
Loader	80	59
Pile Driving (Impact)	101	80
Pneumatic Tool	85	64
Pump	77	56
Saw	83	55
Shovel	82	61
Truck	84	63

1. Calculated using the inverse square law formula for sound attenuation: $dBA_2 = dBA_1+20Log(d_1/d_2)$
Where: dBA_2 = estimated noise level at receptor; dBA_1 = reference noise level; d_1 = reference distance; d_2 = receptor location distance
Source: Federal Transit Administration, *Transit Noise and Vibration Impact Assessment Manual*, September 2018.

Construction Traffic Noise

Construction noise may be generated by large trucks moving materials to and from the Project site. Large trucks would be necessary to deliver building materials as well as remove demolition materials. During the demolition phase of the Project, approximately 5,674 square feet of materials would be removed.

Based on the California Emissions Estimator Model (CalEEMod) default assumptions for this Project, as analyzed in *Air Quality Assessment - Vallejo Ferry Terminal Reconfiguration Project* (Kimley-Horn, 2023), the Project would generate the highest number of daily trips during the demolition phase. The model estimates that the Project would generate up to 21 worker trips per day during demolition. Because of the logarithmic nature of noise levels, a doubling of the traffic volume (assuming that the speed and vehicle mix do not also change) would result in a noise level increase of 3 dBA. Mare Island Way (between Marin Street and Maine Street) has an average daily trip volume of 13,241 vehicles and Mare Island way (between Maine Street and Florida Street) has an average daily trip volume of 12,778 vehicles[3]. Therefore, the Project's 21 demolition worker trips would not double the existing traffic volume. Construction related traffic noise would not be perceptible. Impacts would be less than significant.

California establishes noise limits for vehicles licensed to operate on public roads using a pass-by test procedure. Pass-by noise refers to the noise level produced by an individual vehicle as it travels past a fixed location. The pass-by procedure measures the total noise emissions of a moving vehicle with a microphone. When the vehicle reaches the microphone, the vehicle is at full throttle acceleration at an engine speed calculated for its displacement.

For heavy trucks, the State pass-by standard is consistent with the federal limit of 80 dB. The State pass-by standard for light trucks and passenger cars (less than 4.5 tons gross vehicle rating) is also 80 dB at 15 meters from the centerline. According to the FHWA, dump trucks typically generate noise levels of 77 dBA and flatbed trucks typically generate noise levels of 74 dBA, at a distance of 50 feet from the truck[4].

<u>Operations</u>

Traffic Noise

Implementation of the Project would not generate increased traffic volumes on nearby roadway segments. The Project would not result in uses that would increase traffic volumes over existing levels on surrounding roadway segments given that the Project proposes the same operational uses as the existing facilities. Therefore, there would not be any new operational traffic noise impacts.

Stationary Noise Sources

Implementation of the Project would not create new sources of noise in the Project vicinity from the gangway and passenger float, the passenger queuing and waiting area, parking and circulation, other area improvements (San Francisco Bay Trail improvements), and the ferry route. The Project would reconfigure the existing ferry terminal to reduce or eliminate maintenance dredging and increase operational safety in support of continued ferry service. The Project would not generate any additional sources of stationary noise sources differing from the existing ferry terminal. Therefore, the proposed Project would not result in changes to the existing uses that would create any new operational sources of noise.

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[3] City of Vallejo, *City of Vallejo, CA Traffic Counts – Updated 2007/2008 Average Daily Traffic Volumes*, 2008. Available at https://www.cityofvallejo.net/our_city/departments_divisions/public_works_department/engineering_division/traffic_engineering.

[4] Federal Highway Administration, *Roadway Construction Noise Model*, 2006.

Summary

Overall, noise impacts associated with construction, traffic, and operation of the ferry terminal would remain less than significant. As stated previously, the Project would not generate additional daily trips or result in any new sources of stationary noise during operation. Project operations would be the same as the existing ferry terminal. Therefore, noise impacts would remain less than significant.

Mitigation Measures:

MM NOI-1 Construction Noise Logistics Plan

Prior to Grading Permit issuance, the Applicant shall demonstrate, to the satisfaction of the City of Vallejo Director of Public Works or City Engineer that the Project complies with the following measures:

- Construct solid plywood fences around ground level construction sites, resulting in a decibel reduction of 5-15 dBA.
- Equip all internal combustion engine-driven equipment with intake and exhaust mufflers that are in good condition and appropriate for the equipment. This would provide at least a 10 dBA reduction to individual equipment noise.[5]
- Equip Pile Drivers with pile driver shrouds.
- Prohibit unnecessary idling of internal combustion engines.
- Locate stationary noise-generating equipment such as air compressors or portable power generators as far as possible from the project property line. Construct temporary noise barriers to screen stationary noise-generating equipment in the construction area.
- Utilize “quiet” air compressors and other stationary noise sources where technology exists.
- Notify all adjacent business, residences, and other noise-sensitive land uses of the construction schedule, in writing, and provide a written schedule of “noisy” construction activities to the adjacent land uses and nearby residences.
- If complaints are received or excessive noise levels cannot be reduced using the measures above, erect a temporary noise control blanket barrier along surrounding building facades that face the construction sites.
- Designate a “disturbance coordinator” who shall be responsible for responding to any complaints about construction noise. The disturbance coordinator shall determine the cause of the noise complaint (e.g., bad muffler, etc.) and shall require that reasonable measures be implemented to correct the problem. Conspicuously post a

[5] United States Environmental Protection Agency, *Noise from Construction Equipment and Operations, Building Equipment, and Home Appliances*, 1971.

telephone number for the disturbance coordinator at the construction site and include it in the notice sent to neighbors regarding the construction schedule.

Level of Significance: Less than significant impact with implementation of MM NOI-1.

Threshold 6.2 Would the Project generate excessive groundborne vibration or groundborne noise levels?

Construction

Increases in groundborne vibration levels attributable to the Project would be primarily associated with construction-related activities. Construction on the Project site would have the potential to result in varying degrees of temporary groundborne vibration, depending on the specific construction equipment used and the operations involved. Ground vibration generated by construction equipment spreads through the ground and diminishes in magnitude with increases in distance. 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). The results from vibration can range from no perceptible effects at the lowest vibration levels, to low rumbling sounds and perceptible vibration at moderate levels, to slight damage at the highest levels. Groundborne vibrations from construction activities rarely reach levels that damage structures.

Table 10: Typical Construction Equipment Vibration Levels, lists vibration levels at 25 feet for typical construction equipment. Groundborne vibration generated by construction equipment spreads through the ground and diminishes in magnitude with increases in distance. As indicated in Table 10, based on FTA data, vibration velocities from typical heavy construction equipment operations that would be used during Project construction range from 0.003 to 1.518 in/sec PPV at 25 feet from the source of activity. The nearest building structure is approximately 50 feet from the edge of the active construction zone and approximately 150 feet from the closest pile driving location.

Table 10: Typical Construction Equipment Vibration Levels

Equipment	Peak Particle Velocity at 25 Feet (in/sec)	Peak Particle Velocity at 50 Feet (in/sec) 1	Peak Particle Velocity at 150 Feet (in/sec) [1]
Pile Driver (impact)	1.518	-	0.1033
Large Bulldozer	0.089	0.0315	0.0061
Loaded Trucks	0.076	0.0269	0.0052
Small Bulldozer/Tractors	0.003	0.0011	0.0002

1. Calculated using the following formula: $PPV_{equip} = PPV_{ref} \times (25/D)^{1.5}$, where: PPV_{equip} = the peak particle velocity in in/sec of the equipment adjusted for the distance; PPV_{ref} = the reference vibration level in in/sec from Table 7-4 of the Federal Transit Administration, *Transit Noise and Vibration Impact Assessment Manual*, 2018; D = the distance from the equipment to the receiver.
Source: Federal Transit Administration, *Transit Noise and Vibration Impact Assessment Manual*, September 2018.

As shown in Table 10, the highest vibration levels are achieved with the large bulldozer operations at the receptors located approximately 50 feet away and the impact pile driver operations at receptors located approximately 150 feet away. Large bulldozer operations are expected to take place during demolition and building construction. Pile driving operations are only expected to take place during demolition of the existing facility, which would take place approximately 150 feet away from the nearest building structure over water. At these distances, construction equipment vibration velocities would not exceed the FTA's 0.20 PPV threshold. In general, other construction activities would occur throughout the Project site and would not be concentrated at the point closest to the nearest building structure. Furthermore, construction activity would mostly occur over water and, therefore, these estimates are conservative. Thus, vibration impacts associated with the Project would be less than significant.

Operations

The Project would not generate any new or additional groundborne vibration that could be felt at surrounding uses. The proposed Project includes the reconfiguration of an existing ferry terminal, including the relocation and expansion of an existing bridge and gangway, and installation of a new passenger float. The Project proposes the same operational uses as the existing facilities that are currently used for standard WETA ferry operations. Therefore, there would be no change in operational groundborne vibration as a result of the Project. Furthermore, Project operations would not involve railroads or substantial heavy truck operations, and therefore would not result in vibration impacts at surrounding uses. As a result, impacts from vibration associated with Project operation would be less than significant.

Mitigation Measures: No mitigation is required.

Level of Significance: Less than significant impact.

Threshold 6.3 For a Project located within the vicinity of a private airstrip or an airport land use plan or, where such a plan has not been adopted, within 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 nearest airports to the Project site are the Napa County Airport located approximately 7.4 miles north of the Project, the Sonoma Valley Airport approximately 13.3 miles northwest of the Project, and the Buchanan Field Airport located approximately 13.4 miles southeast of the Project. The Project is not within 2.0 miles of a public airport or within an airport influence zone. Additionally, there are no private airstrips located within the Project vicinity. The Project site is located well outside the noise impact area of the Napa County Airport, the nearest airport to the Project site. Therefore, the Project would not expose people working in or visiting the Project area to excessive airport- or airstrip-related noise levels and no mitigation is required.

Mitigation Measures: No mitigation is required.

Level of Significance: Less than significant impact.

6.2 CUMULATIVE NOISE IMPACTS

Noise by definition is a localized phenomenon, and drastically reduces as distance from the source increases. Cumulative noise impacts involve development of the Project in combination with ambient growth and other related development projects. As noise levels decrease as distance from the source increases, only projects in the nearby area could combine with the Project to potentially result in cumulative noise impacts.

Cumulative Construction Noise

The Project would contribute to other proximate construction noise impacts if construction activities were conducted concurrently. However, based on the City of Vallejo Development Project Website, there are no nearby projects that would construct concurrently with the Project.[6] Further, construction activities at other planned and approved projects would be required to take place during daytime hours, and the City and project applicants would be required to evaluate construction noise impacts and implement mitigation, if necessary, to minimize noise impacts. Therefore, Project construction would not contribute to cumulative impacts and impacts in this regard are not cumulatively considerable. As such, the Project would not result in a cumulatively considerable construction noise impact.

<u>Cumulative Operational Noise</u>

Cumulative noise impacts describe how much noise levels are projected to increase over existing conditions with the development of the Project and other foreseeable projects. Cumulative operational noise impacts would be less than significant given that the proposed Project uses would be the same as the existing uses. Thus, the Project would not result in a cumulatively considerable operational noise impact.

Stationary Noise

As mentioned previously, the Project would not add any new stationary noise sources to the Project vicinity. Given that the proposed Project would not change from existing conditions, cumulative noise impacts would remain less than significant. Thus, cumulative operational noise impacts from related projects, in conjunction with Project-specific noise impacts, would not be cumulatively significant.

Traffic Noise

There would be no cumulative increase in traffic noise levels as a result of Project operations. The Project would not generate any new permanent operational trips given that the proposed uses would remain the same as the existing uses. Therefore, the proposed Project would not increase traffic volumes when compared to the existing ferry terminal. Thus, cumulative traffic noise levels impacts would be less than significant.

[6] City of Vallejo, *Development Projects*, 2023. Accessed at https://www.cityofvallejo.net/our_city/departments_divisions/planning_development_services/economic_development_department/development_projects.

7 REFERENCES

1. California Department of Transportation, *Traffic Noise Analysis Protocol*, 2011.
2. California Department of Transportation, *Technical Noise Supplement to the Traffic Noise Analysis Protocol*, 2013.
3. California Department of Transportation, *Transportation and Construction-Induced Vibration Guidance Manual*, 2004.
4. City of Vallejo, *City of Vallejo, CA Traffic Counts – Updated 2007/2008 Average Daily Traffic Volumes*, 2008.
5. City of Vallejo, *Development Projects*, 2023.
6. City of Vallejo, *Municipal Code*, 2023.
7. City of Vallejo, *Vallejo General Plan 2040 Land Use Designations*, 2011.
8. Elliott H. Berger, Rick Neitzel, and Cynthia A. Kladden, Noise Navigator Sound Level Database with Over 1700 Measurement Values, July 6, 2010.
9. Federal Highway Administration, *Roadway Construction Noise Model*, 2006.
10. Federal Highway Administration, Roadway Construction Noise Model User's Guide Final Report, 2006.
11. Federal Interagency Committee on Noise, *Federal Agency Review of Selected Airport Noise Analysis Issues*, 1992.
12. Federal Transit Administration, *Transit Noise and Vibration Impact Assessment Manual*, September 2018.
13. Hayne, M.J., et al. 2006. *Prediction of Crowd Noise*, Acoustics.
14. U.S. EPA, Noise from Construction Equipment and Operations, Building Equipment, and Home Appliances, 1971.

Appendix A

Noise Data

Noise Measurement Field Data

Project:	WETA Vallejo	**Job Number:**	099974001
Site No.:	ST-1	**Date:**	12/5/2023
Analyst:	Mia Berg	**Time:**	9:33 AM
Location:	The sidewalk adjacent to 101 Maine Street, looking towards Mare Island Way		
Noise Sources:	Street Traffic from Mare Island Way, Ferry Terminal Parking		
Comments:			

Results (dBA):

Leq:	Lmin:	Lmax:	Peak:
61.6	45.1	76.8	97.6

Equipment	
Sound Level Meter:	LD SoundExpert LxT
Calibrator:	CAL200
Response Time:	Slow
Weighting:	A
Microphone Height:	5 feet

Weather	
Temp. (degrees F):	52
Wind (mph):	5
Sky:	Partly Cloudy
Bar. Pressure:	30.21
Humidity:	92%

Photo:

Kimley»Horn

Measurement Report

Report Summary

Meter's File Name	LxT_Data.072.s	Computer's File Name	LxTse_0006073-20231205 093353-LxT_Data.072.ldbin
Meter	LxT SE 0006073	Firmware	2.404
User		Location	
Job Description			
Note			

Start Time	2023-12-05 09:33:53	Duration	0:10:00.0		
End Time	2023-12-05 09:43:53	Run Time	0:10:00.0	Pause Time	0:00:00.0
Pre-Calibration	2023-12-05 09:30:44	Post-Calibration	None	Calibration Deviation	---

Results

Overall Metrics

LA_{eq}	61.6 dB		
LAE	89.4 dB	SEA	--- dB
EA	96.4 µPa²h		
LA_{peak}	97.6 dB	2023-12-05 09:34:15	
LAS_{max}	76.8 dB	2023-12-05 09:37:30	
LAS_{min}	45.1 dB	2023-12-05 09:42:46	
LA_{eq}	61.6 dB		
LC_{eq}	75.8 dB	LC_{eq} - LA_{eq}	14.2 dB
LAI_{eq}	64.5 dB	LAI_{eq} - LA_{eq}	2.9 dB

Exceedances

	Count	Duration
LAS > 85.0 dB	0	0:00:00.0
LAS > 115.0 dB	0	0:00:00.0
LApk > 135.0 dB	0	0:00:00.0
LApk > 137.0 dB	0	0:00:00.0
LApk > 140.0 dB	0	0:00:00.0

Community Noise

LDN	LDay	LNight
61.6 dB	61.6 dB	0.0 dB

LDEN	LDay	LEve	LNight
61.6 dB	61.6 dB	--- dB	--- dB

Any Data

	A		C		Z	
	Level	Time Stamp	Level	Time Stamp	Level	Time Stamp
L_{eq}	61.6 dB		75.8 dB		--- dB	
$Ls_{(max)}$	76.8 dB	2023-12-05 09:37:30	--- dB	None	--- dB	None
$LS_{(min)}$	45.1 dB	2023-12-05 09:42:46	--- dB	None	--- dB	None
$L_{Peak(max)}$	97.6 dB	2023-12-05 09:34:15	--- dB	None	--- dB	None

Overloads

Count	Duration	OBA Count	OBA Duration
0	0:00:00.0	0	0:00:00.0

Statistics

LAS 5.0	67.1 dB
LAS 10.0	65.6 dB
LAS 33.3	60.7 dB
LAS 50.0	56.6 dB
LAS 66.6	53.0 dB
LAS 90.0	49.0 dB

Noise Measurement Field Data

Project:	WETA Vallejo	**Job Number:**	099974001
Site No.:	ST-2	**Date:**	12/5/2023
Analyst:	Mia Berg	**Time:**	10:13 AM
Location:	Sidewalk southeast edge of Project site, facing the existing Ferry terminal		
Noise Sources:	Street Traffic from Mare Island Way, Pedestrian Noise		
Comments:			

Results (dBA):

Leq:	Lmin:	Lmax:	Peak:
59.4	49.8	70.5	87.4

Equipment	
Sound Level Meter:	LD SoundExpert LxT
Calibrator:	CAL200
Response Time:	Slow
Weighting:	A
Microphone Height:	5 feet

Weather	
Temp. (degrees F):	54
Wind (mph):	6
Sky:	Partly Cloudy
Bar. Pressure:	30.21
Humidity:	89%

Photo:

Kimley»Horn

Measurement Report

Report Summary

Meter's File Name	LxT_Data.074.s	Computer's File Name	LxTse_0006073-20231205 101355-LxT_Data.074.ldbin
Meter	LxT SE 0006073	Firmware	2.404
User		Location	
Job Description			
Note			

Start Time	2023-12-05 10:13:55	Duration	0:10:00.0		
End Time	2023-12-05 10:23:55	Run Time	0:10:00.0	Pause Time	0:00:00.0
Pre-Calibration	2023-12-05 09:30:41	Post-Calibration	None	Calibration Deviation	---

Results

Overall Metrics

LA_{eq}	59.4 dB		
LAE	87.2 dB	SEA	--- dB
EA	58.1 µPa²h		
LA_{peak}	87.4 dB	2023-12-05 10:19:45	
LAS_{max}	70.5 dB	2023-12-05 10:19:45	
LAS_{min}	49.8 dB	2023-12-05 10:15:20	
LA_{eq}	59.4 dB		
LC_{eq}	68.4 dB	LC_{eq} - LA_{eq}	9.0 dB
LAI_{eq}	61.1 dB	LAI_{eq} - LA_{eq}	1.7 dB

Exceedances

	Count	Duration
LAS > 85.0 dB	0	0:00:00.0
LAS > 115.0 dB	0	0:00:00.0
LApk > 135.0 dB	0	0:00:00.0
LApk > 137.0 dB	0	0:00:00.0
LApk > 140.0 dB	0	0:00:00.0

Community Noise

LDN	LDay	LNight	
59.4 dB	59.4 dB	0.0 dB	
LDEN	**LDay**	**LEve**	**LNight**
59.4 dB	59.4 dB	--- dB	--- dB

Any Data

	A		C		Z	
	Level	Time Stamp	Level	Time Stamp	Level	Time Stamp
L_{eq}	59.4 dB		68.4 dB		--- dB	
$Ls_{(max)}$	70.5 dB	2023-12-05 10:19:45	--- dB	None	--- dB	None
$LS_{(min)}$	49.8 dB	2023-12-05 10:15:20	--- dB	None	--- dB	None
$L_{Peak(max)}$	87.4 dB	2023-12-05 10:19:45	--- dB	None	--- dB	None

Overloads

Count	Duration	OBA Count	OBA Duration
0	0:00:00.0	0	0:00:00.0

Statistics

LAS 5.0	64.9 dB
LAS 10.0	63.2 dB
LAS 33.3	58.7 dB
LAS 50.0	56.2 dB
LAS 66.6	53.8 dB
LAS 90.0	51.6 dB

Time History

140

Noise Measurement Field Data

Project:	WETA Vallejo	**Job Number:**	099974001
Site No.:	ST-3	**Date:**	12/5/2023
Analyst:	Mia Berg	**Time:**	9:58 AM
Location:	Sidewalk northeast edge of Project site, facing the existing Ferry terminal		
Noise Sources:	Street Traffic from Mare Island Way, Pedestrian Noise		
Comments:			

Results (dBA):

Leq:	Lmin:	Lmax:	Peak:
61.4	47.9	75.3	91.3

Equipment	
Sound Level Meter:	LD SoundExpert LxT
Calibrator:	CAL200
Response Time:	Slow
Weighting:	A
Microphone Height:	5 feet

Weather	
Temp. (degrees F):	53
Wind (mph):	5
Sky:	Partly Cloudy
Bar. Pressure:	30.21
Humidity:	90%

Photo:

Kimley»Horn

Measurement Report

Report Summary

Meter's File Name	LxT_Data.073.s	Computer's File Name	LxTse_0006073-20231205 095820-LxT_Data.073.ldbin
Meter	LxT SE 0006073	Firmware	2.404
User		Location	
Job Description			
Note			

Start Time	2023-12-05 09:58:20	Duration	0:10:00.0		
End Time	2023-12-05 10:08:20	Run Time	0:10:00.0	Pause Time	0:00:00.0
Pre-Calibration	2023-12-05 09:30:41	Post-Calibration	None	Calibration Deviation	---

Results

Overall Metrics

LA_{eq}	61.4 dB		
LAE	89.2 dB	SEA	--- dB
EA	92.0 μPa²h		
LA_{peak}	91.3 dB	2023-12-05 09:58:34	
LAS_{max}	75.3 dB	2023-12-05 10:08:12	
LAS_{min}	47.9 dB	2023-12-05 10:06:20	
LA_{eq}	61.4 dB		
LC_{eq}	68.6 dB	LC_{eq} - LA_{eq}	7.2 dB
LAI_{eq}	63.5 dB	LAI_{eq} - LA_{eq}	2.1 dB

Exceedances

Exceedances	Count	Duration
LAS > 85.0 dB	0	0:00:00.0
LAS > 115.0 dB	0	0:00:00.0
LApk > 135.0 dB	0	0:00:00.0
LApk > 137.0 dB	0	0:00:00.0
LApk > 140.0 dB	0	0:00:00.0

Community Noise

LDN	LDay	LNight
61.4 dB	61.4 dB	0.0 dB

LDEN	LDay	LEve	LNight
61.4 dB	61.4 dB	--- dB	--- dB

Any Data

	A		C		Z	
	Level	Time Stamp	Level	Time Stamp	Level	Time Stamp
L_{eq}	61.4 dB		68.6 dB		--- dB	
$Ls_{(max)}$	75.3 dB	2023-12-05 10:08:12	--- dB	None	--- dB	None
$LS_{(min)}$	47.9 dB	2023-12-05 10:06:20	--- dB	None	--- dB	None
$L_{Peak(max)}$	91.3 dB	2023-12-05 09:58:34	--- dB	None	--- dB	None

Overloads

Count	Duration	OBA Count	OBA Duration
0	0:00:00.0	0	0:00:00.0

Statistics

LAS 5.0	67.3 dB
LAS 10.0	66.1 dB
LAS 33.3	60.1 dB
LAS 50.0	57.6 dB
LAS 66.6	54.4 dB
LAS 90.0	50.8 dB

Noise Measurement Field Data

Project:	WETA Vallejo	**Job Number:**	099974001
Site No.:	ST-4	**Date:**	12/5/2023
Analyst:	Mia Berg	**Time:**	10:35 AM
Location:	Sidewalk at the edge of Martin Luther King Jr Park at 155 Georgia Street		
Noise Sources:	Street Traffic Noise, Pedestrian Noise		
Comments:			

Results (dBA):

Leq:	Lmin:	Lmax:	Peak:
58.2	44.1	70.5	91.2

Equipment	
Sound Level Meter:	LD SoundExpert LxT
Calibrator:	CAL200
Response Time:	Slow
Weighting:	A
Microphone Height:	5 feet

Weather	
Temp. (degrees F):	55
Wind (mph):	6
Sky:	Partly Cloudy
Bar. Pressure:	30.2
Humidity:	86%

No Photo Available

Kimley»Horn

Measurement Report

Report Summary

Meter's File Name	LxT_Data.075.s	Computer's File Name	LxTse_0006073-20231205 103531-LxT_Data.075.ldbin
Meter	LxT SE 0006073	Firmware	2.404
User		Location	
Job Description			
Note			

Start Time	2023-12-05 10:35:31	Duration	0:10:00.0		
End Time	2023-12-05 10:45:31	Run Time	0:10:00.0	Pause Time	0:00:00.0
Pre-Calibration	2023-12-05 09:30:41	Post-Calibration	None	Calibration Deviation	---

Results

Overall Metrics

LA_{eq}	58.2 dB		
LAE	86.0 dB	SEA	--- dB
EA	44.0 µPa²h		
LA_{peak}	91.2 dB	2023-12-05 10:44:00	
LAS_{max}	70.5 dB	2023-12-05 10:44:34	
LAS_{min}	44.1 dB	2023-12-05 10:38:01	
LA_{eq}	58.2 dB		
LC_{eq}	68.3 dB	LC_{eq} - LA_{eq}	10.1 dB
LAI_{eq}	61.8 dB	LAI_{eq} - LA_{eq}	3.6 dB

Exceedances

Exceedances	Count	Duration
LAS > 85.0 dB	0	0:00:00.0
LAS > 115.0 dB	0	0:00:00.0
LApk > 135.0 dB	0	0:00:00.0
LApk > 137.0 dB	0	0:00:00.0
LApk > 140.0 dB	0	0:00:00.0

Community Noise

LDN	LDay	LNight	
58.2 dB	58.2 dB	0.0 dB	
LDEN	**LDay**	**LEve**	**LNight**
58.2 dB	58.2 dB	--- dB	--- dB

Any Data

	A		C		Z	
	Level	Time Stamp	Level	Time Stamp	Level	Time Stamp
L_{eq}	58.2 dB		68.3 dB		--- dB	
$Ls_{(max)}$	70.5 dB	2023-12-05 10:44:34	--- dB	None	--- dB	None
$LS_{(min)}$	44.1 dB	2023-12-05 10:38:01	--- dB	None	--- dB	None
$L_{Peak(max)}$	91.2 dB	2023-12-05 10:44:00	--- dB	None	--- dB	None

Overloads

Count	Duration	OBA Count	OBA Duration
0	0:00:00.0	0	0:00:00.0

Statistics

LAS 5.0	64.8 dB
LAS 10.0	63.0 dB
LAS 33.3	55.9 dB
LAS 50.0	52.6 dB
LAS 66.6	50.3 dB
LAS 90.0	46.8 dB