3.12 NOISE

This section describes the existing physical and regulatory setting related to noise and vibration and discusses the potential effects of the EA Alternatives related to noise and vibration.

3.12.1 Acoustic Terminology and Definitions

Noise is generally defined as unwanted or objectionable sound. Many factors influence how a sound is perceived and whether it is considered harmful or disruptive to an individual or a community. These factors include primary physical characteristics of a sound (e.g., amplitude, frequency, duration, etc.), but also secondary acoustic and non-acoustic factors that can influence perception regarding the degree to which noise is intrusive and disruptive. 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 its pitch or loudness. Pitch is the height of a tone; higher pitched sounds are louder to humans than lower pitched sounds. Loudness is intensity or amplitude of sound.

Noise levels are measured as decibels (dB) on a logarithmic scale that quantifies sound intensity in a manner similar to the Richter scale used for earthquake magnitudes. Thus, a doubling of the energy of a noise source, such as doubling of traffic volume, would increase the noise level by 3 dB; a halving of the energy would result in a 3-dB decrease. The human ear is not equally sensitive to all frequencies within the sound spectrum. Therefore, sound can be characterized by several methods. The most common method is the “A-weighted” sound level (dBA), which gives greater weight to the frequencies audible to the human ear by filtering out noise frequencies not audible to the human ear. Human judgments of the relative loudness or annoyance of a sound correlate well with the dBA levels of those sounds. Therefore, the dBA scale is used for measurements and standards involving the human perception of noise.

Human perception of noise has no simple correlation with acoustical energy. The perception of noise is not linear in terms of dBA or acoustical energy. Two noise sources do not sound twice as loud as one source. It is widely accepted that the average healthy person can barely perceive an increase or decrease of 3 dBA; that a change of 5 dBA is readily perceptible; and that an increase of 10 dBA sounds twice as loud (Caltrans, 2009). Table 3.12-1 lists common indoor and outdoor activities and the corresponding sound levels to demonstrate human perception of the correlation of noise with acoustical energy.

In addition to instantaneous noise levels, the duration or magnitude of noise over time is important to the assessment of potential noise disturbance. Average noise levels over a period of time are usually expressed as dBA energy-equivalent noise level (L_{eq}), or the equivalent noise level for that period. For example, $L_{eq(3)}$ would be a 3-hour average; when no period is specified, a 1-hour average is assumed. The time of day is also an important factor for noise assessment, because noise levels that may be acceptable during the day may interfere with the ability to sleep during evening or nighttime hours. Therefore, there are 24-hour noise-level descriptors that incorporate noise penalties (in decibels) for evening and night periods. The community noise equivalent level (CNEL) is the cumulative noise exposure in a community during a 24-hour period, with a 5-dBA penalty added to evening sound levels (between 7 P.M. and 10 P.M.), and a 10-dBA penalty added to the night sound levels (between 10 P.M. and 7 A.M.). The day/night average sound level (L_{dn}) is similar to CNEL, except that the 3-hour evening period is considered with the daytime period and does not include the penalty that is applied with the CNEL.

Table 3.12-1: Representative Environmental Noise Levels

Common Outdoor Noise Sources	Noise Level (dBA)	Common Indoor Noise Sources
Power Saw	—110—	Rock Band
Jet Fly-over at 100 feet		Crying Baby
Subway	—100—	
Gas Lawn Mower at 3 feet		
Tractor	—90—	
		Food Blender at 3 feet
Diesel Truck Moving at 50 mph at 50 feet	—80—	Garbage Disposal at 3 feet
Noisy Urban Area during Daytime		
Gas Lawn Mower at 100 feet	—70—	Vacuum Cleaner at 10 feet
Commercial Area		Normal Speech at 3 feet
Heavy Traffic at 300 feet	—60—	Sewing Machine
Air Conditioner		Large Business Office
Quiet Urban Area during Daytime	—50—	Dishwasher in Next Room
		Refrigerator
Quiet Urban Area during Nighttime	—40—	Theater, Large Conference Room (background)
Quiet Suburban Area during Nighttime		
	—30—	Library
Quiet Rural Area during Nighttime		Bedroom at Night, Concert Hall (background)
	—20—	
		Broadcast/Recording Studio
	—10—	
Lowest Threshold of Human Hearing	—0—	Lowest Threshold of Human Hearing

Notes: dBA = A-weighted decibels
Source: American Association of State Highway and Transportation Officials. *Guide on Evaluation and Attenuation of Traffic Noise*. 1974

Noise levels from a source decline as distance to the receptor increases. Other factors, such as the weather and reflecting or shielding structures, also may intensify or reduce the noise level at a location. Sound waves reflect off of hard surfaces, but are partially absorbed by softer or irregular surfaces. A commonly used rule of thumb for roadway noise is that for every doubling of distance from the source, the noise level is reduced by about 3 dBA at acoustically “hard” locations (i.e., where the area between the noise source and the receptor is nearly complete asphalt, concrete, hard-packed soil, or other solid materials) and 4.5 dBA at acoustically “soft” locations (i.e., where the area between the source and receptor is unpacked earth or has vegetation, including grass). Noise from stationary or point sources (such as construction equipment) is reduced by about 6 to 7.5 dBA for every doubling of distance at acoustically hard and soft locations, respectively. Generally, if a noise source is completely enclosed or completely shielded with a solid barrier located close to the source, an 8 dBA noise reduction can be expected; if the enclosure or barrier is interrupted, noise would be reduced by only 5 dBA. The exterior-to-interior reduction of newer residential units and office buildings is generally 30 dBA or more.

3.12.2 Fundamentals of Environmental Ground-borne Vibration

Vibration is the periodic oscillation of a medium or object. The rumbling sound caused by the vibration of room surfaces is called groundborne noise. Both natural phenomena (e.g., earthquakes, volcanic eruptions, sea waves, landslides) and human-made causes (e.g., explosions, machinery, traffic, trains, construction equipment) can result in groundborne vibration. Some vibration sources, such as factory machinery, are continuous; others, such as explosions, are transient. Vibration amplitude is typically expressed in peak particle velocity (PPV) or root mean square (RMS), as in RMS vibration velocity. The PPV and RMS velocity are normally described in inches per second (in/sec). PPV is defined as the maximum instantaneous positive or negative peak of a vibration signal. PPV is the metric often used to describe blasting vibration and other vibration sources that result in structural stresses in buildings (FTA, 2006).

Although PPV is appropriate for evaluating the potential for building damage, it is not always suitable for evaluating human response. It takes some time for the human body to respond to vibration signals. In a sense, the human body responds to average vibration amplitude. The RMS of a signal is the average of the squared amplitude of the signal, typically calculated over a period of 1 second. As with airborne sound, the RMS velocity is often expressed in decibel notation as vibration decibels (VdB), which serves to compress the range of numbers required to describe vibration (FTA, 2006). This vibration decibel scale is based on a reference value of 1 microinch per second (µin/sec). The background vibration-velocity level typical of residential areas is approximately 50 VdB.

Groundborne vibration is normally perceptible to humans at approximately 65 VdB. For most people, a vibration-velocity level of 75 VdB is the approximate dividing line between barely perceptible and distinctly perceptible levels. Table 3.12-2 summarizes the general human response to different levels of groundborne vibration.

Table 3.12-2: Human Response to Different Levels of Groundborne Vibration

Vibration-Velocity Level (VdB)	Human Reaction
65	Approximate threshold of perception.
75	Approximate dividing line between barely perceptible and distinctly perceptible. Many people find that transportation-related vibration at this level is unacceptable.
85	Vibration acceptable only if there is an infrequent number of events per day.

Note:
VdB = vibration decibels referenced to 1 microinch per second and based on the root mean square vibration velocity.
Source: FTA, 2006

Sensitive Receptors

People typically experience annoyance when they are exposed to vibration that exceeds certain thresholds. These thresholds are generally lower than threshold levels for vibration-related building damage. Buildings that are normally occupied by people are considered sensitive to groundborne vibration. Historical or lightweight buildings are considered most vulnerable to vibration damage; thus, more stringent vibration-damage thresholds are recommended for these building types. Buildings used for research, manufacturing, or healthcare operations that are sensitive to very low thresholds of vibration to function effectively (e.g., magnetic resonance imaging [MRI] or microelectronics manufacturing facilities) are also considered vibration sensitive; groundborne vibration can result in structural damage and/or interfere with the intended functions of such buildings (FTA, 2006).

3.12.3 Regulatory Framework

Noise Control Act

The USEPA Office of Noise Abatement and Control was established to coordinate Federal noise control activities. After its inception, the Office of Noise Abatement and Control established programs and guidelines under the Federal Noise Control Act of 1972 to identify and address the effects of noise on public health and welfare and the environment. A summary of recommended guidelines for noise levels considered safe for community exposure without the risk of adverse effects on health or welfare are presented in Table 3.12-3 (EPA, 1974). To prevent hearing loss over the lifetime of a receptor, the yearly average L_{eq} should not exceed 70 dBA; to prevent activity interference and annoyance, the L_{dn} should not exceed 55 dBA in outdoor activity areas or 45 dBA indoors.

Table 3.12-3: Summary of Noise-Level Standards Recommended by the U.S. Environmental Protection Agency

Effect	Level	Area
Hearing loss	$L_{eq(24)} \leq 70$ dB	All areas
Outdoor activity interference and annoyance	$L_{dn} \leq 55$ dB	Outdoor in residential areas and farms and other outdoor areas where people spend widely varying amounts of time and other places in which quiet is a basis for use
	$L_{eq(24)} \leq 55$ dB	Outdoor areas where people spend limited amounts of time, such as school yards and playgrounds
Indoor activity interference and annoyance	$L_{dn} \leq 45$ dB	Indoor residential areas
	$L_{eq(24)} \leq 45$ dB	Other indoor areas with human activities, such as schools

Notes:
dB = decibels; EPA = U.S. Environmental Protection Agency; L_{dn} = day-night noise level (L_{eq} with a 10-dB nighttime weighting); $L_{eq(24)}$ = equivalent noise level (the sound energy averaged over a 24-hour period)
Source: EPA, 1974

The Noise Control Act is applicable to the EA Alternatives insofar as it establishes general guidelines related to what would be considered acceptable noise levels generated by a project alternative and perceived by adjacent or on-site receptors.

Federal Transit Administration Groundborne Vibration Guidelines

To address the human response to groundborne vibration, the Federal Transit Administration (FTA) has guidelines for maximum-acceptable vibration criteria for different types of land uses. Maximum-acceptable vibration criteria based on the frequency of an event are applied to different types of land uses to address the human response to groundborne vibration (FTA, 2006). These guidelines recommend 65 VdB, referenced to 1 microinch per second (μin/sec) and based on the velocity amplitude for land uses where low ambient vibration is essential for interior operations (e.g., hospitals, high-tech manufacturing, laboratory facilities); 80 VdB for residential uses and buildings where people normally sleep; and 83 VdB for institutional land uses with primarily daytime operations (e.g., schools, churches, clinics, offices) (FTA, 2006). Table 3.12-4 shows the allowable project-generated noise level increases determined to be acceptable.

Table 3.12-4: Summary of Groundborne-Vibration Impact Criteria Recommended by the Federal Transit Administration

Land Use Category	Impact Levels (VdB; relative to 1 μin/sec)		
	Frequent Events[1]	Occasional Events[2]	Infrequent Events[3]
Category 1: Buildings where vibration would interfere with interior operations	65[4]	65[4]	65[4]
Category 2: Residences and buildings where people normally sleep	72	75	80
Category 3: Institutional land uses with primarily daytime uses	75	78	83

Notes:
FTA = Federal Transit Administration; VdB = vibration decibels; μin/sec = microinch per second
1 Defined as more than 70 vibration events of the same source per day. Most rapid transit projects fall into this category.
2 Defined as 30–70 vibration events of the same source per day. Most commuter trunk lines have this many operations.
3 Defined as fewer than 30 vibration events of the same kind per day. This category includes most commuter rail branch lines.
4 This criterion limit is based on levels that are acceptable for most moderately sensitive equipment, such as optical microscopes. Vibration-sensitive manufacturing or research will require detailed evaluation to define the acceptable vibration levels. Ensuring lower vibration levels in a building often requires special design of the heating, ventilation, and air conditioning systems and stiffened floors.
Source: FTA, 2006

Standards also have been established to address the potential for construction-caused vibration annoyance or interference. The primary concern related to construction vibration is the potential for the operation of heavy-duty construction equipment to cause structural damage to buildings. Varying criteria have been developed to address the appropriate level of vibration considered acceptable before it may result in damage to structures or varying building types (FTA, 2006). Table 3.12-5 shows the allowable project-generated vibration-level thresholds determined to be acceptable for different building types.

Table 3.12-5: Summary of Vibration-Damage Criteria Recommended by the Federal Transit Administration

Building Category	PPV (in/sec)	Approximate VdB
Reinforced concrete, steel, or timber (no plaster)	0.5	102
Engineered concrete and masonry (no plaster)	0.3	98
Nonengineered timber and masonry buildings	0.2	94
Buildings extremely susceptible to vibration damage	0.12	90

Notes:
FTA = Federal Transit Administration; in/sec = inches per second; PPV = peak particle velocity; VdB = vibration decibels
Source: FTA, 2006

The criteria established by FTA and noted above are applicable to the Proposed Action because they are widely used and provide a sound basis for determining how the vibration levels generated by the EA Alternatives would be perceived by adjacent or on-site receptors.

3.12.4 Affected Environment

Existing Noise and Vibration Sources

VA Transfer Parcel

Very few noise sources currently exist within the VA Transfer Parcel. No public roadways currently traverse this area and public access is restricted. Noise sources that contribute to the overall ambient noise level in the area include occasional maintenance vehicles and marine activities along the Oakland Estuary and San Francisco Bay. Management activities for the CLT colony that occur before and during nesting/breeding season also contribute to the noise sources during those times.

Surrounding Area

The predominant noise sources in the surrounding area are mobile sources, such as personal-occupancy and delivery vehicles, and stationary equipment, such as heating, ventilation, and air conditioning (HVAC) systems. Vehicle traffic consists primarily of personal-occupancy vehicles, because there is limited public-transit traffic in the Alameda Point area. Most of the perceivable noise from stationary-source equipment is located in the eastern portion of Alameda Point, where there are existing structures. Other stationary-source noise in the area is generated largely on the rooftops of existing structures and shielded from view by the existing structures.

Noise Measurements

To identify representative noise levels in the Alameda Point area, existing daytime noise levels were monitored on March 11, 2009, from 7 A.M. to 7 P.M. at one location on the VA Transfer Parcel (i.e., northwest corner of the California Least Tern colony). Noise levels were measured using a Larson-Davis Model 820 precision sound level meter, which satisfies the requirements of the American National Standards Institute for general environmental noise measurement instrumentation. The maximum, minimum, and average noise levels measured at the VA Transfer Parcel are identified in Table 3.12-6.

Table 3.12-6: Existing Ambient Noise Levels in the Study Area

Location	Average Noise Level	Maximum Noise Level	Minimum Noise Level
Northwest Corner of CLT colony	52 dBA L_{eq}	100 dBA L_{max}	38 dBA L_{min}

Notes: dBA = A-weighted decibels; L_{eq} = energy-equivalent noise level; L_{max} = maximum noise level (the maximum instantaneous noise level during a specific period); L_{min} = minimum noise level (the minimum instantaneous noise level during a specific period)

Source: Data compiled by AECOM in 2009

Noise-sensitive Receptors

VA Transfer Parcel

There are no sensitive human noise-sensitive receptors within the existing VA Transfer Parcel. However, the VA Transfer Parcel does include wildlife noise-sensitive receptors, the CLT colony. See Section 3.1 (Biological Resources) for a discussion of noise as it relates to the existing CLT colony.

Surrounding Area

The nearest sensitive human receptors to the VA Transfer Parcel are located in the surrounding area. These receptors include residential homes located near the northeast corner of Alameda Point, south of Main Street, approximately 3,700 feet east of the eastern edge of the VA Transfer Parcel. Receptors near roadways that would be used by project traffic include residential areas and schools adjacent to Atlantic Avenue (Ralph Appezzato Memorial Parkway) east of Main Street. It should also be noted that existing noise levels at the project site are considered acceptable for sensitive receptors. As noted above, EPA generally establishes a noise standard of 55 dBA L_{eq} for outdoor areas where people spend limited amounts of time. Existing ambient noise levels do not exceed these standards, and, as a result, are considered acceptable.

3.12.5 Environmental Consequences

Assessment Methods

To assess potential noise impacts from implementation of the EA Alternatives, the effects of construction-related and operational activities on sensitive receptors were identified and assessed. The noise (and vibration) levels of equipment expected to be used in various construction and operational projects were determined and resultant noise levels at sensitive receptors were calculated, assuming documented rates of noise (vibration) attenuation.

Alternative 1

Construction

<u>Noise</u>

Initial construction under Alternative 1 would take approximately 18 months to complete and would entail development of the VHA OPC, VBA Outreach Office, Conservation Management Office, NCA Cemetery, and associated infrastructure within the VA Development Area and an off-site access utility/road corridor. It is anticipated that approximately 441,000 cubic yards of fill would be trucked to the VA Development Area for the initial construction. All construction staging areas would be located within the VA Development Area.

Equipment required for all construction activities under Alternative 1 would include scrapers, graders, loaders, backhoes, vibratory rollers, on-site dump trucks, welders, rollers, pavers, Cone Penetration Technology (CPT) rigs, cement/mortar mixers, and water trucks. Additional equipment required only during the initial construction would include tracked dozers and cranes. In addition to general construction equipment, pile driving or deep-compaction techniques would be required for structural foundations.

Construction noise is generated by the operation of construction equipment and vehicles and by the transport of material and workers to and from the site. Construction noise levels are a function of the type of equipment used and the timing and duration of the noise-generating activities. Noise levels vary for individual pieces of equipment, because equipment comes in different sizes and with different engines. Construction equipment noise levels also vary as a function of the activity level or duty cycle. Typical construction projects, with equipment moving from one point to another, work breaks, and idle time, have lower long-term average noise levels than louder short-term noise events. Additionally, noise levels are calculated from the center of the activity because of the dynamic nature of a construction site. Table 3.12-7 lists noise generation levels for various types of equipment that could be used to construct site facilities.

Table 3.12-7: Noise Levels of Typical Construction Equipment

Equipment Type	Typical Noise Level (dBA) @ 50 feet	Usage Factor (%)
Air compressor	80	40
Backhoe	80	40
Concrete pump truck	82	20
Crane, mobile	85	16
Dozer	85	40
Excavator	85	40
Front-end loader	80	40
Generator	82	50
Pneumatic tools	85	50
Pumps	77	50
Roller	85	20
Welder	73	40
Trucks	74–81	

Notes:
dBA = A-weighted decibels; usage factor = the percent per hour equipment is in use.
All equipment is fitted with a properly maintained and operational noise control device, per manufacturer specifications. Noise levels listed are manufacturer-specified noise levels for each piece of heavy construction equipment.
Source: FTA, 2006

Maximum noise levels from construction equipment typically range from approximately 70 dBA to 90 dBA at 50 feet from the equipment (Table 3.12-7). In a typical construction project, the generators of the loudest short-term noise tend to be earth-moving equipment under full load at approximately 85–90 dBA at a distance of 50 feet from the source. In addition to these maximum instantaneous noise levels, the magnitude of construction noise can be defined by the type of construction activity, the various pieces of equipment operating, and the duration of the activity. Typically, construction noise is averaged over time and expressed as dBA L_{eq}.

Noise levels from construction activities are typically considered “point” sources and attenuate with distance at a rate of 6 dBA per doubling of distance over hard site surfaces, such as streets and parking lots, and a rate of 7.5 dBA per doubling of distance for soft site surfaces, such as grass fields and open terrain with vegetation (FTA, 2006). Operational noise from constructed facilities includes equipment operation (e.g., pumps, generators, fans), vehicle trips to and from the facilities for operation and maintenance, and facility worker trips.

During initial construction under Alternative 1 a maximum noise level of 85 dBA L_{max} and hourly noise level of 77 dBA L_{eq} is projected to occur at a distance of 50 feet from the center of typical construction activity. Pile-driving activities are projected to generate maximum noise levels of 95 dBA L_{max} at 50 feet each time the hammer head strikes the pile. It is estimated that the actual strike of an impact pile driver accounts for 20% of each hour that the equipment is operating on site, thus resulting in an average hourly noise level of 88 dBA L_{eq} at 50 feet from the pile being driven. See Appendix G (Noise Assessment Worksheets) for complete construction noise modeling results.

The nearest human noise-sensitive receptor (residential area located east of the VA Transfer Parcel on Pan Am Way) is located approximately 3,700 feet (approximately 0.7 mile) from the edge of the VA Development Area. The intervening ground is a mix of developed buildings, green space, and concrete and would be considered acoustically soft because of surface variability and intervening structures. For the purposes of this impact analysis, construction activities are conservatively considered to potentially occur anywhere within the VA Development Area identified for improvements (e.g., the VHA OPC, parking lot, NCA Cemetery improvements).

Construction noise attributable to Alternative 1 was estimated using the FTA's noise methodology for predicting noise from heavy equipment (FTA, 2006). Construction noise levels at the nearest off-site receptor were modeled based on these parameters. The modeling generated a maximum noise level of 36 dBA L_{max} and 28 dBA L_{eq} at the nearest off-site receptor during the initial construction which would be the most intense phase of construction. Pile-driving noise levels at the nearest off-site receptor were also modeled; the modeling generated a maximum noise level of 46 dBA L_{max} and 38 dBA $L_{eq.}$ These modeled noise levels at the nearest off-site receptor would be considered inaudible relative to existing background noise levels. No new receptors would be affected during the subsequent phases of cemetery construction.

Construction during Alternative 1 would require haul trips on area roads as trucks transport fill materials from local commercial quarries to the VA Development Area. Estimates of noise levels are based on the amount of material to be hauled, the number of days of construction, and the hours per day when hauling would occur. Construction-related traffic would be distributed over the roadway network identified in the traffic impact study prepared for this EA (AECOM, 2012). Based on estimates of fill needed for Alternative 1, a maximum of 372 haul trucks per day would be needed at the peak of construction activities. Noticeable increases of 3 dBA (L_{dn}) typically do not occur without a doubling in roadway traffic volumes (Caltrans, 2009:N-96). Existing intersection peak-hour traffic volumes range from 191 to 232 trips per hour; Alternative 1–related haul trucks would generate approximately 16 additional trips per hour at the two main intersections accessing the VA Development Area (Willie Stargell Avenue and Atlantic Avenue). Because Alternative 1 would add less than double the traffic volume to the existing roadways, noise increases from construction traffic under this alternative is projected to be less than 3 dBA.

In summary, noise levels during initial construction under Alternative 1 is projected to be less than 55 dBA at the nearest sensitive human receptors, and off-site construction traffic would not result in a substantial increase in area traffic; thus, temporary noise generated by Alternative 1 construction activities would not result in a substantial increase in the ambient noise environment. As a result, construction-related noise impacts of Alternative 1 would be short term and would not be significant. A discussion of potential effects to biological resources is included in Section 3.1 (Biological Resources).

It is assumed subsequent phased expansion of the cemetery as part of construction under Alternative 1 would include periodic development of 6 acres of land over a period of approximately 12 months beginning in 2026. In addition, it is anticipated that approximately 62,400 cubic yards of fill would be delivered by truck to the VA Development Area for the cemetery under the subsequent phases of cemetery construction under Alternative 1. Noise levels during the first phase of construction is projected to be less than 55 dBA at the nearest sensitive receptor and construction would be substantially less during subsequent phases of cemetery construction. Under subsequent phases of cemetery construction under Alternative 1, noise impacts would be similar to or less than the impact identified for initial construction, because construction during these later phases generally would involve activities that would occur farther from existing off-site receptors and would be less intense. Because future phases of development (i.e., NCA National Cemetery) under Alternative 1 would result in noise less than 55 dBA at the nearest sensitive receptors, temporary noise generated by construction activities during these future phases would not result in a substantial increase in the ambient noise environment. As a result, construction-related noise impacts associated with subsequent cemetery construction under Alternative 1 would be short term and would not be significant.

Vibration

Construction activities would result in varying degrees of temporary groundborne vibration, depending on the specific construction equipment used and the activities involved. Vibration generated by construction equipment that would be used during initial construction of Alternative 1 spreads through the ground and diminishes in magnitude with increases in distance. Using FTA's recommended procedure (FTA, 2006) to apply a propagation adjustment to these reference levels, construction activities would need to occur within 40 feet of vibration-sensitive receptors to exceed 80 VdB, FTA's maximum-acceptable vibration standard with respect to human annoyance for sensitive uses. Activities would need to occur within 15 feet to exceed 0.2 PPV in/sec, FTA's maximum-acceptable vibration standard with respect to structural damage. See Appendix G (Noise Assessment Worksheets) for complete construction vibration modeling results.

Because there are no existing on-site human sensitive receptors (i.e., residences and inpatient facilities), and because off-site human sensitive receptors would be a minimum of 3,700 feet from the proposed development, construction of Alternative 1 would occur well beyond the threshold distances identified above and would not expose any sensitive human receptors to excessive levels of vibration. As a result, construction-related vibration impacts of Alternative 1 would be short-term and would not be significant.

On-site vibration levels during subsequent construction of the NCA Cemetery (approximately 6 acres over a period of 12 months as needed from 2026 through 2116) would be less than the aforementioned FTA standards at the nearest sensitive receptors. Construction of the subsequent cemetery phases would be substantially less than under the initial facility construction. Therefore, temporary vibration generated by Alternative 1 subsequent cemetery construction activities would not result in a substantial increase in vibration. Construction-related vibration impacts of Alternative 1 subsequent cemetery construction would be short term and would not be significant.

Operation

Mobile-Source Noise

Operation of the proposed VA facilities under Alternative 1 would result in an increase in traffic volumes on the local roadway network, and consequently, in an increase in noise levels from traffic sources along affected roadway segments. Traffic noise levels associated with Alternative 1 were calculated for roadway segments that would receive the greatest contribution of project-generated traffic in the vicinity of the VA Development Area, using the FHA's Highway Noise Prediction Model (FHWA-RD-77-108).

Traffic noise levels were modeled under existing conditions. Traffic volumes were derived from 2017 P.M. peak-hour intersection volumes as presented in the traffic impact study prepared for this project (AECOM, 2013). Table 3.12-8 summarizes the modeled traffic noise levels of Alternative 1 (year 2017) at 100 feet from the centerline

Table 3.12-8: Predicted Traffic Noise Levels at Full Buildout of Alternative 1 (Year 2017)

Roadway	Segment		L_{dn} at 100 Feet, dB				
	From	To	Existing	Existing Plus Project	Net Change	Significance Threshold	Significant Impact?
Atlantic Avenue	Webster Street	Main Street	64.8	65.0	0.2	1.5	No
Willie Stargell Avenue	Webster Street	Main Street	63.8	64.4	0.6	3	No
Main Street	Atlantic Avenue	Willie Stargell Avenue	61.9	63.1	1.2	3	No
Webster Street	Atlantic Avenue	Willie Stargell Avenue	68.6	68.7	0.1	1.5	No
Webster Street	Willie Stargell Avenue	North	69.9	70.1	0.2	1.5	No

Notes: dB = (A-weighted) decibels; L_{dn} = day-night average noise level
Traffic noise levels are predicted at a standard distance of 100 feet from the roadway centerline and do not account for shielding from existing noise barriers or intervening structures. Traffic noise levels may vary depending on actual setback distances and localized shielding.
Source: Data compiled by AECOM in 2012

of affected roadway segments in the project area. Additional input data included day/night percentages of automobiles, medium and heavy trucks, vehicle speeds, ground attenuation factors, and roadway widths. See Appendix G (Noise Assessment Worksheets) for complete traffic noise modeling results.

The modeling conducted shows that implementation of Alternative 1 in 2017 in addition to then-existing conditions would result in traffic noise-level increases up to 1.2 dB L_{dn} compared to existing noise levels. Therefore, noise levels from traffic generated by Alternative 1 would not result in a substantial permanent increase in ambient noise levels. Accordingly, the operational noise impacts of Alternative 1 from mobile sources would not be significant.

Stationary-Source Noise

Implementing Alternative 1 would result in an increase in on-site stationary-source noise associated with operation of HVAC units as part of the use of proposed buildings, loading docks, landscaping, maintenance, and parking areas. The VHA OPC and NCA Cemetery would be day-use-only facilities, and no overnight sensitive receptors (i.e., residences or inpatient facilities) would be located on site. Because of the distance (3,700 feet) and intervening structures between Alternative 1 development and the nearest human sensitive receptors, noise levels from stationary sources located on site would have to exceed 102 dBA—equivalent to a jet flyover (Table 3.12-1)—to exceed 55 dBA at the nearest sensitive receptor. No stationary noise sources proposed by Alternative 1 would generate noise exceeding 102 dBA. (Typical HVAC noise ranges from 45 dBA to 70 dBA L_{eq} at a distance of 50 feet [EPA, 1971].) In addition to this stationary-source noise, periodic firearm salutes would take place during ceremonies and events on cemetery property. These salutes would be short in duration (less than 10 minutes) and would occur infrequently. As a result, operation of stationary noise sources under Alternative 1 would not cause ambient noise levels at nearby sensitive receptors to increase substantially. Thus, the operational noise impacts of Alternative 1 from stationary sources would not be significant. See Section 3.1 (Biological Resources) for a discussion of potential effects to biological resources.

Vibration

Long-term project operation under Alternative 1 would not include any major sources of vibration. In addition, there are no on-site human sensitive receptors, and off-site human receptors would be a minimum of 3,700 feet from the proposed development. Therefore, operations under Alternative 1 would not expose any sensitive human receptors to excessive levels of vibration and would have no permanent effect on groundborne vibration. Thus, vibration impacts of Alternative 1 would not be significant.

Alternative 2 (Preferred Alternative)

Construction

Noise

Alternative 2 would involve construction activities similar to those of Alternative 1. Alternative 2 construction activities would occur in different locations on the VA Transfer Parcel than activities for Alternative 1; however, as under Alternative 1, the nearest sensitive human receptors are 3,700 feet from the construction activities proposed for Alternative 2. Therefore, modeling of construction noise levels for Alternative 2 generated a maximum noise level of 36 dBA L_{max} and 28 dBA L_{eq} at the nearest off-site receptor during the most intense phase of construction (Phase 1). Pile-driving noise levels at the nearest off-site human receptor would generate a maximum noise level of 46 dBA L_{max} and 38 dBA L_{eq} at the nearest off-site receptor. These maximum construction noise levels are identical to the maximum noise levels modeled for Alternative 1. As noted above

(Table 3.12-6), ambient noise levels in the area average approximately 52 dBA L_{eq}. Thus, on-site construction equipment would be considered inaudible relative to existing background noise levels.

Construction traffic associated with Alternative 2 also would be similar to construction traffic for Alternative 1, with approximately 16 trips per hour per intersection. As noted above, noticeable increases of 3 dBA (L_{dn}) typically do not occur without a substantial (i.e., doubling) increase in roadway traffic volumes (Caltrans, 2009:N-96). As under Alternative 1, construction trips associated with Alternative 2 would not double existing traffic volumes, and therefore would not substantially increase the area's traffic noise levels. Construction under Alternative 2 would not result in a substantial temporary increase in ambient noise levels, nor would it generate noise exceeding applicable standards. As a result, Alternative 2 construction activities would not result in a substantial increase in the ambient noise environment. Construction-related noise impacts of Alternative 2 would be short-term and would not be significant.

Vibration

Alternative 2 would involve construction activities similar to those of Alternative 1. Alternative 2 construction activities would occur in different locations on the VA Transfer Parcel than activities for Alternative 1; however, as under Alternative 1, the nearest sensitive human receptors to any initial construction activity are 3,700 feet away (i.e., residential development located near northeast corner of Alameda Point). Using FTA's recommended procedure (FTA, 2006) to apply a propagation adjustment to these reference levels, construction activities would need to occur within 40 feet of vibration-sensitive human receptors to exceed 80 VdB, FTA's maximum-acceptable vibration standard with respect to human annoyance for sensitive uses. Activities would need to occur within 15 feet to exceed 0.2 PPV in/sec, FTA's maximum-acceptable vibration standard with respect to structural damage.

Because there are no on-site human sensitive receptors (i.e., residences and in-patient facilities), and because off-site receptors would be a minimum of 3,700 feet from the proposed development, construction of Alternative 2 facilities would not expose any sensitive human receptors to excessive levels of vibration. As a result, construction-related vibration impacts of Alternative 2 initial construction would be short-term and would not be significant.

It is assumed that as part of subsequent cemetery phase construction under Alternative 2 additional areas of the proposed NCA Cemetery would be developed over a period of approximately 12 months beginning in 2026. On-site vibration levels during initial construction would be less than FTA standards at the nearest sensitive human receptors and construction would be substantially less under subsequent cemetery phase construction than under initial construction. Therefore, temporary vibration generated by Alternative 2, subsequent cemetery phase construction activities would not result in a substantial increase in vibration. Construction-related impacts of Alternative 2 subsequent cemetery phases would be short-term and would not be significant.

Operation

Mobile-Source Noise

Alternative 2 would generate the same levels of traffic as Alternative 1. Like Alternative 1, Alternative 2 would result in a maximum increase of 1.2 dBA L_{dn} over existing conditions (Table 3.12-8). Therefore, implementing this alternative would not result in a substantial permanent increase in ambient noise levels, nor would it cause existing noise to exceed applicable standards. Noise levels from traffic generated by Alternative 2 would not result in a substantial increase in the ambient traffic noise environment. Accordingly, the operational noise impacts of Alternative 2 from mobile sources would not be significant.

Stationary-Source Noise

Implementing Alternative 2 would involve the operation of stationary sources of the same type and on the same scale as implementing Alternative 1. Alternative 2 sources would be located in different locations on the VA Transfer Parcel; however, as under Alternative 1, the nearest sensitive human receptors are 3,700 feet away. Therefore, like Alternative 1, Alternative 2 would not include stationary sources that could generate noise levels sufficient to cause annoyance to these receptors or cause existing noise to exceed applicable standards. Alternative 2 would not result in a substantial increase in the ambient noise environment. The operational noise impacts of Alternative 2 from stationary sources would not be significant.

Vibration

As under Alternative 1, long-term project operation under Alternative 2 would not include any major sources of vibration. In addition, there are no on-site sensitive human receptors, and off-site human receptors would be a minimum of 3,700 feet from the proposed development. Therefore, operations under Alternative 2 would not expose any sensitive receptors to excessive levels of vibration and would have no permanent effect on groundborne vibration and noise. Thus, vibration impacts of Alternative 2 would not be significant.

No Action Alternative

Construction

Under the No Action Alternative, the Fed-to-Fed transfer would not take place and the proposed development (e.g., VHA OPC, VBA Outreach Office, NCA Cemetery, etc.) would not be built. Therefore, no significant construction impacts on noise or vibration would occur.

Operation

Under the No Action Alternative, the Fed-to-Fed transfer would not take place and the proposed development and operations (e.g., VHA OPC, VBA Outreach Office, NCA Cemetery, etc.) would not occur. Therefore, no significant operational impacts on noise or vibration would occur.

3.12.6 References

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