E. NOISE

This section describes existing noise conditions for the Measure DD Implementation Project area, describes criteria for determining the significance of noise impacts, and estimates the likely noise that would result from the proposed project. Mitigation measures are recommended to reduce project-related noise impacts to a less-than-significant level, as appropriate.

1. Setting

The setting section begins with an introduction to several key concepts and terms that are used in evaluating noise. It then explains the various agencies that regulate the noise environment in the City of Oakland and summarizes key standards that are applied to proposed development. This setting section concludes with a description of current noise sources that affect the project site and the noise conditions that are experienced in the project site vicinity.

a. Characteristics of Sound. Noise is generally defined as unwanted sound. Noise consists of any sound that may produce physiological or psychological damage and/or interfere with communication, work, rest, recreation, and sleep.

To the human ear, sound has two significant characteristics: *pitch* and *loudness*. Pitch is the number of complete vibrations or cycles per second of a wave that results in the range of tone from high to low. Loudness is the strength of a sound that describes a noisy or quiet environment, and it is measured by the amplitude of the sound wave. Loudness is determined by the intensity of the sound waves combined with the reception characteristics of the human ear. Sound intensity refers to how hard the sound wave strikes an object, which in turn produces the sound's effect. This characteristic of sound can be precisely measured with instruments. The analysis of a project defines the noise environment of the project area in terms of sound intensity and its effects on adjacent sensitive land uses.

(1) Measurement of Sound. The decibel (dB) is a unit of measurement that indicates the relative intensity of a sound. Furthermore, sound intensity is measured through the A-weighted scale (dBA) to correct for the relative frequency response of the human ear. That is, an A-weighted noise level de-emphasizes low and very high frequencies of sound in a manner similar to the human ear's de-emphasis of these frequencies. Unlike linear units such as inches or pounds, decibels are measured on a logarithmic scale, representing points on a sharply rising curve. Table IV.E-1 contains a list of typical acoustical terms and definitions. Table IV.E-2 shows representative outdoor and indoor noise levels in units of dBA.

The 0 point on the dBA scale is based on the lowest sound level that the healthy, unimpaired human ear can detect. Changes of 3 dBA or less are only perceptible in laboratory environments. Audible increases in noise levels generally refer to a change of 3 dBA or more, as this level has been found to be barely perceptible to the human ear in outdoor environments. Sound levels in dB are calculated on a logarithmic basis. An increase of 10 dB represents a 10-fold increase in acoustic energy, while 20 dB is 100 times more intense, 30 dB is 1,000 times more intense. Each 10-dB increase in sound level is perceived as approximately a doubling of loudness.

Table IV.E-1: Definitions of Acoustical Terms

Term	Definitions
Decibel, dB	A unit of level that denotes the ratio between two quantities proportional to power; the number of decibels is 10 times the logarithm (to the base 10) of this ratio.
Frequency, Hz	Of a function periodic in time, the number of times that the quantity repeats itself in one second (i.e., number of cycles per second).
A-Weighted Sound Level, dBA	The sound level obtained by use of A-weighting. 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. All sound levels in this report are A-weighted, unless reported otherwise.
L_{01}, L_{10}, L_{50}, L_{90}	The fast A-weighted noise levels equaled or exceeded by a fluctuating sound level for 1 percent, 10 percent, 50 percent, and 90 percent of a stated time period.
Equivalent Continuous Noise Level, L_{eq}	The level of a steady sound that, in a stated time period and at a stated location, has the same A-weighted sound energy as the time varying sound.
Community Noise Equivalent Level, CNEL	The 24-hour A-weighted average sound level from midnight to midnight, obtained after the addition of five decibels to sound levels occurring in the evening from 7:00 p.m. to 10:00 p.m. and after the addition of 10 decibels to sound levels occurring in the night between 10:00 p.m. and 7:00 a.m.
Day/Night Noise Level, L_{dn}	The 24-hour A-weighted average sound level from midnight to midnight, obtained after the addition of 10 decibels to sound levels occurring in the night between 10:00 p.m. and 7:00 a.m.
L_{max}, L_{min}	The maximum and minimum A-weighted sound levels measured on a sound level meter, during a designated time interval, using fast time averaging.
Ambient Noise Level	The all encompassing noise associated with a given environment at a specified time, usually a composite of sound from many sources at many directions, near and far; no particular sound is dominant.
Intrusive	The noise that intrudes over and above the existing ambient noise at a given location. The relative intrusiveness of a sound depends upon its amplitude, duration, frequency, and time of occurrence and tonal or informational content as well as the prevailing ambient noise level.

Source: Handbook of Acoustical Measurements and Noise Control, 1991.

Table IV.E-2: Typical A-Weighted Sound Levels

Noise Source	A-Weighted Sound Level in Decibels	Noise Environments
Near Jet Engine	140	Deafening
Civil Defense Siren	130	Threshold of pain
Hard Rock Band	120	Threshold of feeling
Accelerating Motorcycle at a Few Feet Away	110	Very loud
Pile Driver; Noisy Urban Street/Heavy City Traffic	100	Very loud
Ambulance Siren; Food Blender	95	Very loud
Garbage Disposal	90	Very loud
Freight Cars; Living Room Music	85	Loud
Pneumatic Drill; Vacuum Cleaner	80	Loud
Busy Restaurant	75	Moderately loud
Near Freeway Auto Traffic	70	Moderately loud
Average Office	60	Moderate
Suburban Street	55	Moderate
Light Traffic; Soft Radio Music in Apartment	50	Quiet
Large Transformer	45	Quiet
Average Residence Without Stereo Playing	40	Faint
Soft Whisper	30	Faint
Rustling Leaves	20	Very faint
Human Breathing	10	Very faint

Source: Compiled by LSA Associates, Inc., 2004.

As noise spreads from a source, it loses energy so that as the noise receiver moves farther away from the noise source, the perceived noise level decreases. Geometric spreading causes the sound level to attenuate or decrease, generally resulting in a 6 dB reduction in the noise level for each doubling of distance from a single point source of noise to the noise sensitive receptor of concern.

There are many ways to rate noise for various time periods, but an appropriate rating of ambient noise affecting humans also accounts for the annoying effects of sound. Equivalent continuous sound level (L_{eq}) is the total sound energy of time varying noise over a sample period. However, the predominant rating scales for human communities in the State of California are the L_{eq}, the community noise equivalent level (CNEL), and the day-night average level (L_{dn}) based on the dBA scale. CNEL is the time varying noise over a 24-hour period, with a 5 dBA weighting factor applied to the hourly L_{eq} for noises occurring from 7:00 p.m. to 10:00 p.m. (defined as relaxation hours) and 10 dBA weighting factor applied to noise occurring from 10:00 p.m. to 7:00 a.m. (defined as sleeping hours). L_{dn} is similar to the CNEL scale, but without the adjustment for events occurring during the evening hours. CNEL and L_{dn} are within one dBA of each other and are normally interchangeable. The noise adjustments are added to the noise events occurring during the more sensitive hours. Typical A-weighted sound levels from various sources are described in Table IV.E-2.

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

Noise impacts are generally considered at three levels: audible, potentially audible, and inaudible. Audible impacts refer to increases in noise levels noticeable to humans. Audible increases in noise levels generally refer to a change of 3 dBA or greater, since this level has been found to be barely perceptible in exterior environments. Potentially audible impacts refer to a change in the noise level between 1 and 3 dB. This range of noise levels has been found to be noticeable only in laboratory environments. Changes in noise levels of less than 1 dB are inaudible to the human ear. Only audible changes in existing ambient or background noise levels are considered potentially significant.

(2) Psychological and Physiological Effects of Noise. Physical damage to human hearing begins at prolonged exposure to noise levels higher than 85 dBA. Exposure to high noise levels affects our entire system, with prolonged noise exposure in excess of 75 dBA increasing body tensions, and thereby affecting blood pressure, functions of the ear, and the nervous system. In comparison, extended periods of noise exposure above 90 dBA would result in permanent cell damage. When the noise level reaches 120 dBA, a tickling sensation occurs in the human ear even with short-term exposure. This level of noise is called the threshold of feeling. As the sound reaches 140 dBA, the tickling sensation is replaced by the feeling of pain in the ear. This is called the threshold of pain. A sound level of 160 to 165 dBA will result in dizziness or loss of equilibrium.

b. Noise Regulatory Framework. This section summarizes the regulatory framework related to noise, including federal, State, and City of Oakland plans, policies and standards.

(1) U.S. Environmental Protection Agency (EPA). In 1972 Congress enacted the Noise Control Act. This act authorized the EPA to publish descriptive data on the effects of noise and

establish levels of sound "requisite to protect the public welfare with an adequate margin of safety." These levels are separated into health (hearing loss levels) and welfare (annoyance levels), as shown in Table IV.E-3. The EPA cautions that these identified levels are not standards because they do not take into account the cost or feasibility of the levels.

For protection against hearing loss, 96 percent of the population would be protected if sound levels are less than or equal to an $L_{eq(24)}$ of 70 dBA. The "(24)" signifies an L_{eq} duration of 24 hours. The EPA activity and interference guidelines are designed to ensure reliable speech communication at about 5 feet in the outdoor environment. For outdoor and indoor environments, interference with activity and annoyance should not occur if levels are below 55 dBA and 45 dBA, respectively.

The noise effects associated with an outdoor L_{dn} of 55 dBA are summarized in Table IV.E-3. At 55 dBA L_{dn}, 95 percent sentence clarity (intelligibility) may be expected at 3.5 meters, and no community reaction. However, 1 percent of the population may complain about noise at this level and 17 percent may indicate annoyance.

Table IV.E-3: Summary of Human Effects in Areas Exposed to 55 dBA L_{dn}

Type of Effects	Magnitude of Effect
Speech – Indoors	100 percent sentence intelligibility (average) with a 5 dB margin of safety.
Speech – Outdoors	100 percent sentence intelligibility (average) at 0.35 meters. 99 percent sentence intelligibility (average) at 1.0 meters. 95 percent sentence intelligibility (average) at 3.5 meters.
Average Community Reaction	None evident; 7 dB below level of significant complaints and threats of legal action and at least 16 dB below "vigorous action."
Complaints	1 percent dependent on attitude and other non-level related factors.
Annoyance	17 percent dependent on attitude and other non-level related factors.
Attitude Towards Area	Noise essentially the least important of various factors.

Source: U.S. Environmental Protection Agency, 1974. "Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety." March.

(2) State of California. The State of California has established regulations that help prevent adverse impacts to occupants of buildings located near noise sources. Referred to as the "State Noise Insulation Standard," it requires buildings to meet performance standards through design and/or building materials that would offset any noise source in the vicinity of the receptor. State regulations include requirements for the construction of new hotels, motels, apartment houses, and dwellings other than detached single-family dwellings that are intended to limit the extent of noise transmitted into habitable spaces. These requirements are found in the California Code of Regulations, Title 24 (known as the Building Standards Administrative Code), Part 2 (known as the California Building Code), Appendix Chapters 12 and 12A. For limiting noise transmitted between adjacent dwelling units, the noise insulation standards specify the extent to which walls, doors, and floor ceiling assemblies must block or absorb sound. For limiting noise from exterior noise sources, the noise insulation standards set an interior standard of 45 dBA CNEL in any habitable room with all doors and windows closed. In addition, the standards require preparation of an acoustical analysis demonstrating the manner in which dwelling units have been designed to meet this interior standard, where such units are proposed in an area with exterior noise levels greater than 60 dBA CNEL.

The State has also established land use compatibility guidelines for determining acceptable noise levels for specified land uses. However, the City has adopted and modified the State's land use compatibility guidelines, as discussed below.

(3) City of Oakland. Locally, the City of Oakland addresses noise in the City's General Plan Noise Element, the Municipal Code Noise Ordinances, and in the Standard and Uniformly Applied Conditions of Approval.

City of Oakland's General Plan Noise Element and the Municipal Code Noise Ordinances. The City of Oakland adopted a revised Noise Element in June of 2005. The City has established exterior noise thresholds of 60 dBA L_{dn} as normally acceptable for residential uses and 65 dBA L_{dn} for commercial uses. For residential uses, noise levels exceeding 60 dBA L_{dn} are conditionally acceptable with an analysis of noise reduction measures to achieve the interior noise standard of 45 dBA L_{dn}. Table IV.E-4 shows the maximum allowable receiving noise level for residential and commercial uses.

Table IV.E-4: City of Oakland Operational Noise Standards at Receiving Property Line, dBA

Cumulative Number of Minutes in Either the Daytime or Nighttime One Hour Time Period	Residential Daytime 7:00 a.m. to 10:00 p.m.	Residential Nighttime 10:00 p.m. to 7:00 a.m.	Commercial Use, Anytime
20	60	45	65
10	65	50	70
5	70	55	75
1	75	60	80
0	80	65	85

Source: City of Oakland Municipal Code Section 17.120.050 Noise

The following are the noise policies and action steps of the Noise Element and other elements of the General Plan that apply to the proposed project.

- Policy 1: Ensure the compatibility of existing and, especially, of proposed development projects not only with neighboring land uses but also with their surrounding noise environment.
    - Action 1.1: Use the noise-land use compatibility matrix (Figure 6 *of the Noise Element*) in conjunction with the noise contour maps (especially for roadway traffic) to evaluate the acceptability of residential and other proposed land uses and also the need for any mitigation or abatement measures to achieve the desired degree of acceptability.
    - Action 1.2: Continue using the City's zoning regulations and permit processes to limit the hours of operation of noise-producing activities which create conflicts with residential uses and to attach noise-abatement requirements to such activities.
    - Action 1.3: Continue working with the Alameda County Community Development Agency (in its role as the county's airport land use commission) and with the Port of Oakland to ensure consistency with the county's airport land-use plan of the city's various master-planning documents, zoning ordinance and land-use development proposals near Oakland's airport.
- Policy 2: Protect the noise environment by controlling the generation of noise by both stationary and mobile noise sources.
    - Action 2.1: Review the various noise prohibitions and restrictions under the City's nuisance noise ordinance and revise the ordinance if necessary.
    - Action 2.2: As resources permit, increase enforcement of noise-related complaints and also of vehicle speed limits and of operational noise from cars, trucks and motorcycles.
    - Action 2.3: Encourage the Port of Oakland to continue promoting its noise abatement office and programs for Oakland International Airport.
- Policy 3: Reduce the community's exposure to noise by minimizing the noise levels that are *received* by Oakland residents and others in the City. (This policy addresses the *reception* of noise whereas Policy 2 addresses the *generation* of noise.)
    - Action 3.1: Continue to use the building-permit application process to enforce the California Noise Insulation Standards regulating the maximum allowable interior noise level in new multi-unit buildings.

- Action 3.2: Review the City's noise performance standards and revise them as appropriate to be consistent with City Council policy.
- Action 3.3: Demand that Caltrans implement sound barriers, building retrofit programs and other measures to mitigate to the maximum extent feasible noise impacts on residential and other sensitive land uses from any new, widened or upgraded roadways; any new sound barrier must conform with City policies and standards regarding visual and aesthetic resources and quality.

- Policy I/C4.2: Minimizing nuisances. The potential for new or existing industrial or commercial uses, including seaport and airport activities, to create nuisance impacts on surrounding residential land uses should be minimized through appropriate siting and efficient implementation and enforcement of environmental and development controls.
- Policy T6.1: Posting maximum speeds. Collector streets shall be posted at the lowest possible speed (usually a maximum speed of 25 miles per hour), except where a lower speed is dictated by safety and allowable by law.
- Policy W1.3: Reducing land use conflicts. Land uses and impacts generated from Port or neighborhood activities should be buffered, protecting adjacent residential areas from the impacts of seaport, airport, or other industrial uses. Appropriate siting of industrial activities, buffering (e.g., landscaping, fencing, transitional uses, etc.), truck traffic management efforts, and other mitigations should be used to minimize the impact of incompatible uses.
- Policy N5.2: Buffering residential areas. Residential areas should be buffered and reinforced from conflicting uses through the establishment of performance-based regulations, the removal of non-conforming uses, and other tools.
- Policy N11.4: Alleviating Public Nuisances. The City should strive to alleviate public nuisances and unsafe and illegal activities. Code Enforcement efforts should be given as high a priority as facilitating the development process. Public nuisance regulations should be designed to allow community members to use City codes to facilitate nuisance abatement in their neighborhood.

The noise ordinances of the City's Municipal Code (Section 17.120 and Section 8.18) also regulate the maximum allowable daytime average receiving noise level for construction activity. These noise levels are shown in Table IV.E-5.

Table IV.E-5: City of Oakland Construction Noise Standards at Receiving Property Line, dBA

	Daily 7:00 a.m. to 7:00 p.m.	Weekends 9:00 a.m. to 8:00 p.m.
Short-Term Operation [a]		
Residential	80	65
Commercial, Industrial	85	70
Long-Term Operational [b]		
Residential	65	55
Commercial, Industrial	70	60

[a] Short-Term construction or demolition operation is less than 10 days
[b] Long-Term construction or demolition operation is 10 days or more
Source: City of Oakland Municipal Code Section 17.120.050 Noise

City of Oakland's Standard and Uniformly Applied Conditions of Approval. The City of Oakland's Standard and Uniformly Applied Conditions of Approval that would apply to the proposed project are listed below. Implementation of these Conditions of Approval would ensure that a project complies with the City's Noise Ordinance with regards to construction related noise.

Condition 19: Days/Hours of Construction Operation. *Ongoing throughout demolition, grading, and/or construction.* The project applicant shall require construction contractors to limit standard construction activities as follows.

a) Construction activities are limited to between 7:00 a.m. and 7:00 p.m. Monday through Friday, except that pile driving and/or other extreme noise generating activities greater than 90 dBA limited to between 8:00 a.m. and 4:00 p.m. Monday through Friday.

b) Any construction activity proposed to occur outside of the standard hours of 7:00 am to 7:00 pm Monday through Friday for special activities (such as concrete pouring which may require more continuous amounts of time) shall be evaluated on a case by case basis, with criteria including the proximity of residential uses and a consideration of resident's preferences for whether the activity is acceptable if the overall duration of

construction is shortened and such construction activities shall only be allowed with the prior written authorization of the Building Services Division.

c) Construction activity shall not occur on Saturdays, with the following possible exceptions:

- Prior to the building being enclosed, requests for Saturday construction for special activities (such as concrete pouring which may require more continuous amounts of time), shall be evaluated on a case by case basis, with criteria including the proximity of residential uses and a consideration of resident's preferences for whether the activity is acceptable if the overall duration of construction is shortened. Such construction activities shall only be allowed on Saturdays with the prior written authorization of the Building Services Division.

- After the building is enclosed, requests for Saturday construction activities shall only be allowed on Saturdays with the prior written authorization of the Building Services Division, and only then within the interior of the building with the doors and windows closed.

d) No extreme noise generating activities (greater than 90 dBA) shall be allowed on Saturdays, with no exceptions.

e) No construction activity shall take place on Sundays or Federal holidays.

f) Construction activities include but are not limited to: truck idling, moving equipment (including trucks, elevators, etc.) or materials, deliveries, and construction meetings held on-site in a non-enclosed area.

Condition 20: **Noise Control.** *Ongoing throughout demolition, grading, and/or construction.* To reduce noise impacts due to construction, the project applicant shall require construction contractors to implement a site-specific noise reduction program, subject to city review and approval, which includes the following measures:

a) Equipment and trucks used for project construction shall utilize the best available noise control techniques (e.g., improved mufflers, equipment redesign, use of intake silencers, ducts, engine enclosures and acoustically-attenuating shields or shrouds, wherever feasible).

b) Impact tools (e.g., jack hammers, pavement breakers, and rock drills) used for project construction shall be hydraulically or electrically powered wherever possible to avoid noise associated with compressed air exhaust from pneumatically powered tools. However, where use of pneumatic tools is unavoidable, an exhaust muffler on the compressed air exhaust shall be used; this muffler can lower noise levels from the exhaust by up to about 10 dBA. External jackets on the tools themselves shall be used where feasible, and this could achieve a reduction of 5 dBA. Quieter procedures shall be used, such as drills rather than impact equipment, whenever feasible.

c) Stationary noise sources shall be located as far from adjacent receptors as possible, and they shall be muffled and enclosed within temporary sheds, incorporate insulation barriers, or other measures to the extent feasible.

d) If feasible, the noisiest phases of construction shall be limited to less than 10 days at a time.

Conditions 21: Noise Complaint Procedures. *Ongoing throughout demolition, grading, and/or construction.* Prior to the issuance of each building permit, along with the submission of construction documents, the project applicant shall submit to the City Building Services Division a list of measures to respond to and track complaints pertaining to construction noise. These measures shall include:

a) A procedure and phone numbers for notifying the City Building Services Division staff and Oakland Police Department; (during regular construction hours and off-hours);

b) A sign posted on-site pertaining with permitted construction days and hours and complaint procedures and who to notify in the event of a problem. The sign shall also include a listing of both the City and construction contractor's telephone numbers (during regular construction hours and off-hours);

c) The designation of an on-site construction complaint and enforcement manager for the project;

d) Notification of neighbors and occupants within 300 feet of the project construction area at least 30 days in advance of extreme noise generating activities about the estimated duration of the activity; and

e) A preconstruction meeting shall be held with the job inspectors and the general contractor/on-site project manager to confirm that noise measures and practices (including construction hours, neighborhood notification, posted signs, etc.) are completed.

Condition 22: Interior Noise. *Prior to issuance of a building permit.* If necessary to comply with the interior noise requirements of the City of Oakland's General Plan Noise Element and achieve an acceptable interior noise level, noise reduction in the form of sound-rated assemblies (i.e., windows, exterior doors, and walls) shall be incorporated into project building design, based upon recommendations of a qualified acoustical engineer. Final recommendations for sound-rated assemblies will depend on the specific building designs and layout of buildings on the site and shall be determined during the design phase.

Condition 27: Pile Driving and Other Extreme Noise Generators. *Ongoing throughout demolition, grading, and/or construction.* To further reduce potential pier drilling, pile driving and/or other extreme noise generating construction impacts greater than 90dBA, a set of site-specific noise attenuation measures shall be completed under the supervision of a qualified acoustical consultant. Prior to commencing construction, a plan for such measures shall be submitted for review and approval by the City to ensure that maximum feasible noise attenuation will be achieved. This plan shall be based on the final design of the project. A third-party peer review, paid for by the project applicant, may be required to assist the City in evaluating the feasibility and effectiveness of the noise reduction plan submitted by the project applicant. A special inspection deposit is required to ensure compliance with the noise reduction plan. The amount of the deposit shall be determined by the Building Official, and the deposit shall be submitted by the project applicant concurrent with submittal of the noise reduction plan. The noise reduction plan shall include, but not be limited to, an evaluation of the following measures. These attenuation measures shall include as many of the following control strategies as feasible:

a) Erect temporary plywood noise barriers around the construction site, particularly along on sites adjacent to residential buildings;

b) Implement "quiet" pile driving technology (such as pre-drilling of piles, the use of more than one pile driver to shorten the total pile driving duration), where feasible, in consideration of geotechnical and structural requirements and conditions;

c) Utilize noise control blankets on the building structure as the building is erected to reduce noise emission from the site;

d) Evaluate the feasibility of noise control at the receivers by temporarily improving the noise reduction capability of adjacent buildings by the use of sound blankets for example; and

e) Monitor the effectiveness of noise attenuation measures by taking noise measurements.

c. Existing Noise Environment. The project components are located in an urban area. The following section describes the existing noise environment and identifies primary noise sources in each of the component areas of the project.

(1) Ambient Noise Conditions. An LSA noise technician conducted ambient noise monitoring near sensitive receptors adjacent to proposed project sites between the hours of 9:00 a.m. and 4:00 p.m. on January 31, 2007. These ambient (20-minute) noise measurements were conducted to document the existing noise environment and capture the noise levels associated with operations or activities in the project areas at six representative sensitive receptor locations. The noise level measurements were performed using a Larson Davis Model 720 Type II sound level meter. Table IV.E-6 presents the results of these measurements. Maximum and peak noise levels were recorded as well as the equivalent continuous noise level measure L_{eq}. The maximum and peak noise levels all reflect vehicular traffic noise sources. The meteorological conditions at the project site during the short-term noise monitoring are shown in Table IV.E-7.

The following measurement procedures were utilized during the short-term noise monitoring:

- Set up sound level meter at a height of 1.5 m (5 ft);
- Calibrate sound level meter;
- Commence noise monitoring;

Table IV.E-6: Ambient Noise Monitoring Results, dBA

Monitoring Locations	Start Time	L_{eq}	L_{max}	L_{min}
Lake Merritt and Lake Merritt Channel – Group 1				
El Embarcadero - by Lakeview Branch Library	9:05	63.3	83.9	56.6
#1555 Lakeside Drive - across from Municipal Boat House	10:20	65.6	79.6	50.0
Peralta Park - next to Lake Merritt Channel	11:50	55.2	84.9	47.0
1200 Lakeshore Avenue - by 14th Street	12:30	64.0	80.2	53.5
Waterfront Trail – Group 2				
E. Embarcadero/ East Street – near Condos by Estuary Park	11:05	57.6	80.7	46.5
Recreational Facilities – Group 3				
Ira Jinkins Park/Recreation Center - near elementary school	2:00	59.4	82.9	54.3

Source: LSA Associates, Inc., January 31, 2007.

Table IV.E-7: Meteorological Conditions for Noise Monitoring

Monitoring Locations	Maximum Wind Velocity (mph)	Average Wind Velocity (mph)	Temp (F)	Relative Humidity (%)
Lake Merritt and Lake Merritt Channel – Group 1				
El Embarcadero – by Lakeview Branch Library	3.3	1.0	52.1	76
#1555 Lakeside Drive - across from Municipal Boat House	3.0	0.9	53.6	78
Peralta Park - next to Lake Merritt Channel	4.2	1.1	54.4	70
1200 Lakeshore Avenue - by 14th Street	3.1	0.9	53.8	70
Waterfront Trail – Group 2				
E. Embarcadero/ East Street – near Condos by Estuary Park	2.7	0.9	56.2	69
Recreational Facilities – Group 3				
Ira Jinkins Park/ Recreation Center - near elementary school	7.5	2.7	56.5	54

Source: LSA Associates, Inc., January 31, 2007

- Collect site-specific data such as date, time, direction of traffic, distance from the sound level meter to the right-of-way and/or sensitive receptors, and meteorological conditions;
- Stop measurement after 20 minutes; and
- Calibrate sound level meter.

Existing Railroad Noise Levels. Railroad activities in the City of Oakland include the Union Pacific Railroad and the Bay Area Rapid Transit rail lines. According to the City of Oakland General Plan, railroad noise levels at 100 feet from the railroad tracks are up to 110 dBA L_{dn} with warning horns and 95 dBA L_{dn} without warning horns. Typical BART train noise levels at 100 feet from the rail line tracks are up to 85 dBA. The existing rail operations currently contribute to the noise environment at adjacent receptors and would continue into the future. The proposed project does not include modifications to the Union Pacific Railroad and would not incorporate construction of any new sensitive receptors within railroad noise contours.

Existing Aircraft Noise Levels. The project area is approximately 1 to 5 miles north of the Oakland International Airport and 9 to 12 miles northeast of San Francisco International Airport. Although the project component areas experience audible aircraft noise, they do not lie within the 60 dBA contour lines of these airports.

(2) Lake Merritt and Lake Merritt Channel (Group 1). Vehicular traffic is a major source of ambient noise for the Lake Merritt and Lake Merritt Channel group project area as it is in many urban settings. Ambient noise measurements were taken at four representative sensitive locations within the Lake Merritt and Lake Merritt Channel group area. The noise monitoring results, shown in Table IV.E-6, indicate existing ambient noise levels range from 55.2 dBA L_{eq} to 65.6 dBA L_{eq}.

The Federal Highway Administration (FHWA) highway traffic noise prediction model (FHWA RD-77-108) was used to evaluate traffic-related noise conditions in the vicinity of the Lake Merritt and Lake Merritt Channel group. The resultant noise levels were weighed and summed over a 24-hour period in order to determine the L_{dn} values. The existing 2006 and cumulative 2025 traffic volumes for roadway segments were used in the traffic noise impact analysis. Table IV.E-8 shows the modeled existing traffic noise levels adjacent to the roadway segments in the Lake Merritt and Lake Merritt Channel group area.

(3) Waterfront Trail (Group 2). Traffic, railroads, commercial facilities, and industrial facilities are the primary noise sources along the Waterfront Trail. This group also experiences audible aircraft noise due to its proximity to Oakland International Airport; however, it does not lie within the 60 dBA contour lines of the airport. An ambient noise measurement was taken at Estuary Park. The noise monitoring results, shown in Table IV.E-6, indicate an existing ambient noise level of 57.6 dBA L_{eq} within the Waterfront Trail area.

(4) Recreational Facilities (Group 3). Existing primary noise sources at the Recreational Facilities include traffic and railroad related noise sources. Ambient noise measurements were taken at the proposed site of the East Oakland Sports Complex on January 31, 2007. Results indicate an existing ambient noise level of 59.4 dBA L_{eq} at the site. Traffic noise from I-880 is the primary traffic noise source. This project component area also experiences audible aircraft noise; however, it does not lie within the 60 dBA contour lines of an airport.

(5) City-wide Creeks (Group 4). The existing ambient noise levels surrounding the extensive City-wide Creek group is characteristic of the existing urban environment. Vehicular traffic is a major source of ambient noise levels in urban settings. Other noise sources in the urban setting include industrial, commercial, railroad, and aircraft related noise sources.

2. Impacts and Mitigation Measures

This section discusses potential impacts related to noise that could result from implementation of the proposed project components. The section begins with the criteria of significance, which establish the thresholds used to determine whether an impact is significant. The latter part of the section presents project impacts and identifies mitigation measures, as appropriate.

a. Criteria of Significance. The Measure DD Implementation Project would have a significant noise impact if it would:

1) Expose persons to or generate noise levels in excess of standards established in the Oakland general plan or applicable standards of other agencies (e.g., OSHA);
2) Violate the City of Oakland Noise Ordinance (Oakland Planning Code Section 17.120.050) regarding operational noise *(Table IV.E-4)*;
3) Violate the City of Oakland Noise Ordinance (Oakland Planning Code Section 17.120.050) regarding construction noise *(Table IV.E-5)*, except if an acoustical analysis is performed and all feasible mitigation measures imposed, including the standard City of Oakland noise measures adopted by the Oakland City Council on January 16, 2001.

Table IV.E-8: Existing (2006) Baseline Traffic Noise Levels

Roadway Segment	ADT[a]	Center-line to 70 L_{dn} (feet)	Center-line to 65 L_{dn} (feet)	Center-line to 60 L_{dn} (feet)	L_{dn} (dBA) 50 feet from Centerline of Outermost Lane
Grand Avenue (MacArthur Boulevard to El Embarcadero)	22,500	< 50[b]	81	171	66.2
Grand Avenue (El Embarcadero to Euclid Avenue)	21,800	< 50	79	167	66.1
El Embarcadero (Lakeshore Avenue to Grand Avenue)	4,600	< 50	< 50	60	60.1
Lakeshore Avenue (MacArthur Boulevard to El Embarcadero)	15,800	< 50	65	135	64.7
Lakeshore Avenue (El Embarcadero to Boden Way)	19,800	< 50	75	157	65.6
Harrison Street (Grand Avenue to 20th Street)	29,500	< 50	106	208	65.6
Lakeside Drive (19th Street to 20th Street)	16,700	< 50	67	140	64.9
Lakeside Drive (14th Street to 17th Street)	9,000	< 50	< 50	94	62.2
19th Street (Lakeside Drive to Harrison Street)	1,200	< 50	< 50	< 50	54.2
Madison Street (19th Street to 17th Street)	7,400	< 50	< 50	82	61.9
17th Street (Madison Street to Lakeside Drive)	900	< 50	< 50	< 50	53.0
14th Street (Oak Street to Madison Street)	12,400	< 50	56	115	63.6
12th Street (Oak Street to Madison Street)	9,600	< 50	< 50	98	62.5
10th Street (Oak Street to Madison Street)	3,600	< 50	< 50	53	58.2
14th Street (East of Oak Street)	13,600	< 50	59	123	64.0
1st Avenue (East 16th Street to Foothill Boulevard)	21,300	< 50	82	166	65.1
12th Street (Fallon Street to Oak Street)	9,100	< 50	< 50	95	62.3
Oak Street (11th Street to 12th Street)	8,600	< 50	< 50	91	62.0
1st Avenue (East 15th Street to East 14th Street)	13,900	< 50	58	124	64.6
12th Street (3rd Avenue to 2nd Avenue)	10,900	< 50	< 50	106	63.0
2nd Avenue (12th Street to 14th Street)	6,900	< 50	< 50	78	61.8
5th Avenue (12th Street to 14th Street)	6,300	< 50	< 50	73	61.4
10th Street (4th Avenue to 2nd Avenue)	5,400	< 50	< 50	66	60.8
10th Street (2nd Avenue to Fallon Street)	5,400	< 50	< 50	66	60.8
8th Street (5th Avenue to Lake Merritt Channel)	13,300	< 50	58	121	63.9
Embarcadero East (5th Avenue to Lake Merritt Channel)	7,100	< 50	< 50	79	62.0

[a] Average Daily Traffic volume.
[b] Traffic noise within 50 feet of the roadway centerline requires site-specific analysis.
Source: LSA Associates Inc., February 2007

During the hours of 7 p.m. to 7 a.m. on weekdays and 8 p.m. to 9 a.m. on weekends and federal holidays, noise levels received by any land use from construction or demolition shall not exceed the applicable nighttime operational noise level standard *(Table IV.E-5)*;

4) Violates the City of Oakland Noise Ordinance (Oakland Municipal Code Section 8.18.020) regarding nuisance of persistent construction-related noise;

5) Create a vibration which is perceptible without instruments by the average person at or beyond any lot line containing vibration-causing activities not associated with motor vehicles, trains, and temporary construction or demolition work, except activities located within the (a) M-40 zone or (b) M-30 zone more than 400 feet from any legally occupied residential property

(Oakland Planning Code Section 17.120.060);

6) Generate interior L_{dn} or CNEL greater than 45 dBA for multi-family dwellings, hotels, motels, dormitories and long-term care facilities (and may be extended by local legislative action to include single family dwellings) per California Noise Insulation Standards (CCR Part 2, Title 24);
7) Result in a 5 dBA permanent increase in ambient noise levels in the project vicinity above levels existing without the project;
8) Conflicts with state land use compatibility guidelines for all specified land uses for determination of acceptability of noise (Source: State of California, Governor's Office of Planning and Research, *General Plan Guidelines, 2003*);
9) Be located within an airport land use plan and would expose people residing or working in the project area to excessive noise levels; or
10) Be located within the vicinity of a private airstrip, and would expose people residing or working in the project area to excessive noise levels.

The level of noise impacts associated with the project are discussed in the following section and summarized in Table IV.E-9.

b. Impacts and Mitigation Measures Applicable to all Project Components. The following section identifies the potential impacts associated with project implementation on sensitive receptors located adjacent to all proposed project components.

Established Noise Standards. The proposed project would construct recreational facilities and make water quality improvements at sites currently used for the same or similar types of activities and would not substantially increase noise levels over those currently present at the project component sites. None of the four groups of project components would expose people to or generate noise levels in excess of standards established in the Oakland General Plan or applicable standards of other agencies (such as OSHA) as identified in Section IV.E.1.b, Noise Regulatory Framework. Some project groups would construct new facilities, such as the new restaurant at the Municipal Boathouse or the expanded recreational facilities at the Ira Jinkins Recreation Center, but these would not substantially increase noise or house activities that would exceed the City of Oakland's noise standards. Temporary and long-term project-related construction noise impacts are discussed in sections IV.E.2.b. (3) and (4), below.

None of the project components would create or develop any new noise sensitive land uses. None of the project components would create or develop permanent noise sources that would be incompatible with existing noise sensitive land uses (land uses would be essentially unchanged over most of the project group areas). The project would fully comply with established noise standards and the potential impact of the project on noise sensitive land uses would be less than significant.

Table IV.E-9: Summary of Potential Impacts – Noise

	Project Group[a]			
Would the Project:	**Group 1 Lake Merritt**	**Group 2 Waterfront Trail**	**Group 3 Recreational Facilities**	**Group 4 City-wide Creeks**
1. Expose persons to or generate noise levels in excess of standards established in the Oakland general plan or applicable standards of other agencies?	O	O	O	O
2. Violate the City of Oakland Noise Ordinance (Oakland Planning Code Section 17.120.050) regarding operational noise?	O	O	O	O
3. Violate the City of Oakland Noise Ordinance regarding construction noise?	O	O	O	O
4. Violate the City of Oakland Noise regarding nuisance of persistent construction-related noise?	O/●	O	O	O
5. Create a vibration which is perceptible without instruments by the average person at or beyond any lot line containing vibration-causing activities not associated with motor vehicles, trains, and temporary construction or demolition work?	O	O	O	O
6. Generate interior L_{dn} or CNEL greater than 45 dBA for multi-family dwellings, hotels, motels, dormitories and long-term care facilities?	O	O	O	O
7. Result in a 5 dBA permanent increase in ambient noise levels in the project vicinity above levels existing without the project?	O	O	O	O
8. Conflict with state land use compatibility guidelines for all specified land uses for determination of acceptability of noise?	O	O	O	O
9. Be located within an airport land use plan and would expose people residing or working in the project area to excessive noise levels?	O	O	O	O
10. Be located within the vicinity of a private airstrip, and would expose people residing or working in the project area to excessive noise levels?	O	O	O	O

[a] The Lake Merritt and Waterfront Trail groups are analyzed at the project level. The Recreational Facilities and City-wide Creeks groups are analyzed at the program level. The level of impact and the proposed mitigation measure, if any, are identified as follows:

== No impact
O Less-than-Significant or Less-than-Significant with standard Conditions of Approval
O Reduced to Less-than-Significant after recommended mitigation
● Significant
NA Not Applicable
NOISE-1, etc. identifies the mitigation measure, if any, that addresses the impact and reduces it to a level that is less than significant.

Source: LSA Associates, 2007

(1) Operational Noise. Project components would not violate the City of Oakland Noise Ordinance regarding operational noise. None of the project components would create or develop any new noise sensitive land uses. None of the project components would create or develop permanent noise sources that would exceed the maximum allowable receiving noise level standards for residential and civic land uses, commercial land uses, or manufacturing land uses. Therefore, the project's potential operational noise impacts on noise sensitive land uses would be less than significant.

(2) Significant Construction Noise Impacts. Project related construction noise impacts and related City standards are discussed together with the persistent construction noise impacts in Section IV.E.2.b. (4), below.

(3) Persistent Construction-Related Noise Impacts. The potential construction-related noise impacts are similar for each group as discussed below.

Lake Merritt and Lake Merritt Channel (Group 1). The proposed Lake Merritt and Lake Merritt Channel group is bordered by recreational, commercial and residential land uses. Project construction would temporarily increase noise levels on these adjacent land uses. Construction-related noise impacts would occur from worker commute trips and material deliveries and from on-site construction activities such as excavation and grading. This discussion addresses potential noise impacts to human receptors. Construction noise impacts on the Lake Merritt Channel wildlife are addressed in Section IV.F, Biological Resources.

Construction crew commutes and the transport of construction equipment and materials to the project site would incrementally increase noise levels on access roads leading to the construction site. There would be single event noise exposure potential up to 87 dBA L_{max} at 50 feet from passing trucks. This is consistent with typical noise levels generated by delivery trucks, busses, maintenance vehicles, etc. These single event noise levels would not significantly increase the ambient noise when averaged over time and would thus not exceed the maximum allowable daytime average receiving noise level standard shown in Table IV.E-5. Therefore, construction-related noise impacts associated with worker commutes and equipment transport to the project site would be less than significant.

Construction would be performed in discrete steps, each of which has its own mix of equipment and, consequently, its own noise characteristics. The site preparation phase, which includes excavation and grading of the site, tends to generate the highest noise levels, because the noisiest construction equipment is earthmoving equipment. Typical equipment used during this phase would include excavating machinery such as backfillers, bulldozers, draglines and front loaders, and earthmoving and compacting equipment such as compactors, scrapers, and graders. Typical operating cycles for the construction equipment may involve one or two minutes of full power operation followed by three to four minutes at lower power settings. Other construction vehicles may include water and pickup trucks. Table IV.E-10 lists typical construction equipment noise levels recommended for noise impact assessments, based on a distance of 50 feet between the equipment and a noise receptor. Typical noise levels range up to 91 dBA L_{max} at 50 feet during the noisiest construction phases.

As shown in Table IV.E-10, the maximum noise level generated by each earthmover on the proposed project site is anticipated to be 86 dBA L_{max} at 50 feet from the earthmover. Each bulldozer would generate 85 dBA L_{max} at 50 feet. The maximum noise level generated by water and pickup trucks is approximately 86 dBA L_{max} at 50 feet from these vehicles. With each doubling of the number of sound sources of equal strength, the noise level increases by 3 dBA (e.g., two bulldozers operating at 85 dBA yield a total noise level of 88 dBA). Assuming that each piece of construction equipment operates simultaneously, the worst case combined noise level during this phase of construction would be 91 dBA L_{max} at a distance of 50 feet from an active construction area. The closest noise sensitive receptors are the residential buildings on Lakeshore Avenue, Lakeside Drive; other sensitive receptors include the Lakeview Branch Library on El Embarcadero and Dewey Academy High School on 2nd Avenue.

Table IV.E-10: Typical Construction Equipment Noise Level

Type of Equipment	Range of Sound Levels Measured (dBA at 50 feet)	Suggested Sound Levels for Analysis (dBA at 50 feet)
Pile Drivers	81 to 96	93
Rock Drills	83 to 99	96
Jackhammers	75 to 85	82
Pneumatic Tools	78 to 88	85
Pumps	74 to 84	80
Scrapers	83 to 91	87
Haul Trucks	83 to 94	88
Cranes	79 to 86	82
Portable Generators	71 to 87	80
Rollers	75 to 82	80
Dozers	77 to 90	85
Tractors	77 to 82	80
Front-End Loaders	77 to 90	86
Hydraulic Backhoe	81 to 90	86
Hydraulic Excavators	81 to 90	86
Graders	79 to 89	86
Air Compressors	76 to 89	86
Trucks	81 to 87	86

Source: Bolt, Beranek & Newman, 1987. *Noise Control for Buildings and Manufacturing Plants.*

Impact NOISE-1 (Group 1): Pile driving would generate noise levels that exceed the City's long-term construction noise standards. (LTS/S)

Construction related noise associated with pile driving at East 18th Street Pier, 12th Street bridge, 10th Street bridge, 10th Street pedestrian bridge, 7th Street bypass, and the bridge over UPRR tracks, would impact noise sensitive receptors adjacent to these areas, if noise reducing measures identified in the Conditions of Approval are not feasible at some locations. As shown in Table IV.E-10, the maximum noise level generated by a pile driver on the proposed project site is anticipated to be 93 dBA L_{max} at 50 feet from the pile driver. Sensitive receptors adjacent to these potential pile driving areas include the residential buildings along Lakeshore Avenue and 18th Street, Laney College, and the Dewey Academy High School on 2nd Avenue. The closest receptors are located within 150 feet of the proposed pile driving areas. At this distance they would be exposed to maximum noise levels due to pile driving without attenuation of up to 83.5 dBA L_{max}. At each location, pile driving would occur periodically during the construction period, sometimes for durations lasting ten working days or more; pile driving for the 12th Street bridge would take approximately 85 working days. All work would be conducted in accordance with the City's Standard and Uniformly Applied Conditions of Approval for construction noise.

The impacts from construction noise, including pile driving, would be reduced to less-than-significant levels with implementation of the City's Standard and Uniformly Applied Conditions of Approval for construction noise as described in Section IV.E1.b(3). The Conditions of Approval (Conditions 19, 20, 21, and 27) identify measures that are generally feasible. Specifically, for project components that require pile driving, the City would prepare and implement a noise reduction plan to reduce noise to

levels that are below the City's standards for construction noise at residential and commercial properties. For pile driving this includes limiting work to the hours between 8:00 a.m. and 4:00 p.m. and use of noise barriers, use of sound blankets at the site or on nearby structures, and/or implementation of other engineering and administrative measures to attain the required noise attenuation. While the City's Conditions of Approval generally are adequate to reduce construction noise including noise from extreme noise generators to less-than-significant levels, for the Lake Merritt and Lake Merritt Channel group, because pile driving would occur over a geographically extensive area with varying soil conditions for an extended period of time, not all measures may be feasible. Thus noise-reducing measures may not be feasible at all locations and it may not be possible to reduce noise to less-than-significant levels. If the measures identified within the Conditions of Approval are implemented, impacts would be less than significant. However, if measures are not feasible at some locations then this impact would significant and unavoidable. (SU)

Waterfront Trail (Group 2). Most construction elements for the Waterfront Trail group include general trail improvements, landscaping, lighting and additional signage. These improvements are not expected to generate noise levels that would cause a significant impact on adjacent noise sensitive land uses. Other aspects of improvements along the Waterfront Trail group that would impact noise sensitive land uses are described below.

Construction related noise associated with pier drilling and trail construction could impact noise sensitive receptors along the following segments of the trail and trail access: the Cryer Site; the Bridges at Park Street, Fruitvale Avenue and High Street segment; Derby Avenue to Lancaster Street; and the US Audio/Capture Technologies and Friendly Transportation Trail Connection. Construction of this portion of the proposed project is expected to require the use of pile drivers. As shown in Table IV.E-10, the maximum noise level generated by a pile driver on the proposed project site is anticipated to be 93 dBA L_{max} at 50 feet from the pile driver. The closest known noise sensitive receptors to these trail segments are the residential properties located on the northern shore of Alameda along the Oakland Inner Harbor Tidal Canal approximately 350 feet from a proposed construction site. Assuming a direct line of sight and the worst case noise level of 91 dBA L_{max}, these sensitive receptors would be exposed to noise levels up to 74.1 dBA L_{max}.

To minimize the construction noise impact for the residential land use adjacent to these trail and access segments, and to comply with the construction hours specified in the City's Noise Ordinance, the City's standard Conditions of Approval are required as described above, including Condition 27, which addresses pile driving. Compliance with the Conditions of Approval would reduce this impact to a less-than-significant level.

Recreation Facilities (Group 3). The renovations of the Studio One Art Center in North Oakland would require the use of heavy, noise producing construction equipment. Construction of the proposed project component is expected to require the use of haul trucks, front-end loaders, and pickup trucks. As shown in Table IV.E-10, the maximum noise level generated by each haul truck on the proposed project site is assumed to be 88 dBA L_{max} at 50 feet. Each front-end loader would generate 86 dBA L_{max} at 50 feet. Pickup trucks used on the proposed project site would generate 86 dBA L_{max} at 50 feet. Each doubling of the sound sources with equal strength increases the noise level by 3 dBA. Assuming that each piece of construction equipment operates as individual noise sources, the worst case combined noise level during this phase of construction would be 92 dBA L_{max} at a distance of 50 feet from an active construction area.

To minimize the construction noise impact for noise sensitive land uses adjacent to the recreation center, and to comply with the construction hours specified in the City's Noise Ordinance, the City's standard Conditions of Approval are required as described above. Compliance with the Conditions of Approval would reduce this impact to a less-than-significant level.

The East Oakland Aquatic, Sports and Recreation Complex at the Ira Jinkins Park at Edes and Jones Avenues would include a 150,000 square foot addition to and expansion of the existing Ira Jinkins Park/Recreation Center.

Construction of the proposed project component is expected to require the use of earthmovers, bulldozers, hydraulic backhoes, and haul trucks. As seen in Table IV.E-10, the maximum noise level generated by each earthmover on the proposed project site is assumed to be 86 dBA L_{max} at 50 feet from the earthmover. Each bulldozer would generate 85 dBA L_{max} at 50 feet. Hydraulic backhoes used on the proposed project site would generate 86 dBA L_{max} at 50 feet; the maximum noise level generated by each haul truck is assumed to be 88 dBA L_{max} at 50 feet from the truck. Each doubling of the sound sources with equal strength increases the noise level by 3 dBA. Assuming that each piece of construction equipment operates as individual noise sources, the worst case combined noise level during this phase of construction would be 91 dBA L_{max} at a distance of 50 feet from an active construction area.

To minimize the construction noise impact for noise sensitive land uses adjacent to the recreation center, and to comply with the construction hours specified in the City's Noise Ordinance, the City's standard Conditions of Approval are required as described above. Compliance with the Conditions of Approval would reduce this impact to a less-than-significant level.

City-wide Creeks (Group 4). Restoration of creeks would require the use of backhoes, water and pickup trucks. As shown in Table IV.E-10, the maximum noise level generated by hydraulic backhoes is anticipated to be 86 dBA L_{max} at 50 feet from the backhoe. The maximum noise level generated by water and pickup trucks is approximately 86 dBA L_{max} at 50 feet from these vehicles. Each doubling of the sound sources with equal strength increases the noise level by 3 dBA. Assuming that each piece of construction equipment operates as individual noise sources, the worst case combined noise level during this phase of construction would be 89 dBA L_{max} at a distance of 50 feet from an active construction area. Noise sensitive receptors adjacent to City creeks include residential land uses. To minimize the construction noise impact for noise sensitive land uses adjacent to the creeks, and to comply with the construction hours specified in the City's Noise Ordinance, the City's standard Conditions of Approval are required as described above. Compliance with the Conditions of Approval would reduce this impact to a less-than-significant level.

(4) Vibration. None of the four project groups contain components that would generate ground-borne vibration levels that would be perceptible to the average person. There would be no impact during the project's operational phase. Construction activities associated with implementation of the project, including proposed pile driving activities, could temporarily expose persons in the vicinity of the proposed project construction areas to ground-borne vibration or ground-borne noise levels. However, the project would comply with the construction hours specified in the City's Noise Ordinance and the City's standard Conditions of Approval would be applied. Implementation of the Conditions of Approval would ensure potential ground-borne vibration would be avoided or reduced to a less-than-significant level.

(5) Interior Noise. None of the four project groups would generate noise levels that would exceed the interior noise level standard of 45 dBA L_{dn} for nearby multi-family dwelling units, hotels, motels, dormitories, or long-term care facilities in the project component areas. Most measured ambient and modeled traffic noise levels for the project component areas exceed 60 dBA L_{eq} and L_{dn}. The segment of 10th Street from Oak Street to Madison Street is the only modeled roadway segment under cumulative 2025 conditions where traffic noise levels exceed 60 dBA that does not currently experience traffic noise levels that exceed 60 dBA. However, there are no existing noise sensitive receptors located adjacent to this roadway segment that do not have a form of sound-attenuating mechanical ventilation system, such as air conditioning, enabling windows to be closed for long periods of time. Based on the EPA's Protective Noise Levels (EPA 550/9-79-100, November 1978), with a combination of walls, doors, and windows, standard construction for northern California residential buildings would provide more than 25 dBA in exterior to interior noise reduction with windows closed and 15 dBA or more with windows open. Thus, with windows closed, sensitive receptors adjacent to this roadway segment would still meet the interior noise standard of 45 dBA L_{dn} (i.e., 60.6 dBA – 25 dBA = 35.6 dBA).

The Lakeview Branch Library on El Embarcadero is a potential sensitive receptor within the Lake Merritt and Lake Merritt Channel group. This building does not have a form of sound-attenuating mechanical ventilation system and would occasionally have windows open for ventilation, which would provide a noise attenuation of 15 dBA as noted above. The predicted Cumulative Plus Project traffic noise levels at 50 feet from the centerline of the outermost travel lane of this roadway segment would be up to 63.3 dBA L_{dn}. The project includes moving the travel lanes approximately 2 feet closer to the library. Under the Cumulative Plus Project Conditions, the library would be located at a distance of 82 feet from the centerline of the outermost travel lane. At this distance, the modeled Cumulative Plus Project traffic noise level would be 59 dBA L_{dn}. Thus, with windows open, the interior noise standard of 45 dBA L_{dn} would still be met (i.e., 59 dBA – 15 dBA = 44 dBA).

The proposed project would have a less-than-significant impact on interior noise levels within all project group areas.

(6) Permanent Increase in Ambient Noise Levels. Because the project renovates and constructs parks, creeks, and recreational facilities and makes improvements to water quality, it would not be a substantial source of noise during its normal operation. The primary source of ambient noise in the project area is and would be traffic noise, particularly in the area around Lake Merritt where streets would be reconfigured. The ambient noise analysis therefore examines how the future traffic patterns and flows would affect the ambient noise environment if the project were approved.

To determine future traffic noise levels the FHWA highway traffic noise prediction model (FHWA RD-77-108) was used to evaluate traffic-related noise conditions in the vicinity of the Lake Merritt and Lake Merritt Channel project component. The resultant noise levels were weighed and summed over a 24-hour period in order to determine the L_{dn} values. The existing 2006 and cumulative 2025 traffic volumes for the indicated roadway segments were used in the traffic noise impact analysis. Table IV.E-11 shows the Existing Plus Project traffic noise levels adjacent to the indicated roadway segments in the Lake Merritt and Lake Merritt Channel group area. Tables IV.E-12 and IV.E-13 show the predicted Cumulative 2025 No Project and the Cumulative 2025 Plus Project traffic noise levels.

Table IV.E-11: Existing Plus Project Traffic Noise Levels

Roadway Segment	ADT	Center-line to 70 L_{dn} (feet)	Center-line to 65 L_{dn} (feet)	Center-line to 60 L_{dn} (feet)	L_{dn} (dBA) 50 feet from Centerline of Outermost Lane	Increase from Existing Conditions
Grand Avenue (MacArthur Boulevard to El Embarcadero)	21,800	< 50 [a]	79	167	66.1	-0.1
Grand Avenue (El Embarcadero to Euclid Avenue)	27,900	< 50	93	197	67.1	1.0
El Embarcadero (Lakeshore Avenue to Grand Avenue)	9,800	< 50	< 50	98	63.1	3.0
Lakeshore Avenue (MacArthur Boulevard to El Embarcadero)	5,600	< 50	< 50	70	60.2	-4.5
Lakeshore Avenue (El Embarcadero to Boden Way)	13,300	< 50	57	120	64.4	-1.2
Harrison Street (Grand Avenue to 20th Street)	29,500	< 50	106	208	65.6	0.0
Lakeside Drive (19th Street to 20th Street)	16,700	< 50	65	140	65.7	0.8
Lakeside Drive (14th Street to 17th Street)	9,000	< 50	< 50	93	63.0	0.8
19th Street (Lakeside Drive to Harrison Street)	1,200	< 50	< 50	< 50	54.2	0.0
Madison Street (19th Street to 17th Street)	7,400	< 50	< 50	82	61.9	0.0
17th Street (Madison Street to Lakeside Drive)	900	< 50	< 50	< 50	53.0	0.0
14th Street (Oak Street to Madison Street)	12,400	< 50	56	115	63.6	0.0
12th Street (Oak Street to Madison Street)	9,600	< 50	< 50	98	62.5	0.0
10th Street (Oak Street to Madison Street)	3,600	< 50	< 50	53	58.2	0.0
14th Street (East of Oak Street)	13,600	< 50	59	123	64.0	0.0
1st Avenue (East 16th Street to Foothill Boulevard)	23,200	< 50	82	174	66.3	1.2
12th Street (Fallon Street to Oak Street)	9,100	< 50	< 50	94	62.8	0.5
Oak Street (11th Street to 12th Street)	8,600	< 50	< 50	91	62.0	0.0
1st Avenue (East 15th Street to East 14th Street)	23,400	< 50	83	175	66.4	1.8
12th Street (3rd Avenue to 2nd Avenue)	10,900	< 50	< 50	106	63.0	0.0
2nd Avenue (12th Street to 14th Street)	6,900	< 50	< 50	78	61.8	0.0
5th Avenue (12th Street to 14th Street)	6,300	< 50	< 50	73	61.4	0.0
10th Street (4th Avenue to 2nd Avenue)	5,400	< 50	< 50	66	60.8	0.0
10th Street (2nd Avenue to Fallon Street)	5,400	< 50	< 50	66	60.8	0.0
8th Street (5th Avenue to Lake Merritt Channel)	13,300	< 50	58	121	63.9	0.0
Embarcadero East (5th Avenue to Lake Merritt Channel)	7,100	< 50	< 50	79	62.0	0.0

[a] Traffic noise within 50 feet of the roadway centerline requires site-specific analysis.
Source: LSA Associates Inc., February 2007

Table IV.E-12: Cumulative (2025) No Project Traffic Noise Levels

Roadway Segment	ADT	Center-line to 70 L_{dn} (feet)	Center-line to 65 L_{dn} (feet)	Center-line to 60 L_{dn} (feet)	L_{dn} (dBA) 50 feet from Centerline of Outermost Lane
Grand Avenue (MacArthur Boulevard to El Embarcadero)	24,700	< 50 [a]	86	181	66.6
Grand Avenue (El Embarcadero to Euclid Avenue)	24,900	< 50	86	182	66.6
El Embarcadero (Lakeshore Avenue to Grand Avenue)	5,400	< 50	< 50	66	60.8
Lakeshore Avenue (MacArthur Boulevard to El Embarcadero)	17,300	< 50	69	144	65.1
Lakeshore Avenue (El Embarcadero to Boden Way)	21,700	< 50	79	167	66.0
Harrison Street (Grand Avenue to 20th Street)	32,900	< 50	112	223	66.1
Lakeside Drive (19th Street to 20th Street)	18,600	< 50	72	151	65.4
Lakeside Drive (14th Street to 17th Street)	10,000	< 50	< 50	100	62.7
19th Street (Lakeside Drive to Harrison Street)	1,600	< 50	< 50	< 50	55.5
Madison Street (19th Street to 17th Street)	8,600	< 50	< 50	90	62.5
17th Street (Madison Street to Lakeside Drive)	1,200	< 50	< 50	< 50	54.2
14th Street (Oak Street to Madison Street)	18,300	< 50	71	149	65.3
12th Street (Oak Street to Madison Street)	10,600	< 50	< 50	104	62.9
10th Street (Oak Street to Madison Street)	6,200	< 50	< 50	74	60.6
14th Street (East of Oak Street)	19,700	< 50	74	156	65.6
1st Avenue (East 16th Street to Foothill Boulevard)	24,400	< 50	88	181	65.7
12th Street (Fallon Street to Oak Street)	9,900	< 50	< 50	100	62.6
Oak Street (11th Street to 12th Street)	9,900	< 50	< 50	100	62.6
1st Avenue (East 15th Street to East 14th Street)	19,400	< 50	72	154	66.0
12th Street (3rd Avenue to 2nd Avenue)	12,500	< 50	56	116	63.6
2nd Avenue (12th Street to 14th Street)	8,400	< 50	< 50	89	62.7
5th Avenue (12th Street to 14th Street)	9,700	< 50	< 50	97	63.3
10th Street (4th Avenue to 2nd Avenue)	7,600	< 50	< 50	83	62.3
10th Street (2nd Avenue to Fallon Street)	7,600	< 50	< 50	83	62.3
8th Street (5th Avenue to Lake Merritt Channel)	26,300	< 50	89	189	66.9
Embarcadero East (5th Avenue to Lake Merritt Channel)	17,800	< 50	68	145	67.0

[a] Traffic noise within 50 feet of the roadway centerline requires site-specific analysis.
Source: LSA Associates Inc., February 2007

Table IV.E-13: Cumulative (2025) Plus Project Traffic Noise Levels

Roadway Segment	ADT	Center-line to 70 L_{dn} (feet)	Center-line to 65 L_{dn} (feet)	Center-line to 60 L_{dn} (feet)	L_{dn} (dBA) 50 feet from Centerline of Outermost Lane	Increase from Cumulative No Project Conditions
Grand Avenue (MacArthur Boulevard to El Embarcadero)	23,500	< 50 [a]	83	176	66.4	-0.2
Grand Avenue (El Embarcadero to Euclid Avenue)	28,900	< 50	95	201	67.3	0.7
El Embarcadero (Lakeshore Avenue to Grand Avenue)	10,200	< 50	< 50	101	63.3	2.5
Lakeshore Avenue (MacArthur Boulevard to El Embarcadero)	6,100	< 50	< 50	73	60.5	-4.6
Lakeshore Avenue (El Embarcadero to Boden Way)	13,900	< 50	58	124	64.6	-1.4
Harrison Street (Grand Avenue to 20th Street)	31,800	< 50	110	218	66.0	-0.1
Lakeside Drive (19th Street to 20th Street)	16,600	< 50	65	139	65.6	0.2
Lakeside Drive (14th Street to 17th Street)	10,000	< 50	< 50	99	63.4	0.7
19th Street (Lakeside Drive to Harrison Street)	1,600	< 50	< 50	< 50	55.5	0.0
Madison Street (19th Street to 17th Street)	7,500	< 50	< 50	83	61.9	-0.6
17th Street (Madison Street to Lakeside Drive)	1,200	< 50	< 50	< 50	54.2	0.0
14th Street (Oak Street to Madison Street)	18,300	< 50	71	149	65.3	0.0
12th Street (Oak Street to Madison Street)	10,600	< 50	< 50	104	62.9	0.0
10th Street (Oak Street to Madison Street)	6,200	< 50	< 50	74	60.6	0.0
14th Street (East of Oak Street)	19,700	< 50	74	156	65.6	0.0
1st Avenue (East 16th Street to Foothill Boulevard)	25,600	< 50	88	186	66.8	1.1
12th Street (Fallon Street to Oak Street)	9,900	< 50	< 50	99	63.1	0.5
Oak Street (11th Street to 12th Street)	9,900	< 50	< 50	100	62.6	0.0
1st Avenue (East 15th Street to East 14th Street)	26,900	< 50	91	192	67.0	1.0
12th Street (3rd Avenue to 2nd Avenue)	9,400	< 50	< 50	97	62.4	-1.2
2nd Avenue (12th Street to 14th Street)	6,800	< 50	< 50	77	61.8	-0.9
5th Avenue (12th Street to 14th Street)	9,700	< 50	< 50	97	63.3	0.0
10th Street (4th Avenue to 2nd Avenue)	7,600	< 50	< 50	83	62.3	0.0
10th Street (2nd Avenue to Fallon Street)	7,600	< 50	< 50	83	62.3	0.0
8th Street (5th Avenue to Lake Merritt Channel)	27,800	< 50	92	196	67.1	0.2
Embarcadero East (5th Avenue to Lake Merritt Channel)	17,800	< 50	68	146	65.9	-1.1

[a] Traffic noise within 50 feet of the roadway centerline requires site-specific analysis.
Source: LSA Associates Inc., February 2007

Lake Merritt and Lake Merritt Channel (Group 1). The proposed project would change traffic patterns and roadway alignments and thus potentially increase noise levels along some roadway segments up to 2.5 dBA in 2025. This increase is well below the City's significance criterion of a 5 dBA increase or greater. Therefore, the increase in ambient noise levels resulting from implementation of the proposed project would be less than significant.

Waterfront Trail (Group 2). The project components in this group would not generate any significant increase in traffic volumes and thus would not generate any significant increase in traffic noise levels. Representative parking activities associated with the trail and adjacent parks, such as

people conversing or closing car doors, would generate approximately 60 dBA L_{max} at 50 feet. Parking lot noise would not be a significant noise issue with respect to residences adjacent to this project component.

Recreational Facilities (Group 3). The component would not generate a significant increase in traffic volumes and thus would not generate a significant increase in traffic noise levels. The operation of the East Oakland Sports Complex would potentially increase the ambient noise levels on the park property. However, the closest sensitive receptors are located over 250 feet from the facility. Due to the distance of the proposed facility from existing sensitive receptors, the potential increase in ambient sound levels would be less than significant.

City-wide Creeks (Group 4). The project would not generate an increase in ambient noise levels. These components would not generate an increase in traffic volumes and would not generate an increase in traffic noise in or adjacent to this component area.

(7) Land Use Compatibility Guidelines. The proposed project would not conflict with the State's land use compatibility guidelines related to noise. The proposed project would not create or develop any new noise sensitive land uses nor would it create or develop permanent noise sources that would be incompatible with existing noise sensitive land uses. The project would be consistent with the land use compatibility guidelines and the potential impact would be less than significant.

(8) Located Near an Airport. The project component areas are approximately 1 to 5 miles north of Oakland International Airport and 9 to 12 miles northeast of San Francisco International Airport. The project component areas experience audible aircraft noise but do not lie within the 60 dBA CNEL noise level contours of these airports; nor do they lie within an airport land use plan. Thus, the project would not expose people to excessive aircraft related noise levels and the potential impact from aircraft noise sources would be less than significant.

(9) Located Near a Private Airstrip. The nearest private airstrip is Hayward Executive Airport, located approximately 5 miles south of any of the component areas. The project component areas experience audible aircraft noise but do not lie within the 60 dBA CNEL contour lines of this or any other private airstrip. Thus, the project would not expose any persons to excessive aircraft related noise levels and the impact from aircraft noise sources associated with private airstrips would be less than significant.

c. Impacts and Mitigation Measures Unique to Specific Project Components. There are no additional unique component-specific impacts associated with noise. Project noise impacts are addressed in the preceding section.