4.10 NOISE

4.10.1 Introduction

This section discusses existing project area noise and analyzes the potential for implementation of the proposed 2014 LRDP to affect the ambient noise environment. Information and analysis in this section is based on existing project site documentation; the municipal code, general plans, and general plan CEQA documentation for the city of Richmond; a traffic study prepared by Fehr and Peers; noise and vibration guidance manuals; RBC site noise monitoring data; the CEQA statute and guidelines; and the *UC CEQA Handbook*.

The existing noise environment is described by identifying existing land uses especially sensitive to noise and vibration and existing noise sources. Noise environment changes would result from development under the 2014 LRDP implementation. Construction and demolition would result in short-term noise impacts from construction equipment and vehicle operation. Long-term noise impacts would result from on-site increases in traffic volumes, building mechanical system equipment, and site population. Mitigation measures are included to reduce construction and operational noise impacts.

Public and agency NOP comments related to noise are summarized below:

- Project construction and operational noise, including that from operational equipment such as ventilation fans and fume hood fans, should be reduced as much as possible and should be shielded from natural areas.
- RBC site noise increases could disturb marshland wildlife near the Bay Trail.

The first issue is addressed in the analysis that follows. Noise effects on wildlife are discussed in Section 4.3, Biological Resources.

4.10.2 Environmental Setting

Noise is defined as unwanted sound. Noise can disturb or annoy people, interfere with activities such as sleep or learning, or cause physical effects such as headaches and hearing loss. Noise may also disturb or drive away wildlife.

Sound is typically measured in decibels (dB). Because the human ear is not equally sensitive to all frequencies of sound, the A-weighted decibel (dBA) scale was developed to better approximate the human response to different sound levels. Typically, the human ear cannot perceive a difference in sound levels of less than 3 dB, an increase of 5 dB is the lowest readily apparent change in noise levels, and a 10 dB increase is perceived as twice as loud.

Several measurements are commonly used to describe sound levels over a period of time, including:

- Equivalent sound level (L_{eq}) is the average sound level over a given time period, typically 1 hour.
- Day-night average sound level is the average dBA over a 24-hour period, with 10 dBA added to sound levels between 10:00 p.m. and 7:00 a.m. This weighted result accounts for the typically greater receptor sensitivity for nighttime noises.
- Community noise equivalent level (CNEL) is similar to day-night average sound level with an additional 5 dBA added to sound levels between 7:00 and 10:00 p.m.
- L_n refers to sound level that is exceeded "n" percent of the time over a measurement period (e.g., L_{90} = sound level exceeded 90 percent of the time). The sound level

exceeded for a small percent of the time, L_{10}, closely corresponds to short-term, higher-level noise such as that of a passing vehicle. The sound level exceeded for a large percent of the time, L_{90}, closely corresponds to the background noise level. L_{50} is the level exceeded 50 percent of the time and is typically referred to the median sound level over a given period.

Noise levels attenuate, or decrease, as distance from a noise source increases. Noise from point sources, such as construction equipment, decreases approximately 6 dBA for every doubling of distance[35] and noise from line sources such as roadways decrease approximately 3 dBA for every doubling of distance. These attenuation factors are based on the inverse square law and assume no other factors are influencing the sound attenuation rate. Different frequency sounds attenuate at different rates. Under real world conditions, noise attenuation rates are influenced by factors such as intervening objects between the source and the receptor, vegetation, and atmospheric conditions such as wind, temperature, and humidity. This analysis uses the inverse square law sound attenuation factors that provide a conservative analysis of the rate of sound attenuation. Sound may attenuate at slightly different rates than those represented here due to influencing factors such as frequency, line of sight, and atmospheric conditions.

Buildings also reduce sound transmission from exterior sources to interior occupants. Typical buildings without specific sound-reducing construction provide approximately 25 dBA of noise attenuation (difference between outside noise levels and indoor noise levels) when the windows and doors are closed (American Industrial Hygiene Association 2003).

Because noise levels decrease relatively rapidly as distance increases, the region of influence for noise is relatively small. This area of effect for noise point sources is less than 0.5 mile and for line sources is less than 1,000 feet from the roadway centerline.

The ambient, non-construction noise environment at the RBC site is generated by vehicular traffic on roadways and building heating, ventilating, and air conditioning (HVAC) equipment. The area surrounding the RBC site includes I-580 to the north, undeveloped land and farther office and industrial areas to the east, open space and the San Francisco Bay Trail to the south, residential areas to the southwest, office and industrial areas to the west, and a railroad spur to the northwest.

Some land uses are more sensitive to ambient noise levels than others due to the types of activities involved. Residences, motels and hotels, schools, libraries, churches, hospitals, nursing homes, auditoriums, and parks and other outdoor recreation areas generally are more sensitive to noise than commercial and industrial land uses. These land uses are referred to as sensitive receptors. The nearest sensitive receptor to the RBC site is the Marina Bay residential neighborhood to the southwest. The distance to the nearest sensitive receptor is 150 feet from the boundary of the RBC development.

Other areas near the RBC site that may be sensitive to elevated noise levels are the EPA laboratory adjacent to the west, the NRLF and labs, and the San Francisco Bay Trail adjacent to the south and southwest.

Sound level measurements were taken at 10 locations on and around the RBC site in January 2013 (Tetra Tech 2013). The monitoring locations are shown in Figure 4-10. The duration of the monitoring period and the time of day (daytime or nighttime) are also shown on Figure 4-10. The monitoring results are presented in Table 4.10-1.

[35] This attenuation factor is based on the inverse square law.

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Noise Monitoring Locations

Richmond, California

- 24-Hour Measurement
- 30-Minute Daytime & Night Measurement
- 30-Minute Daytime Measurement Only
- RBC Site Boundary

TETRA TECH

Figure 4-10

Source: Esri, DigitalGlobe, GeoEye, i-cubed, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, and the GIS User Community. Noise Monitoring Locations - Tetra Tech 2013

Table 4.10-1
Ambient Noise Levels at the RBC Site and its Vicinity

Map ID	Land Use	Location Description	Time Period	L_{eq}	L_{10}	L_{50}	L_{90}	CNEL*
MP-1	Residential	Residential Neighborhood at Marina Bay	Day	53	54	51	50	58
			Night	51	53	47	46	
MP-2	Residential	Eastern Residences at Bayside Court	Day	53	53	52	51	58
			Night	51	52	49	48	
MP-3	Residential	Residences at Bayside Court	Day	53	55	51	50	56
			Night	48	50	46	45	
MP-4	Residential	Trade Winds Sailing School	Day	57	61	53	50	59
			Night	50	53	48	44	
MP-5	Civic/Public	Rosie the Riveter World War II Home Front	Day	50	52	48	46	NA
MP-6	Residential	The Anchorage at Marina Bay	Day	54	58	52	49	61
			Night	54	58	47	44	
MP-7	Residential	Neighborhood at 30th Street. and Hoffman Boulevard	Day	62	64	62	60	NA
MP-8	Residential	Neighborhood at 43rd Street and Carlson Boulevard	Day	70	71	60	56	NA
MP-9	Civic/Public	Booker T. Anderson, Jr. Park	Day	66	67	65	63	NA
LT-1	Commercial	Richmond Bay Campus	Day	54	54	50	48	57
			Night	51	51	47	45	

Source: Tetra Tech 2013

*CNEL calculated for only those measurement locations with both day and nighttime monitoring results.
L_{eq} = Equivalent noise level, or average sound level during the measurement period.
L_n = Noise level exceeded "n" percent of the time during the measurement period, either 10, 50, or 90 percent.
NA = not applicable

As shown in Table 4.10-1, a wide range of baseline noise levels is found in and around the RBC site. This variation is due in part to the surrounding land uses, population density, and proximity to transportation corridors. Higher baseline noise levels were generally found closer to major roadways and railway lines. I-580 is generally audible throughout the area at all hours (Tetra Tech 2013).

The Richmond General Plan Update Final EIR includes noise data for the city's busiest and likely noisiest roadways. As part of the General Plan EIR analysis, a model was used to calculate the existing 70 dBA, 65 dBA, and 60 dBA CNEL noise contours for the selected streets. None of the selected streets are at or adjacent to the RBC site. I-580 is one of the modeled roadways. The 60 dBA CNEL noise contour for I-580 is approximately 850 feet north of the RBC site (City of Richmond 2011).

Groundborne vibrations are produced by construction equipment and large vehicles traveling over roads. Groundborne vibrations can be a source of annoyance to people or, if amplitudes are high enough, can damage structures or disrupt sensitive scientific equipment. Like noise, vibrations attenuate with distance from the source. Groundborne vibrations attenuate at different rates in different soil types. Vibration magnitude is often measured using peak particle velocity (PPV) that is measured in inches per second (in/sec), with a larger value representing a vibration with more potential to cause damage.

Sources of vibration at the RBC site are the adjacent railroad tracks, I-580, and the seismic laboratory.

4.10.3 Regulatory Considerations

Federal

In the early 1970s, the EPA established the Office of Noise Abatement and Control under the authority of the Clean Air Act Title IV – Noise Pollution. In the early 1980s the EPA concluded that noise issues were best handled at the state and local level and the Office of Noise Abatement and Control was closed. Although noise regulation has since been primarily a state and local responsibility, the EPA retains certain authorities related to noise investigation and regulation (EPA 2013a, 2013b). The EPA's Noise Abatement Program regulations are found in 40 CFR, Chapter I, Subchapter G and contain federal noise regulations, including noise emission standards for construction equipment in Part 204.

The Noise Control Act of 1972 (42 USC § 7641) requires the all Federal agencies implement programs that promote an environment free from noise that jeopardizes health and welfare. The Quiet Communities Act of 1978 (42 USC § 4913) authorized the EPA to provide grants to state and local governments for noise abatement. The Federal Occupational Health and Safety Administration regulations for workplace noise exposure are found in 29 CFR § 1910.95, Occupational Noise Exposure. Other standards for occupational noise exposure are the American Conference of Governmental Industrial Hygienists' Threshold Limit Values and the National Institute for Occupational Safety and Health's recommended standards.

State

The California Noise Control Act of 1973 (California Health and Safety Code §§ 46000-46080) addresses unwanted and hazardous noise as a public health and welfare issue. The Act establishes criteria and guidelines for local governmental use in setting noise exposure standards.

California Government Code Section 65302[f] requires local jurisdictions to prepare general plans that address noise and identify goals, policies, and implementation measures that can be used to guide future land use development with regard to noise.

Cal/OSHA generally regulates workplace noise exposure in California. California Code of Regulations, Title 8, Article 105 established a time-weighted worker noise exposure limit of 90 dBA averaged over 8 hours.

Local

The RBC site is a University-owned property where work within the University's mission is performed on land owned or controlled by The Regents. As a state entity created by Article IX, Section 9 of the California State Constitution, the University is exempt under the state constitution from compliance with local land use regulations, including general plans and zoning. The University seeks to cooperate with local jurisdictions to reduce any physical consequences of potential land use conflicts to the extent feasible. The RBC site is in the City of Richmond. The following sections summarize local noise ordinances and noise-related City of Richmond General Plan objectives and policies.

City of Richmond 2030 General Plan

The City of Richmond 2030 General Plan Public Safety and Noise Element (City of Richmond 2012) contains the following noise-related goal:

Goal SN4 – Acceptable Noise Levels. Achieve noise levels consistent with acceptable standards and reduce or eliminate objectionable noise sources. Prevent where possible, or mitigate noise impacts from industries, roadways, railroads and businesses in residential areas and sensitive uses in the community. In addition, apply new technology, buffers and other solutions to reduce excessive noise.

The following policies are related to this goal:

- **Policy SN4.1 – Noise Levels.** Work with regulatory agencies to monitor and enforce noise standards in the community. Reduce or mitigate objectionable noise sources and require new noise sources to comply with noise standards. Regulate both indoor and outdoor noise levels to protect health and safety. Use a combination of noise standards and existing noise levels to determine impacts and mitigation measures.
- **Policy SN4.2 – Land Use Compatibility (excerpt).** All new development must avoid or mitigate to the greatest extent feasible potential negative impacts such as noise, odors, and pollution.
- **Policy SN4.3 – Transportation-Related Noise.** Monitor changes in technology that will prevent and mitigate transportation related noise impacts on residential and sensitive uses in the community. Support traffic and freeway improvements that will reduce noise impacts of vehicles. Alternatives to sound walls should be considered where possible.

The following actions are intended to implement the stated goal and policies:

- **Action SN4.A – Noise Study Report Requirement.** Require proposed commercial and industrial uses with potential noise and vibration-producing activities or new noise-sensitive uses that locate in an area with day-night average sound level of 55 or greater to provide noise study reports. The report should identify noise mitigation measures that limit noise to an acceptable level compared to existing conditions.
- **Action SN4.B – Noise Study Guidelines.** Regularly review and update guidelines for the analysis of noise impacts and conflicts in the community. Ensure that the effect of brief loud noises such as locomotive horns are analyzed and that noise limitations include a maximum acceptable noise level for noises of short duration for interior sleeping areas of residential and other uses. Use the noise analysis to review development proposals to assure consistency with noise standards. Consider the following measures for mitigating noise impacts on adjacent properties:
    - Screen and control noise sources such as parking, outdoor activities and mechanical equipment.
    - Use technology to reduce noise impacts in instances where setbacks cannot be increased.
    - Use state of the art noise-abating materials technology and construction standards and double or triple glazed windows to meet noise standards.
    - Control hours of operation, including deliveries and trash pickup to minimize noise impacts.
    - Use the Future Noise Contours data and Municipal Codes on noise to determine if additional noise studies are needed.
- **Action SN4.C – Noise Ordinance.** Regularly review and update the noise ordinance to regulate noise-generating activities and proposed developments near noise generating activities based upon changes in state law. Where feasible, limit the impact of noise

sources on noise-sensitive uses and consider noise and vibration impacts in land use planning decisions. Require mitigation of potential noise impacts on adjacent properties. Enforce the Land Use Compatibility Standards presented in the State of California's General Plan Guidelines when siting new uses in existing noise environments. Require new residential development and other noise sensitive uses near railroad crossings or other sources of brief loud noise to be analyzed for noise compatibility using standards based on both 24-hour averages and maximum instantaneous interior noise levels to determine the noise effects on sleep disturbance and other essential human functions. Encourage projects to use site planning and building orientation principles and state-of-the-art noise-abating materials, technology and construction standards to minimize noise.

Reduce noise levels generated by roadways, railroads and other facilities by: encouraging Caltrans to institute noise reduction measures on existing and future freeways to lessen noise impacts on areas immediately adjacent to the freeway; encouraging public agencies to ensure that their programs are consistent with those of the City as they relate to noise control; and urging strict enforcement of current federal railroad noise emission standards by the DOT.

- **Action SN4.D – Quiet Zone Expansion.** Establish the entire City of Richmond as a railroad quiet zone and complete a study to determine the improvement costs for all of Richmond's at-grade railroad crossings.
- **Action SN4.E – Construction Traffic Plan Guidelines.** Maintain guidelines for preparing traffic plans to mitigate noise, traffic and dust during major construction activity. Continue to require construction traffic plans for all developments of 10 or more homes or commercial projects larger than 5 acres to regulate vehicle speeds, dust and noise mitigation, hours of operation, phased fencing plans and safety standards. The plan should ensure the safety of the public and employees during construction of major projects.

The General Plan defines acceptable noise levels for various types of land uses as shown in Table 4.10-2. These definitions are based on the California Governor's Office of Planning and Research General Plan Guidelines (State of California 2003).

The 2030 General Plan EIR determined that the noise effects from future development pursuant to the General Plan would be significant and unavoidable. Construction noise would cause temporary noise and vibration increases that would remain significant and unavoidable after implementing mitigation measures. Train and traffic noise would, in some cases, continue to remain significant and unavoidable even after mitigation. Operational activities associated with future development under the General Plan would result in less than significant impacts on noise and vibration. Cumulative impacts would be significant and unavoidable.

City of Richmond Municipal Code

City of Richmond Municipal Code Chapter 9.52 is known as the Community Noise Ordinance and provides City noise regulations. The ordinance is enforced by the Richmond Police Department. Key provisions of this ordinance are:

- Loading, unloading, and other handling of building materials, refuse, or similar items is prohibited between 9 p.m. and 6 a.m. if the noise creates a disturbance or violates the noise provisions of the City Planning Code (Section 9.52.050(g)).
- Operation of construction equipment is prohibited between 9 p.m. and 7 a.m. on weekdays and on weekends if the noise creates a disturbance or violates the noise provisions of the City Planning Code (Section 9.52.050(h)).

Table 4.10-2
Acceptable Noise Levels in the City of Richmond

Land Use Category	Normally Acceptable (dBA)	Conditionally Acceptable (dBA)	Normally Unacceptable (dBA)	Clearly Unacceptable (dBA)
Residential low density single family, duplexes, and mobile homes	Up to 60	55 to 70	70 to 75	75 or more
Residential multifamily	Up to 65	60 to 70	70 to 75	75 or more
Transient lodging (motels, hotels)	Up to 65	60 to 70	70 to 80	80 or more
Schools, libraries, churches, hospitals, and nursing homes	Up to 70	60 to 70	70 to 80	80 or more
Auditoriums, concert halls, and amphitheaters	Not specified	Up to 70	65 or more	Not specified
Sports arenas and outdoor spectator parks	Not specified	Up to 75	70 or more	Not specified
Playgrounds and neighborhood parks	Up to 70	67 to 75	72 or more	Not specified
Golf courses, riding stables, water sports, and cemeteries	Up to 75	Not specified	70 to 80	80 or more
Office buildings and business commercial and professional buildings	Up to 70	67 to 77	75 or more	Not specified
Industrial, manufacturing, utilities, and agriculture	Up to 75	70 to 80	75 or more	Not specified

Source: State of California 2003; City of Richmond 2012
dBA A-weighted decibel

- Temporary noise barriers must be constructed at construction sites adjacent to noise sensitive uses when the construction activity is projected to last for a year or more (Section 9.52.050(i)(1)).
- Noise from construction and demolition activities, ventilation and air conditioning systems, and similar equipment must comply with the noise regulations of the City Planning Code (Section 9.52.050(j)).
- Construction equipment must comply with the following (Section 9.52.060):
  - All construction equipment powered by internal combustion engines shall be properly muffled and maintained.
  - Unnecessary idling of internal combustion engines is prohibited.
  - All stationery noise-generating construction equipment such as tree grinders and air compressors are to be as far as is practical from existing residences.
  - Quiet construction equipment, particularly air compressors, are to be selected whenever possible.
  - Use of pile drivers, sources of impulsive sound and jack hammers shall be prohibited on Sundays and holidays, except for emergencies or as approved in advance by the Building Official.

The Community Noise Ordinance contains maximum noise levels of operational noise (Section 9.52.100) as shown in Table 4.10-3.

The Community Noise Ordinance contains maximum noise levels for construction equipment (Section 9.52.110) as shown in Table 4.10-4. The code states that "where technically and economically feasible," sound levels at the receiving properties should not exceed these noise limits.

Table 4.10-3
Maximum Noise Limits in Richmond Noise Ordinance

Zoning	Level not to be exceeded more than 30 minutes in any hour (dBA)		Level not to be exceeded more than 5 minutes in any hour (dBA)
	Measured at property line or district boundary	Measured at any boundary of a residential zone	From 10 p.m. to 7 a.m. measured at any boundary of a residential zone
Single Family Residential	60	60	50 or ambient noise level
Multifamily Residential	65	65	50 or ambient noise level
Commercial	70	60	50 or ambient noise level
Light industrial and office flex	70	60	50 or ambient noise level
Heavy and marine industrial	75	65	50 or ambient noise level
Public facilities and community use	65	60	50 or ambient noise level
Open space and recreational districts	65	60	50 or ambient noise level

Source: Richmond Municipal Code, Section 9.52.100
dBA A-weighted decibel

Table 4.10-4
Construction Noise Limits in Richmond Noise Ordinance

	Single Family Residential Zoning (dBA)	Multifamily Residential Zoning (dBA)	Commercial and Industrial Zoning (dBA)
Mobile Construction Equipment			
Weekdays, 7 a.m. to 7 p.m.	75	80	85
Weekends and holidays, 9 a.m. to 8 p.m.	60	65	70
Stationary Construction Equipment			
Weekdays, 7 a.m. to 7 p.m.	60	65	70
Weekends and holidays, 9 a.m. to 8 p.m.	55	60	65

Source: Richmond Municipal Code, Section 9.52.110

Note: The Community Noise Ordinance Section 9.52.110 states: "Where technically and economically feasible temporary construction activity shall be conducted in such a manner that the maximum sound levels at affected properties shall not exceed the following dBA levels." These levels are presented in Table 4.10-4. Mobile construction equipment is equipment that is used intermittently for less than 15 days. Stationary construction equipment is equipment that is used for 15 days or more.
dBA A-weighted decibel

4.10.4 Impacts and Mitigation Measures

Standards of Significance

The 2014 LRDP noise impacts would be considered significant if they would exceed the following Standards of Significance, in accordance with Appendix G of the *State CEQA Guidelines* and the UC CEQA Handbook:

- Exposure of persons to or generation of noise levels in excess of standards established in any applicable plan or noise ordinance, or applicable standards of other agencies
- Exposure of persons to or generation of excessive groundborne vibration or groundborne noise levels

- A substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project
- A substantial temporary or periodic increase in ambient noise levels in the project vicinity above existing levels existing without the project
- For a project located within an airport land use plan or, where such a plan has not been adopted, within 2 miles of a public airport or public use airport, would the project expose people residing or working in the project area to excessive noise levels?
- For a project near a private airstrip, would the project expose people residing or working in the project area to excessive noise levels?

For construction and operational noise, this EIR analysis uses Richmond Community Noise Ordinance and Richmond Municipal Code Sections 9.52.100 and 9.52.110 to establish significance thresholds.

For vibration, the thresholds for structural damage and annoyance in the Transportation- and Construction-Induced Vibration Guidance Manual are the applicable significance thresholds (Caltrans 2004).

For traffic noise, no impact would occur if traffic volumes were to increase by less than 200 percent because the resulting change in noise level, less than 3 dBA, would not be readily perceptible. A significant noise impact would occur if traffic volumes were to increase more than 1,000 percent. This would result in an increase in traffic noise levels of approximately 10 dBA. Between these two thresholds, a less than significant impact would occur.

CEQA Checklist Items Adequately Addressed in the Initial Study

The Initial Study for the RBC circulated with the NOP concluded that further analysis of the following issues was not required in the EIR.

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

The RBC site is not in a current or proposed airport land use plan or Airport Influence Area, as defined by Assembly Bill 2776. The RBC site is not within 2 miles of a public airport or near a current or planned private airstrip. Therefore, no further analysis is required.

Analytical Methods

Construction and demolition noise was evaluated assuming that typical construction equipment would be used. Noise level ranges were calculated using the distance from the property boundary to the nearest sensitive receptor. Construction would not likely occur at the edge of the RBC site, but construction footprints have not yet been fully defined. Consequently, this EIR noise analysis conservatively calculates noise sources from the boundary edges of the RBC development area (not including Natural Open Space). The nearest sensitive receptor is 150 feet from the RBC development boundary. Calculated noise level ranges were compared to the Richmond Municipal Code Section 9.52.110 construction noise limits to evaluate impact significance. Noise level ranges were also calculated for other surrounding receptors which, although not defined as sensitive and therefore not factoring into significance determination, might be close enough to experience construction noise.

Vibration impacts were analyzed by comparing Caltrans vibration thresholds (Caltrans 2004) to typical construction equipment vibration ratings and then calculating nearby building distances. Potential vibration impacts on project laboratories and scientific instruments would be self-managed and are not analyzed in this EIR.

Traffic noise impacts were evaluated using EIR traffic study data (Fehr and Peers 2013). Existing and future traffic volumes were compared and the difference was used to determine the approximate noise level increases and evaluate significance.

Operational noise was analyzed by (1) determining approximate equipment noise levels such as from generators and cooling towers, (2) determining approximate equipment noise levels at the nearest sensitive receptor, and then (3) comparing noise levels at the nearest sensitive receptor to the Richmond Municipal Code Section 9.52.100 exterior noise limits to evaluate significance. Modern HVAC equipment that would not exceed the noise limits in the Richmond Noise Ordinance when installed and operated in accordance with the manufacturer's instructions would be used. Therefore, HVAC noise was evaluated qualitatively.

RBC 2014 LRDP Policies

The RBC 2014 LRDP does not contain any policies related to noise.

LRDP Impacts and Mitigation Measures

LRDP Impact NOISE-1: Construction activities associated with development under the 2014 LRDP could generate and expose people to noise levels exceeding Richmond Community Noise Ordinance standards. (*Potentially Significant; Less than Significant with Mitigation*)

Construction and demolition would occur intermittently throughout development under the 2014 LRDP. Construction would take place on most portions of the RBC during this period, except for on designated Natural Open Space areas. Although temporary, construction at an individual site could last several years.

Construction and demolition would result in short-term noise impacts from construction equipment and vehicle use. In some instances, construction activities that occur near the project boundary and near sensitive receptors (in the southwest portion of the project site) could expose people to noise levels in excess of Richmond's Noise Ordinance standards, resulting in a potentially significant impact.

Table 4.10-5 contains maximum measured noise level of typical construction phases at distance of 50 feet from the noise source.

Table 4.10-5
Maximum dBA at 50 feet for Typical Construction Phases

Construction Phase	Maximum dBA at 50 feet
Excavation	87
Foundations	85
Building Erection	88
Exterior Finishing	90

Source: Illingworth & Rodkin 2010
dBA = A-weighted decibel

Using the construction noise levels in Table 4.10-5 and the noise attenuation factor of 6 dBA for every doubling of distance, Table 4.10-6 has the noise level ranges that would be experienced at various distances from the noise sources.

Table 4.10-6
Maximum dBA at Various Distances for Typical Construction Phases

Construction Phase	Noise Level at Distance from Noise Source (dBA)			
	100 feet	150 feet	300 feet	600 feet
Excavation	81	78	72	66
Foundations	79	76	70	64
Building Erection	82	79	73	67
Exterior Finishing	84	81	75	69

dBA = A-weighted decibel

The distance from each construction site to sensitive receptors would vary. The nearest sensitive receptor to the RBC site is a residential area to the southwest. The residential area boundary is 150 feet from the RBC development boundary (that excludes RBC Natural Open Space areas). The next nearest sensitive receptor is a residential area 460 feet northeast across I-580. I-580 traffic noise is expected to eclipse any RBC site construction noise. Consequently, no project noise impacts would likely be experienced in this residential area, so it is not further considered in this analysis.

As a result of construction and demolition activities, noise levels at the nearest sensitive receptor and in other surrounding areas could exceed the Richmond Noise Ordinance noise limits for stationary construction equipment (i.e., equipment that is operated for more than 15 days). As shown in Table 4.10-4, the Richmond Community Noise Ordinance limits for construction noise are 60 dBA in areas zoned single-family residential, 65 dBA in areas zoned multifamily residential, and 70 dBA in areas with commercial and industrial zoning.

The following mitigation measures would reduce construction and demolition noise in accordance with the Richmond Community Noise Ordinance. By implementing these mitigation measures, construction noise impacts would be reduced to less than significant.

LRDP MM NOISE-1:

NOISE-1a: Where technically and economically feasible, construction activities shall be conducted in such a manner that the maximum sound levels at the surrounding properties shall not exceed the dBA levels set forth in the Richmond Municipal Code Section 9.52.110.

NOISE-1b: The following measures shall be implemented for all construction equipment in accordance with Richmond Municipal Code Section 9.52.060. Quiet construction equipment, particularly air compressors, shall be used whenever possible. Construction equipment powered by internal combustion engines shall be properly muffled and maintained. Stationery noise-generating construction equipment such as tree grinders and air compressors are to be as far as is practical from existing residences. Unnecessary idling of internal combustion engines shall be prohibited. Sources of impulsive sound and jack hammers shall not be used on Sundays and holidays, except for emergencies.

NOISE-1c: If after implementing NOISE-1a and -1b, construction noise creates a disturbance or results in noise complaints from adjacent property, additional noise reduction strategies shall be evaluated and the necessary practicable technically and economically feasible noise mitigating measures would be implemented, sufficiently to ensure meeting City Noise Ordinance requirements.

LRDP Impact NOISE-2: Development under the 2014 LRDP would not generate or expose people to excessive groundborne vibration. (*Less than Significant*)

Construction equipment would cause vibrations that would spread through the ground and could cause damage to nearby structures, annoy people, or disrupt scientific equipment. Table 4.10-7 has guidelines to assess the damage potential from ground vibration induced by construction equipment. Table 4.10-8 has guidelines for the likely annoyance caused by vibration-producing activities.[36]

Table 4.10-7
Guideline Vibration Damage Thresholds

Structure	PPV (in/sec)*
Extremely fragile historic buildings, ruins, ancient monuments	0.08
Fragile buildings	0.1
Historic and some old buildings	0.25
Older residential structures	0.3
Newer residential structures	0.5
Modern industrial and commercial buildings	0.5

* Threshold for frequent, intermittent, or continuous sources such as pile drivers and compactors.
Source: Caltrans 2004
in/sec = inches per second
PPV = peak particle velocity

Table 4.10-8
Vibration Annoyance Thresholds

Human Response	Continuous Vibration PPV (in/sec)*	Intermittent Vibration PPV (in/sec)*
Very disturbing/severe	3.6 (at 2 Hz)–0.4 (at 20 Hz)	2.0
Strongly perceptible	0.10	0.9
Distinctly perceptible	0.035	0.24
Slightly perceptible	0.012	0.035

Source: Caltrans 2004
in/sec = inches per second
PPV = peak particle velocity

[36] These guideline vibration damage thresholds were developed for Caltrans by synthesizing the results of multiple vibration studies.

Table 4.10-9 shows the vibration associated with several types of common construction equipment.

Table 4.10-9
Vibration Levels produced by Typical Construction Equipment

Equipment	PPV (in/sec) at a distance of 25 feet
Pile driver (impact, typical)	0.644
Pile driver (sonic, typical)	0.170
Vibratory roller	0.210
Large bulldozer	0.089
Loaded truck	0.076
Jackhammer	0.035
Small bulldozer	0.003

Source: Federal Highway Administration and Federal Transit Administration 2006; Caltrans 2004.
in/sec inches per second
PPV peak particle velocity

The distance from each construction site to structures that could be affected by vibration would vary but is not likely to be less than 25 feet. Only pile driving would exceed the vibration damage threshold for newer residential and modern commercial buildings and pile driving is not anticipated as part of the project. The nearest residential area is 150 feet southwest of the RBC development boundary and the residential buildings are of relatively newer construction. Project construction equipment would neither exceed the vibration damage threshold nor be perceptible at these neighborhoods. Since the vibration damage thresholds would not be exceeded and vibrations would not be an annoyance at the nearest sensitive receptor, vibration impacts would be less than significant.

If vibration-sensitive equipment is located at the RBC, appropriate vibration-dampening design would be included in laboratory construction.

Under the 2014 LRDP, campus operations would not induce substantial groundborne vibration so there would be no impact.

Mitigation Measure: No mitigation measure is required.

LRDP Impact NOISE-3: Development under the 2014 LRDP would not generate and expose people to noise levels exceeding Richmond Community Noise Ordinance standards or result in a substantial permanent increase in ambient project vicinity noise levels. (*Less than Significant*)

Long-term noise impacts would occur from increasing the onsite population and traffic volumes on the RBC site and nearby roads and from installing new building cooling towers, emergency generators, and HVAC equipment. Noise would not increase sitewide, but rather near the noise source, with the increase in noise decreasing with distance from the source.

Traffic Volume and Average Daily Population Increases

Development under the 2014 LRDP would ultimately raise the RBC site adp to 10,000 by 2050 and therefore increase the amount of and noise from vehicle traffic.

Vehicle noise depends on a number of factors including the mode split, type of vehicle (for example, passenger car, bus, or truck) and the vehicle's speed. Vehicle noise also fluctuates depending on traffic volume. A doubling of traffic volume results in a 3 dBA increase in noise levels. A 3 dBA noise difference is too small to be perceived by the average person. Traffic volume would need to be tripled to result in a readily perceivable (5 dBA) increase in noise. When traffic volume increases 1,000 percent, it results in a 10 dBA increase in the sound level, which is perceived by the average person as twice as loud (Federal Highway Administration 2011).

Development under the 2014 LRDP would increase traffic volumes and therefore increase traffic noise levels. At most of the 14 intersections studied, traffic volumes would not double (Fehr and Peers 2013); therefore, the increase in traffic noise would be less than 3 dBA and would not be readily perceivable by the average person. Traffic volumes would more than triple at two intersections: Meade Street and Regatta Boulevard and Meade Street and Seaver Avenue. There would be a readily perceptible increase in traffic noise levels near these roadways. However, traffic volumes at these intersections would not increase by 1,000 percent, so the impact on traffic noise levels would be less than significant.

New Mechanical Equipment

Operation of the project would introduce new noise sources, including cooling towers, air compressors, emergency backup generators, electrical transformers, and HVAC systems.

The HVAC systems would include both indoor and outdoor noise-producing components such as fans, pumps, and compressors. Air compressors would be located indoors. HVAC systems would be installed and operated according to the manufacturer's instructions to minimize noise both indoors and outdoors. Although the HVAC systems would add an incremental amount of noise to the area, the resulting difference in ambient noise levels would likely not be perceptible (i.e., would be less than 3 dBA). Since sound levels decrease by 6 dBA with each doubling of distance, the HVAC systems would need to emit a very high noise level (e.g., akin to an operating jackhammer) to exceed the lowest Richmond Community Noise Ordinance threshold of 50 dBA at the nearest sensitive receptor (the residential area 150 feet from the nearest proposed building). The HVAC systems would operate well below this level of noise output. Thus, the HVAC systems would not violate the Richmond Community Noise Ordinance and the impact of HVAC operation would be less than significant.

The approximate noise output of operational equipment is presented in Table 4.10-10.

Table 4.10-10
Typical Noise Levels for Operational Equipment

Equipment	50 feet	Noise level at 150 feet, Distance from RBC boundary to nearest sensitive receptor
Air compressor	66	57
Electrical transformer	51	42
Generator (diesel engine)	71	62
Cooling tower	44	35

Source: EPA 1971; LBNL 2010

The backup generators would generally be outdoors next to each building at ground level and toward the perimeter of the site. The generators would operate a minimum of 100 hours per year to maintain them properly. They would be tested during the day and would typically operate for about 30 minutes; therefore, they would have a minimal effect on ambient noise levels. Any additional operation would be as needed to provide emergency backup power, so with only occasional exceptions, the generators would not be operating and would not produce any noise.

The cooling towers would generally be on building rooftops toward the site perimeter. Each cooling tower would rise approximately 20 feet above the roof. Cooling towers may also be placed adjacent to buildings.

The air compressors would be inside buildings. Being inside a building would provide approximately 25 dBA of sound attenuation, based on the sound dampening properties of buildings of average construction, so the air compressors would not exceed the Richmond Community Noise Ordinance threshold (American Industrial Hygiene Association 2003).

In addition to the air compressors, some of the other equipment could be housed inside the building or an enclosure, so it would not exceed the Richmond Community Noise Ordinance threshold.

As shown in Table 4.10-3, the Richmond Community Noise Ordinance limits equipment noise received at the nearest sensitive receptor. The Ordinance stipulates that such noise cannot exceed 60 dBA in the daytime and cannot exceed 50 dBA or the ambient noise level in the nighttime. The electrical transformers and cooling towers would not exceed these limits. The air compressors would not exceed these limits since they would be inside. The generators could exceed these limits; however, the generators would rarely be used. Therefore, operational noise impacts would be less than significant.

Mitigation Measure: No mitigation measure is required.

Cumulative Impacts and Mitigation Measures

The cumulative noise analysis evaluates whether the 2014 LRDP impacts, together with the cumulative development impacts in the region, would result in a significant impact based on the criteria presented at the beginning of this section. If so, this analysis determines whether the 2014 LRDP contributions would be considerable. Both conditions must apply in order for the project's cumulative impacts to be significant.

The cumulative noise impact region of influence is limited by the distance over which noise propagates. Off-site noise sources would not overlap substantially with proposed project noise at distances of more than 0.5 mile from the RBC site or 1,000 feet from the roadway centerline of affected roads.

LRDP Cumulative Impact NOISE-1: Development under the 2014 LRDP and regional cumulative development would not result in a cumulatively considerable temporary increase in ambient noise levels and groundborne vibration in the project vicinity. (*Less than Significant with Mitigation*)

Development under the 2014 LRDP and cumulative development in the region would intermittently generate short-term noise and vibration from construction and demolition activities. As described under LRDP Impacts NOISE-1 and NOISE-2, construction and demolition activities associated with the 2014 LRDP would not expose people to noise levels in excess of standards established in Richmond's Noise Ordinance or result in significant temporary or periodic increases in noise or vibration with the incorporation of mitigation measures LRDP MM NOISE-1a through 1c.

RBC project construction noise and vibration would cumulatively overlap with construction noise from only one cumulative project in the area: the proposed redevelopment at Bio-Rad Laboratories west of the RBC site. The Bio-Rad Laboratories project is required to comply with the Richmond Noise Ordinance for construction noise limits. The City of Richmond prepared CEQA documentation for the proposed Bio-Rad project that includes imposition of noise mitigation measures. These measures limit noisy Bio-Rad project construction activities, including on-road truck trips near the project, to 7:00 a.m. to 7:00 p.m. on weekdays and 8:30 a.m. to 6:00 p.m. on Saturdays and legal holidays. No construction is permitted on Sundays. There is no indication that the proposed construction would include any unusual vibration-generating activities or equipment that would exceed vibration damage thresholds (City of Richmond 2010). Therefore, temporary noise and vibration impacts from the proposed Bio-Rad Laboratories project in combination with LRDP implementation would be less than significant. Accordingly, with implementation of LRDP MM NOISE-1, there would not be a cumulatively considerable temporary increase in ambient noise levels and groundborne vibration in the project vicinity.

LRDP Cumulative Impact NOISE-2: Development under the 2014 LRDP and regional cumulative development would not result in a cumulatively considerable permanent increase in ambient noise levels in the project vicinity. (*Less than Significant*)

The proposed 2014 LRDP and regional cumulative development would permanently increase noise levels in the area by adding population and vehicle traffic and installing new mechanical equipment such as cooling towers and generators. As described under LRDP Impact NOISE-3, long-term noise impacts associated with the 2014 LRDP would not expose people to noise levels exceeding Richmond's Community Noise Ordinance standards under normal operating conditions.

Project operational noise could overlap with operational noise from only one cumulative project in the area: the proposed redevelopment at Bio-Rad Laboratories west of the RBC site. The Bio-Rad Laboratories project is required to comply with the Richmond Noise Ordinance for exterior noise limits. The City of Richmond prepared CEQA documentation for the proposed Bio-Rad project that requires installation of improved machinery sound insulation in the replacement building. There is no indication that the equipment would be considerable a source of vibration (City of Richmond 2010). Therefore long-term noise and vibration impacts from the proposed

Bio-Rad Laboratories project in combination with development under the proposed 2014 LRDP would be less than significant.

Under cumulative conditions, traffic volumes and therefore traffic noise levels would increase. At 13 of the 14 intersections studied, the project's contribution to traffic volume increases would not cause traffic volumes to double (Fehr and Peers 2013); therefore, the increase in traffic noise would be less than 3 dBA and would not be readily perceivable by the average person. Traffic volumes would more than triple at the intersection of Meade Street and Seaver Avenue, increasing by 315 percent during the a.m. peak hour and by 337 percent during the p.m. peak hour. There would be a readily perceptible increase in traffic noise levels near this location; however, because the traffic volumes at this intersection would not increase 1,000 percent, the impact on traffic noise levels would be less than significant. Accordingly, there would not be a cumulatively considerable permanent increase in ambient noise levels and groundborne vibration in the project vicinity.

4.10.5 References

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