RIVERSIDE COUNTY TRANSPORTATION COMMISSION

Riverside-Downtown STATION IMPROVEMENTS

Appendix N. Noise and Vibration Technical Report

RIVERSIDE COUNTY TRANSPORTATION COMMISSION

Riverside-Downtown
STATION IMPROVEMENTS

Riverside-Downtown Station Improvements

Noise and Vibration Technical Report

July 2021

THIS PAGE INTENTIONALLY LEFT BLANK

TABLE OF CONTENTS

TABLE OF CONTENTS (CONT.)

LIST OF APPENDICES

LIST OF FIGURES

LIST OF TABLES

ACRONYMS AND ABBREVIATIONS

Acronym	Definition
ANSI	American National Standards Institute
BNSF	Burlington Northern Santa Fe
CAD	Computer Aided Design
CadnaA	Computer Aided Noise Abatement
Caltrans	California Department of Transportation
CEQA	California Environmental Quality Act
City	City of Riverside
CNEL	Community Noise Equivalent Level
CY	cubic yard
dB	decibel
dBA	A-weighted decibels
FTA	Federal Transit Administration
Hz	Hertz
HVAC	heating, ventilation, and air conditioning
KHz	kilohertz
L_{DN}	Day-Night level
L_{EQ}	equivalent sound level
MP	mile post
MPA	micro-Pascals
NSLU	noise-sensitive land use
PPV	peak particle velocity
RCNM	Roadway Construction Noise Model
RCTC	Riverside County Transportation Commission
RDS	Riverside-Downtown Station
SPL	sound pressure level
SR	State Route
STC	Sound Transmission Class
TNM	Traffic Noise Model
USDOT	U.S. Department of Transportation
VDb	vibration decibels

1.0 Introduction

This report presents an assessment of potential noise and vibration impacts during construction and operation of the proposed Riverside-Downtown Station (RDS) Improvements Project (project).

The Riverside County Transportation Commission (RCTC) and Metrolink propose construction of the project, which involves improvements to the RDS located at Mile Post (MP) 9.9 to MP 10.2 on the Burlington Northern Santa Fe (BNSF) San Bernardino Subdivision. Proposed improvements include additional passenger loading, enhanced pedestrian and vehicular access, and additional parking. The purpose of the project is to improve capacity, efficiency, and connectivity near the RDS.

The project is subject to state and federal environmental review requirements because it involves the use of federal funds from the Federal Transit Administration (FTA). An Environmental Impact Report (EIR)/Environmental Assessment (EA) will be prepared for the project in compliance with the California Environmental Quality Act (CEQA) and the National Environmental Policy Act (NEPA). RCTC is the CEQA lead agency, and FTA is the NEPA lead agency.

1.1. Project Location and Setting

The proposed project is located at the existing RDS in the City and County of Riverside. Specifically, the project is located at 4066 Vine Street, Riverside, CA 92507, at approximately MP 9.9 to 10.2 on the BNSF Railway San Bernardino Subdivision (Figure 1-1, Regional and Project Location). The project study area is highly developed with residential, commercial, industrial, public facilities, and parks, as well as well as a railroad corridor owned by RCTC and used by passenger and freight rail. Residential uses are concentrated to the east while commercial and industrial uses are interspersed amongst one another on the west side of the study area. State Route (SR) 91 is located approximately 0.1 mile to the west, and SR 60 is located approximately 1.3 miles to the north. Other notable uses in the vicinity include the University of California Riverside campus located approximately two miles to the east and Riverside Community College located approximately 0.75 mile to the southwest.

1.2. Purpose and Need

The purpose of the proposed project is to expand capacity, improve operations and efficiency, connectivity, and the passenger experience at the RDS. In June 2016, the new Perris Valley Line opened, and most of the Metrolink 91 Service was extended to South Perris and rebranded as the 91/Perris Valley (91/PV) Line. Currently, four of the 91/PV Line morning trains originate from the Perris-South Station and four of the afternoon or evening trains terminate there. Additionally, new “local” service currently operates between the RDS and Perris-South Station. This new local service terminates in downtown Riverside, increasing the need for improved connectivity from these trains to other trains in the Metrolink system. This would create more transfers and passenger traffic at the RDS, adding to the approximately 1,000 trips that currently originate there each weekday. The proposed project would increase rail capacity and service reliability at the RDS and would improve connectivity between local trains.

The basic project objectives supporting the purpose of the project are listed below:

- Expand platform capacity to meet passenger train storage needs;
- Allow for train meets off the BNSF mainline and minimize impacts to BNSF operations;
- Improve train connectivity and passenger accessibility while minimizing impacts on improvement projects near the station that are already designed or in construction;
- Facilitate more efficient passenger flow and reduce dwell times;
- Enhance safety and access for station users; and
- Accommodate projected future demand.

Figure 1-1. Regional and Project Location

THIS PAGE INTENTIONALLY LEFT BLANK

2.0 Project Description

2.1. Proposed Project

The RCTC and Metrolink propose to improve the RDS located at MP 9.9 to MP 10.2 on the BNSF San Bernardino Subdivision located just east of SR 91 and a short distance from the SR 60 in the City and County of Riverside, California.

Proposed improvements include construction of an additional passenger loading platform, the extension of the existing pedestrian overcrossing and additional elevator and associated tracks which would allow for two trains to service the station off the BNSF mainline. The proposed track would be required to connect and integrate into the existing station layover tracks on the east side to improve train meet times without impacting BNSF operations. The project would also provide additional parking and improved vehicular traffic circulation on the east side of the station.

2.2. Project Alternatives

Descriptions of a No Project Alternative and one Build Alternative (also referred to as proposed project) are provided below. The No Project Alternative is included to provide a baseline for comparison with the Build Alternative. The Build Alternative, or proposed project, is analyzed in this report.

2.2.1. No Project Alternative

Under the No Project Alternative, implementation of improvements at the RDS would not be constructed, and the current configuration of the RDS would remain the same. The No Project Alternative would not meet the project objectives or improve operations to accommodate the 91/PV Line and the Inland Empire Orange County (IEOC) Lines. Train capacity and storage would be limited to the existing platforms. This alternative does not meet the purpose and need for station improvements and additional passenger service. The No Project Alternative provides insight on future conditions with no improvements and serves as a baseline for comparison with the Build Alternative.

2.2.2. Build Alternative

RCTC and Metrolink propose improvements to the following elements of the RDS: (1) Station Platform and Tracks; (2) Pedestrian Access; and (3) Parking, Circulation and Streetscape. A summary of the proposed Build Alternative improvements is presented in Table 2-1. The Build Alternative includes several design options related to the pedestrian overcrossing and parking and circulation improvements.

Table 2-1. Summary of Proposed Build Alternative Improvements

Element	Description
1. Station Platform and Track Improvements	• Add new center platform (Platform 3) • Add new tracks (Station Tracks 5 and 6) • Modification of railroad signal system
2. Pedestrian Access Improvements	• Extend pedestrian access to new Platform 3 • Emergency egress would be provided at three locations
3. Parking, Circulation and Streetscape Improvements	• Traffic Circulation Options and Howard Avenue Extension • Relocate ADA parking • Add sidewalks and trees • Add up to 560 additional parking spaces

The proposed improvements would enhance Metrolink train connections without affecting BNSF services. The improvements would be designed in accordance with the most recent applicable codes, Southern California Regional Rail Authority (SCRRA), BNSF, Americans with Disabilities Act (ADA), American Railway Engineering and Maintenance-of-Way Association (AREMA), Federal Rail Administration (FRA), and California Public Utilities Commission (CPUC), standards and guidelines.

1. Station Platform and Tracks

The Build Alternative, includes the following station platform and track improvements as part of the proposed project (see Figure 2-1, Build Alternative Elements):

- Add new center platform (Platform 3) that is approximately 680 feet in length and 30 feet in width with direct access from the new parking area to the east and access from the west using the at-grade crossings from Platform 2;

- Add new tracks (Station Tracks 5 and 6) and other track improvements; and

- Modification of the railroad signal system.

Platform 3 would be located between Station Tracks 5 and 6. Platform 3 would be able to service seven 85-foot passenger cars. The centerline to centerline spacing of the parallel tracks at the platform would be approximately 40 feet. Demolition of existing structures and other ancillary improvements would be required to facilitate construction of the station platform and track improvements.

2. Pedestrian Overpass Access

The Build Alternative includes the following pedestrian access improvements as part of the proposed project:

- Extend the existing pedestrian overpass access (see Figure 2-1).

- Add pedestrian at-grade access from the proposed surface parking lot on the east side of proposed station improvements to Platforms 2 and 3 through an extension of the existing pedestrian at-grade crossing on the north end of the platforms and a new pedestrian at-grade rail crossing on the south end of the platforms. The pedestrian at-grade crossings would include safety enhancements such as proper channelization, automated gates, and flashers.

- Emergency egress would be provided at three locations from Platform 3:
  - North end pedestrian at-grade crossing (existing at-grade crossing to be extended);
  - Pedestrian Access; and
  - South end pedestrian at-grade crossing (new).

3. Traffic Circulation Options and Howard Avenue Extension

The Build Alternative includes the following parking, circulation, and streetscape improvements as part of the proposed project:

- Relocate ADA parking;
- Modify the bus drop-off area;
- Add sidewalks and trees; and
- Add up to 560 additional parking spaces (proposed surface parking lot) with access to the east side of the station via at-grade pedestrian crossings.

Parking and Streetscape Improvements

All six of the traffic circulation and parking options studied (1A through 3B) would include the following streetscape components:

1. Adding sidewalks and street trees along the perimeter of the new and existing parking lots, in the planter strips next to the roadway on 12th Street, Howard Avenue, and 10th and 9th Streets.
2. Adding up to 560 parking spaces (proposed surface parking lot) with access to the east side of the station via at-grade pedestrian crossings. ADA parking would be adjacent to Platform 3 on the east side of the station.

Figure 2-1 illustrates each of the proposed project elements previously described.

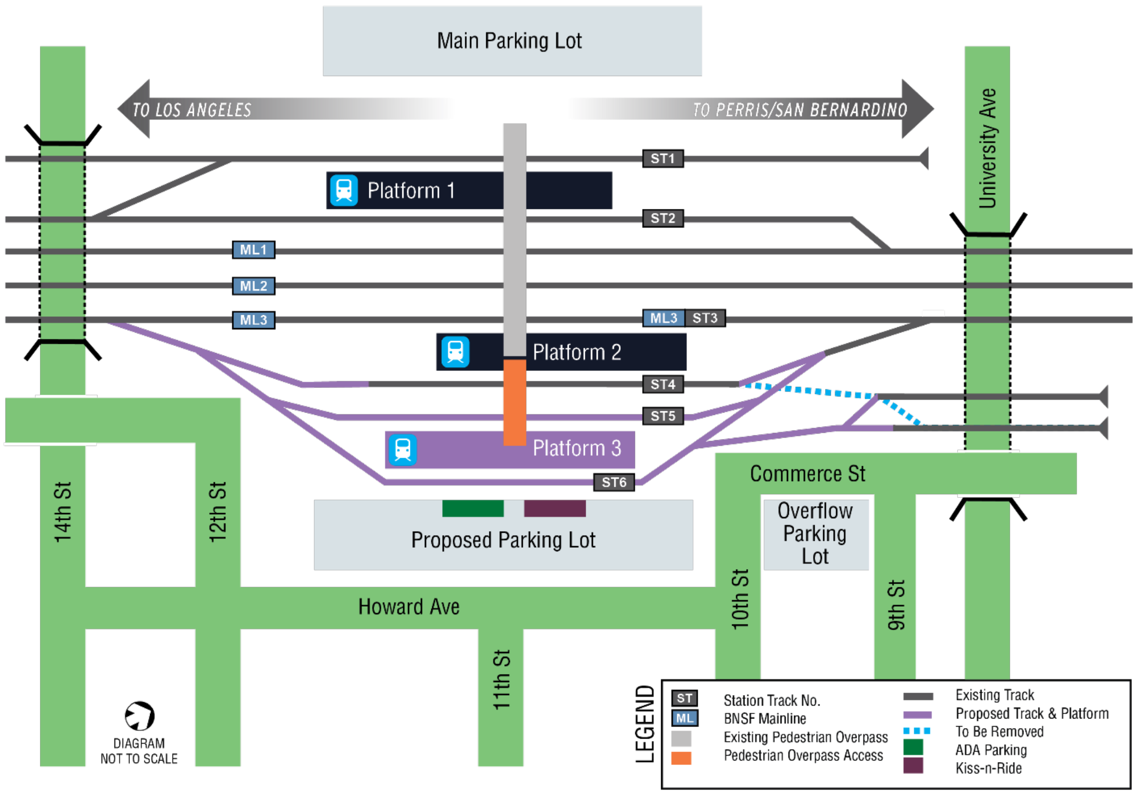


Figure 2-1. Build Alternative Elements

Design Options

As part of the Build Alternative, there is a design option related to a longer extension of the pedestrian overpass access from the new proposed platform to the new surface parking lot. Another design option is associated with the new surface parking lot and combining this new parking lot with the existing overflow parking lot on the east side of the station. This parking option includes traffic circulation improvements along Howard Avenue, 9th Street, 10th Street, and Commerce Street. A summary of the proposed design options is presented in Table 2-2.

Table 2-2. Summary of Proposed Build Alternative with Design Options

Build + Design Option	Description
Pedestrian Overpass Access Improvements	
Pedestrian Overpass Access Design Option 1	Extend pedestrian overpass access from the new Platform 3 and to the new surface parking lot.
Parking, Circulation, and Streetscape Improvements	
Parking Design Option 1A	New surface parking lot east of station *Impacts existing structures and other ancillary structures and residential parcels on the corner of 12th Street and Howard Avenue to facilitate construction of the proposed improvements.*
Parking Design Option 1B	Same as Parking Design Option 1A *Avoids relocation impacts to residential parcels on the corner of 12th Street and Howard Avenue.*
Parking Design Option 2A	New surface parking lot east of station combined with existing overflow parking lot with the extension of Howard Avenue through to 9th Street *Impacts existing structures and other ancillary structures and residential parcels on the corner of 12th Street and Howard and requires acquisition of additional parcels directly east of the existing overflow parking lot.*
Parking Design Option 2B	Same as Parking Design Option 2A *Avoids relocation impacts to residential parcels on the corner of 12th Street and Howard Avenue.*
Parking Design Option 3A	Same as Parking Design Option 1A/2A *Avoids impacts to additional parcels east of the existing overflow parking lot by routing Howard Avenue around the parcels.*
Parking Design Option 3B	Same as Parking Design Option 1B/2B *Avoids relocation impacts to additional parcels east of the existing overflow parking lot and residential parcels on the corner of 12th Street and Howard Avenue.*

Pedestrian Overpass Access Improvements

Access from the existing station area would be provided by the proposed extension of the pedestrian overpass (see Figure 2-2, Build Alternative with Pedestrian Overpass Access Design Option 1). The Build Alternative with Pedestrian Overpass Access Design Option 1 includes a longer extension of the pedestrian overpass to Platform 3 and new surface parking lot (two spans, two towers/elevators).

The new pedestrian overpass elevator tower would be located 14 feet clear of both Track 5 and Track 6 on Platform 3. Emergency egress access would be provided by two 10-foot wide at-grade pedestrian crossings at the north and south end of Platform 3 to the proposed surface parking lot.

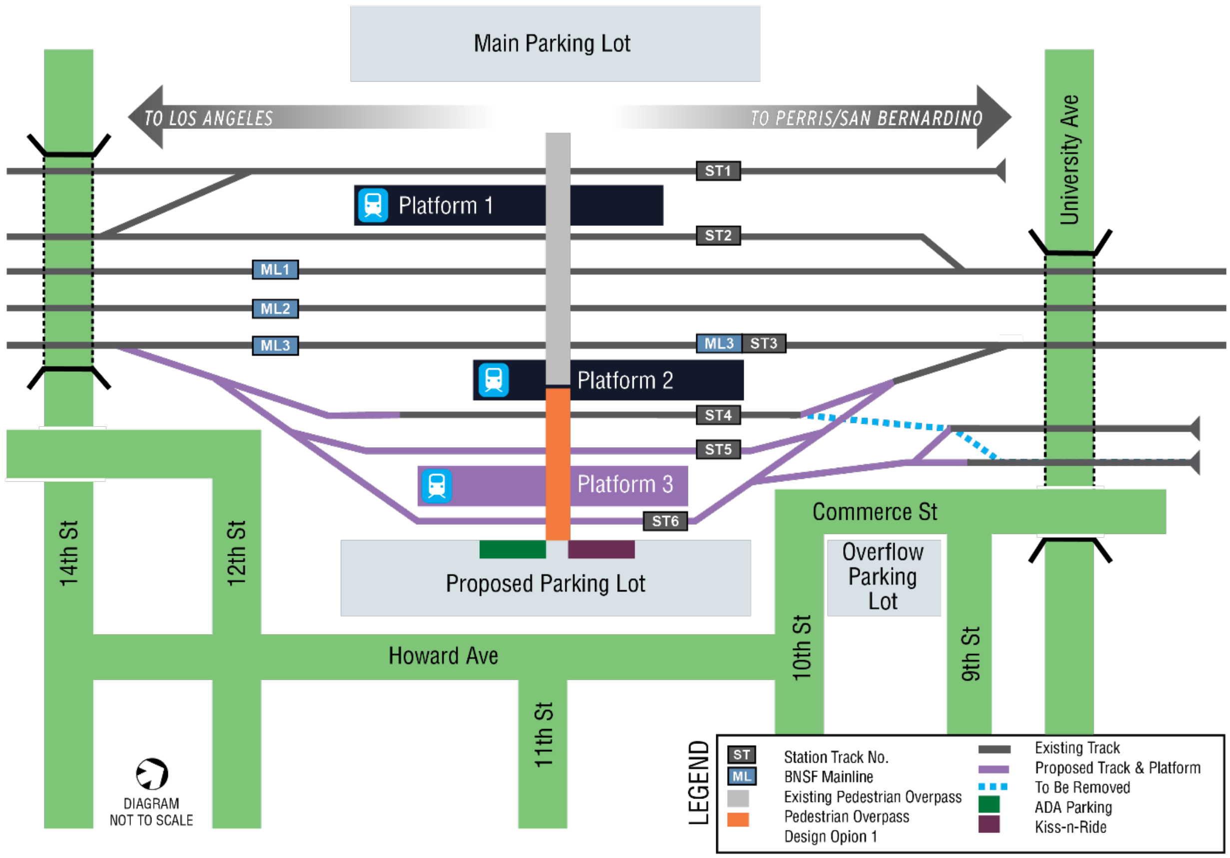


Figure 2-2. Build Alternative with Pedestrian Overpass Access Design Option 1

Parking, Circulation and Streetscape Improvements

All parking design options would require the acquisition of parcels directly east of the station and demolition of existing structures and other ancillary structures to facilitate construction of the proposed Build Alternative improvements:

- Parking Design Option 1A would require the acquisition of residential parcels on the corner of 12th Street and Howard Avenue. Parking Option 1B would avoid the residential properties.
- Parking Design Option 2A and 2B would have similar ROW impacts as Options 1A and 1B but would require acquisition of additional parcels directly east of the existing overflow parking lot.
- Parking Design Option 3A and 3B would have similar ROW impacts as Options 2A and 2B but would avoid parcel acquisitions directly east of the overflow parking lot.

- Parking Design Option 1A/1B adds a new surface parking lot and maintains separation from the existing overflow parking lot on the eastside of the station (Figure 2-3, Build Alternative with Parking Design Option 1A, and Figure 2-4, Build Alternative with Parking Design Option 1B).[1]

  — Parking Design Option 1A – Add new surface parking lot and maintain separation from existing overflow parking lot on the east side of the station. Acquisition and demolition of residential parcels on the corner of 12th Street and Howard Avenue would be required (see Figure 2-3).

  — Parking Design Option 1B – Add proposed surface parking lot and maintain separation from existing overflow parking lot on the east side of the station and avoid impacts to residential parcels at the corner of 12th Street and Howard Avenue (see Figure 2-4).

- Parking Design Options 2A/2B proposes a new surface parking lot directly east of the station combined with the existing overflow parking lot.

  — Parking Design Option 2A – Combine proposed surface parking lot with existing overflow parking lot on the east side of the station which would require acquisition and demolition of residential parcels on the corner of 12th Street and Howard Avenue. This option would also include extending Howard Avenue through to 9th Street and would require additional acquisition of parcels directly east of the existing overflow parking lot as well as partial street vacations for 10th Street and Commerce Street (see Figure 2-5, Build Alternative with Parking Design Option 2A).

  — Parking Design Option 2B – Combine proposed surface parking lot with existing overflow parking lot on the east side of the station and avoid impacts to residential parcels at the corner of 12th Street and Howard Avenue. This option would also include extending Howard Avenue through to 9th Street and would require additional acquisition of parcels directly east of the existing overflow parking lot as well as partial street vacations for 10th Street and Commerce Street (see Figure 2-6, Build Alternative with Parking Design Option 2B).

- Parking Design Options 3A and 3B propose a new surface parking lot directly east of the station combined with the existing overflow parking lot and extension of Howard Street through to 9th Street.

  — Parking Design Option 3A – Combine proposed surface parking lot with existing overflow parking lot on the east side of the station which would require and demolition of residential parcels on the corner of 12th Street and Howard Avenue. This option would also include extending Howard Avenue through to 9th Street as well as partial street vacations for 10th Street and Commerce Street while avoiding additional acquisition of parcels directly east of the existing overflow parking lot (see Figure 2-7, Build Alternative with Parking Design Option 3A).

[1] Figures 2-3 through 2-8 are located at the end of this chapter.

— Parking Design Option 3B – Combine proposed surface parking lot with existing overflow parking lot on the east side of the station and avoid impacts to residential parcels at the corner of 12th Street and Howard Avenue. This option would also include extending Howard Avenue through to 9th Street as well as partial street vacations for 10th Street and Commerce Street while avoiding additional acquisition of parcels directly east of the existing overflow parking lot (see Figure 2-8, Build Alternative with Parking Design Option 3B).

2.3. Construction Activities and Phasing

Project construction is anticipated to begin in 2023 completed in 2025. Construction activities would include demolition, site preparation, grading, paving, track construction, bridge/platform construction, and architectural coatings.

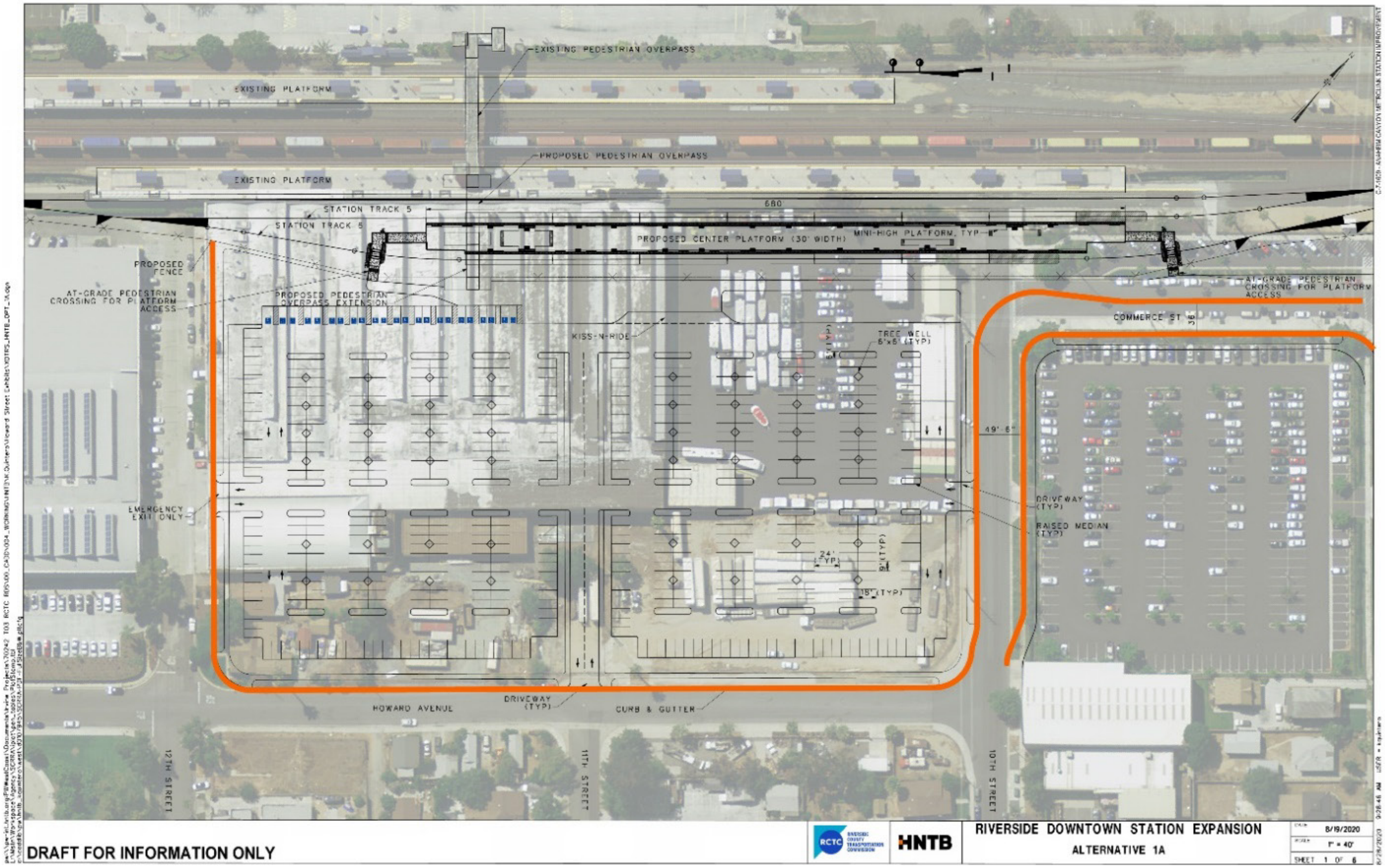


Figure 2-3. Build Alternative with Traffic Circulation and Parking Option 1A

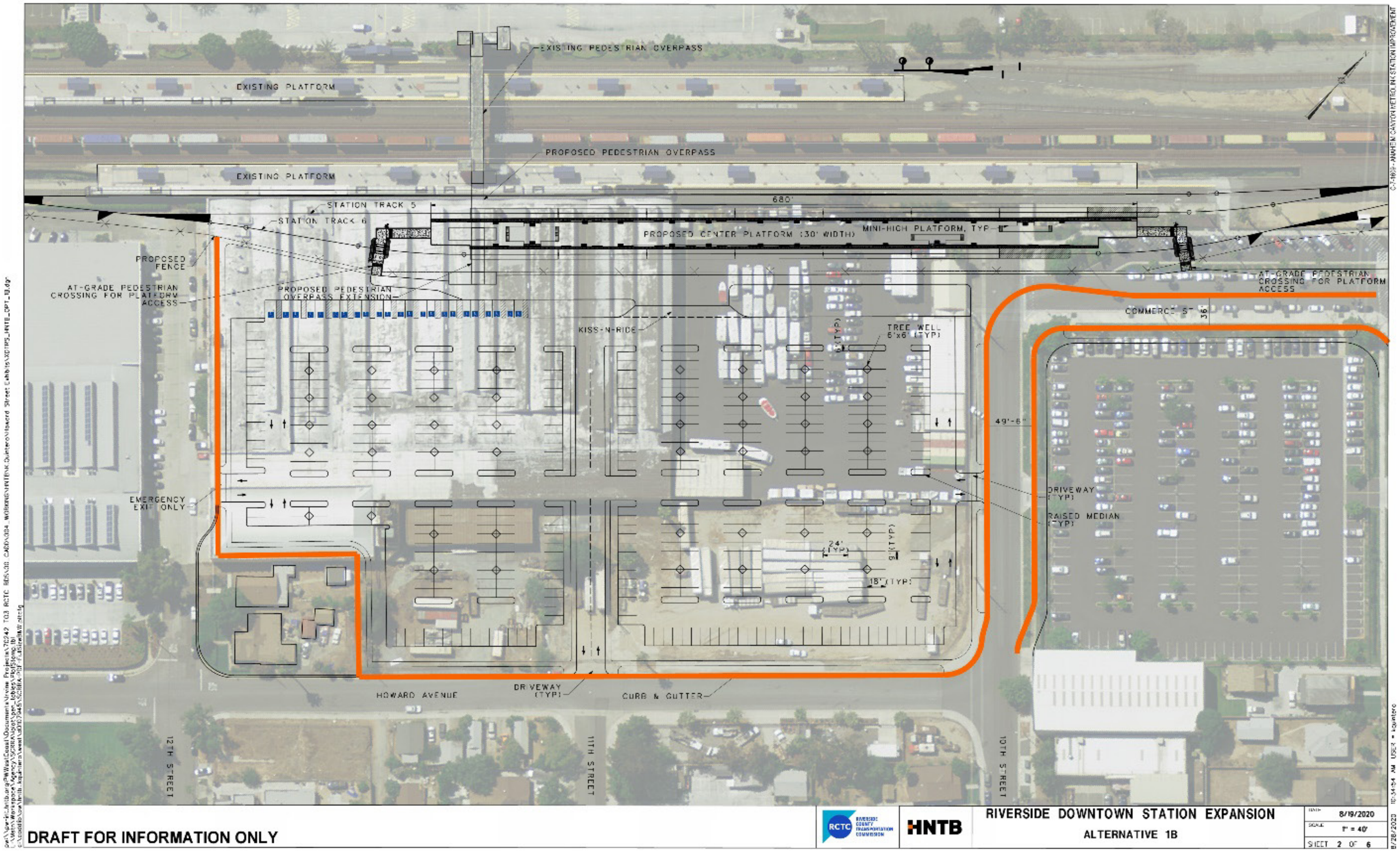


Figure 2-4. Build Alternative with Traffic Circulation and Parking Option 1B

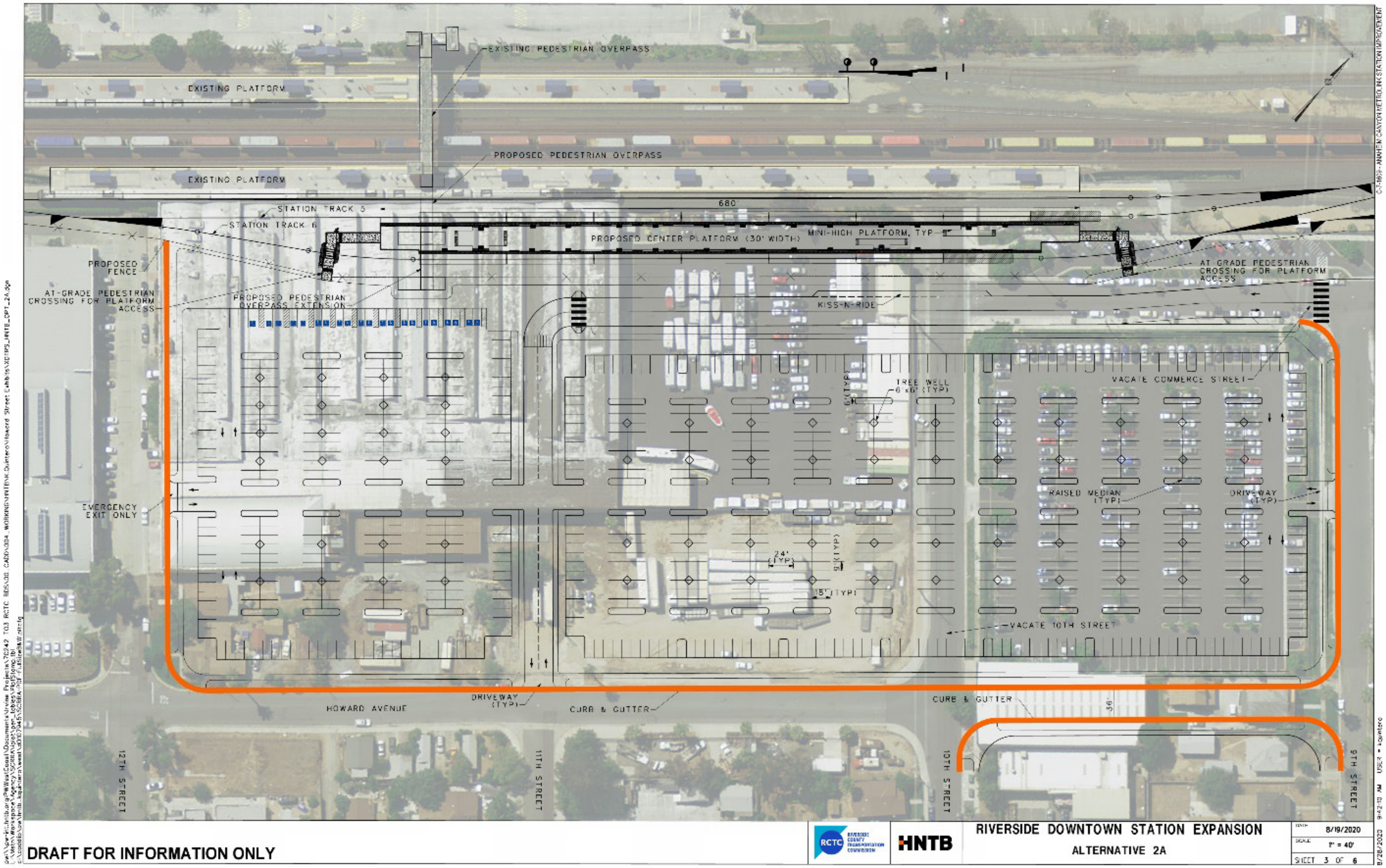


Figure 2-5. Build Alternative with Traffic Circulation and Parking Option 2A

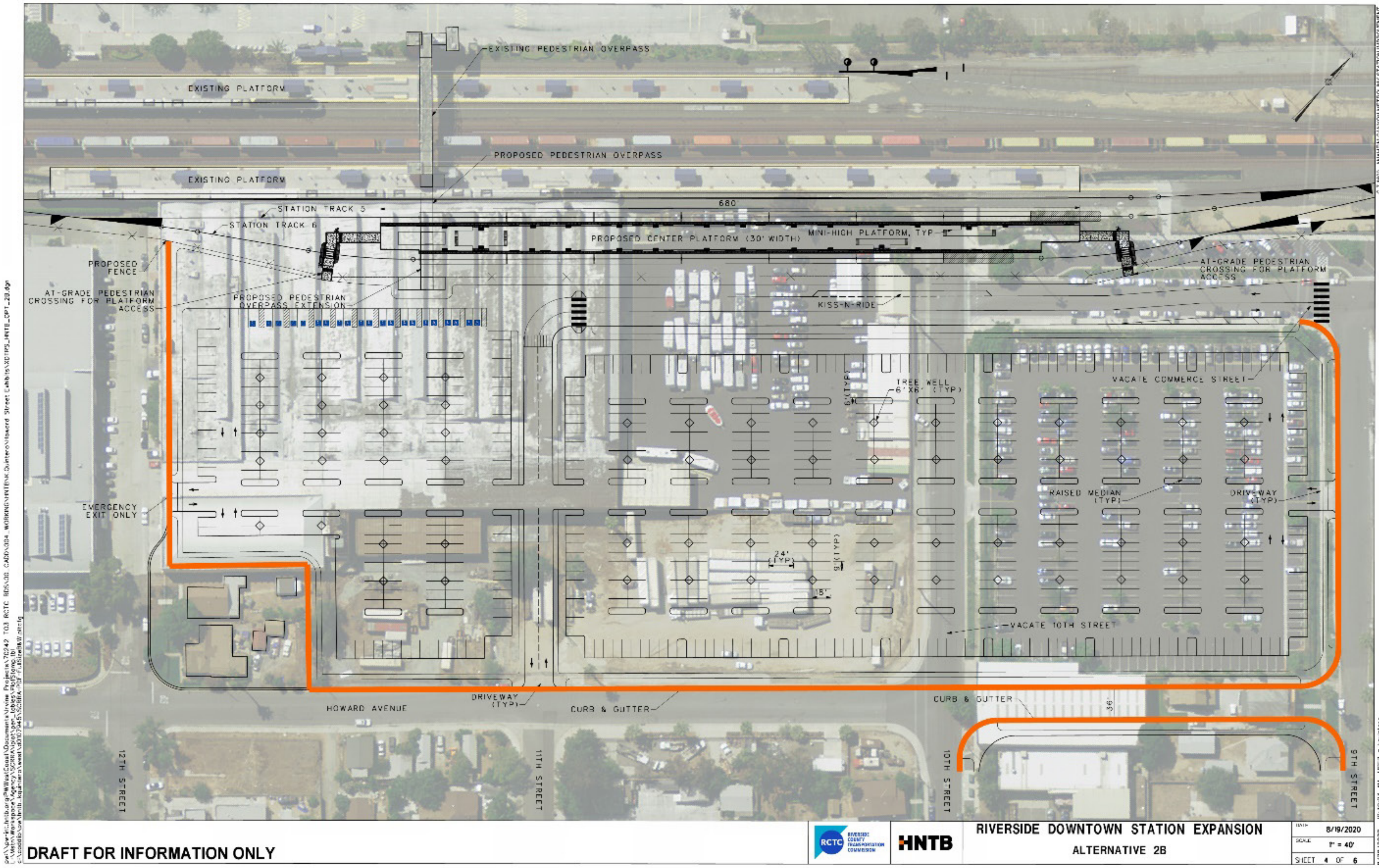


Figure 2-6. Build Alternative with Traffic Circulation and Parking Option 2B

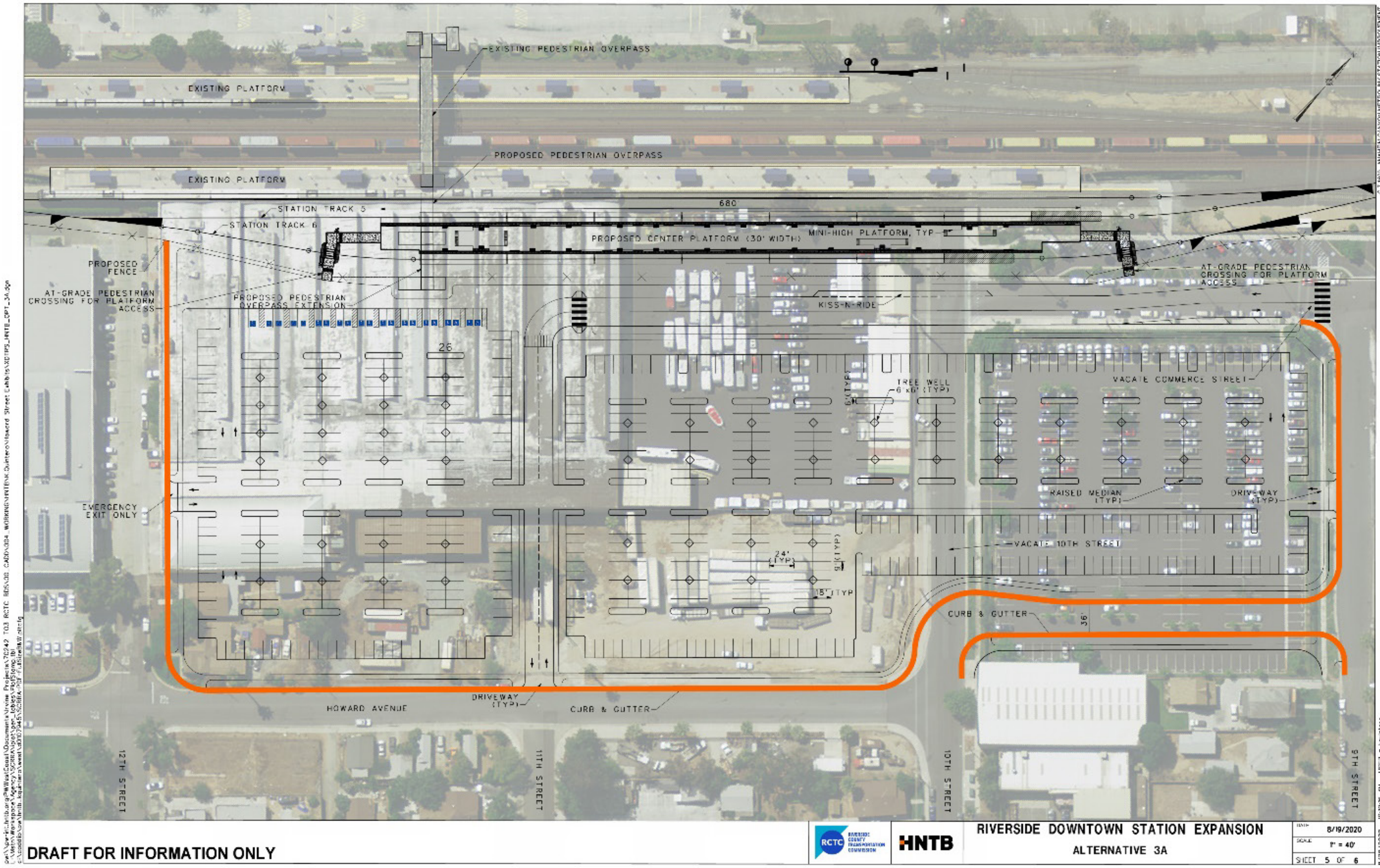


Figure 2-7. Build Alternative with Traffic Circulation and Parking Option 3A

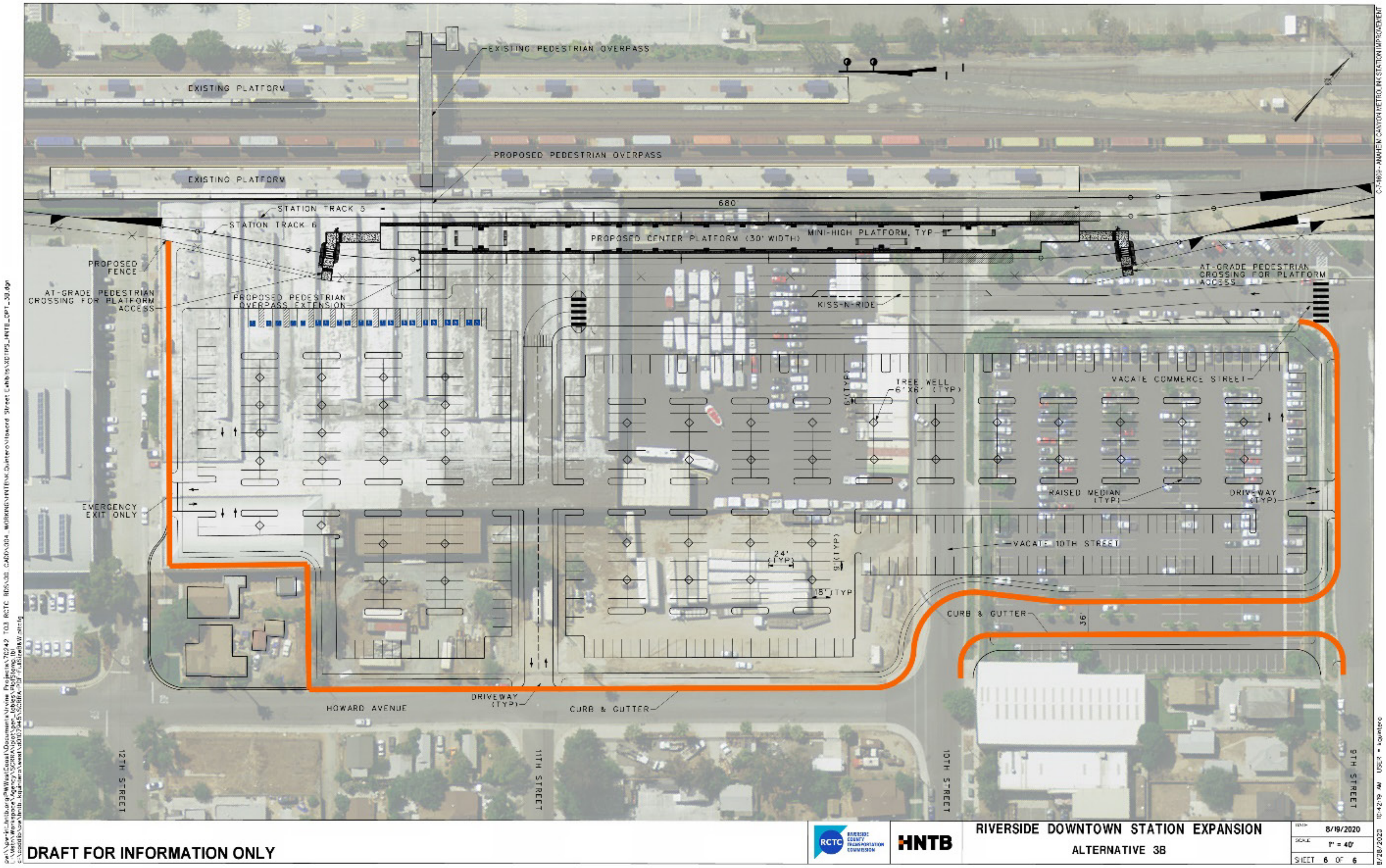


Figure 2-8. Build Alternative with Traffic Circulation and Parking Option 3B

3.0 Environmental Setting

3.1. Noise and Sound Level Descriptors and Terminology

All noise level or sound level values presented herein are expressed in terms of decibels (dB), with A-weighting (dBA) to approximate the hearing sensitivity of humans. Time-averaged noise levels are expressed by the symbol L_{EQ}, with a specified duration. The Day-Night sound level (L_{DN}) is a 24-hour average where sound levels during the nighttime hours of 10:00 p.m. to 7:00 a.m. have an added 10 dBA weighting. Sound levels expressed in L_{DN} are always based on dBA. These metrics are used to express noise levels for both measurement and municipal regulations, as well as for land use guidelines and enforcement of noise ordinances.

Sound can be described as the mechanical energy of a vibrating object transmitted by pressure waves through a liquid or gaseous medium (e.g., air) to a hearing organ, such as a human ear. Noise is defined as loud, unexpected, or annoying sound.

In the science of acoustics, the fundamental model consists of a sound (or noise) source, a receiver, and the propagation path between the two. The loudness of the noise source and obstructions or atmospheric factors affecting the propagation path to the receiver contribute to the sound level and characteristics of the noise perceived by the receiver. The field of acoustics deals primarily with the propagation and control of sound.

Continuous sound can be described by frequency (pitch) and amplitude (loudness). A low-frequency sound is perceived as low in pitch. Frequency is expressed in terms of cycles per second, or Hertz (Hz) (e.g., a frequency of 250 cycles per second is referred to as 250 Hz). High frequencies are sometimes more conveniently expressed in kilohertz (kHz), or thousands of Hertz. The audible frequency range for humans is generally between 20 Hz and 20,000 Hz.

The amplitude of pressure waves generated by a sound source determines the loudness of that source. A logarithmic scale is used to describe sound pressure level (SPL) in terms of dBA units. The threshold of hearing for the human ear is about 0 dBA, which corresponds to 20 micro-Pascals (mPa).

Because decibels are logarithmic units, SPL cannot be added or subtracted through ordinary arithmetic. Under the decibel scale, a doubling of sound energy corresponds to a 3 dBA increase. In other words, when two identical sources are each producing sound of the same loudness, the resulting sound level at a given distance would be 3 dBA higher than one source under the same conditions.

3.2. Vibration Terminology and Descriptors

Vibration is measured in feet (ft) or inches (in). Acceleration is measured by comparing acceleration to that of the Earth's gravity, and this unit is "G." These units of acceleration or velocity are relative to time in seconds and are noted as in/sec^2 for acceleration and in/sec for velocity. Displacement is not relative to time and is only shown as inches.

Vibration effects can be described by its peak and root mean square (RMS) amplitudes. Building damage is often discussed in terms of peak velocity, or peak particle velocity (PPV). The PPV is defined as the maximum instantaneous positive or negative peak of the vibration signal. PPV is related to the stresses that are experienced by buildings; it is often used in monitoring of blasting vibration and to discuss construction vibration.

The RMS amplitude is useful for assessing human annoyance. Because the net average of a vibration signal is zero, the RMS amplitude is used to describe the "smoothed" vibration amplitude. The RMS of a signal is the average of the squared amplitude of the signal. The RMS amplitude is always less than the PPV and is always positive. The RMS average is typically calculated over a one-second period.

Although it is not universally accepted, decibel notation is in common use for vibration. Decibel notation serves to compress the range of numbers required to describe vibration. Vibration velocity level in decibels is defined as: $L_V = 20 \times LOG_{10}(V/V_{ref})$, where "$L_V$" is the velocity level in decibels, "V" is the RMS velocity amplitude, and "V_{ref}" is the reference velocity amplitude. The reference must be specified whenever a quantity is expressed in terms of decibels.

3.3. Noise and Vibration Sensitive Land Uses

Noise-sensitive land uses (NSLUs) are land uses that may be subject to stress and/or interference from excessive noise, such as residential dwellings, schools, transient lodging (hotels), hospitals, educational facilities, and libraries. Industrial and commercial land uses are generally not considered sensitive to noise. NSLUs in the project area include single-family residences abutting the project boundary, residential areas adjacent to the east directly across Howard Avenue, and Lincoln Park located directly south of the project.

Land uses in which ground-borne vibration could potentially interfere with operations or equipment, such as research, manufacturing, hospitals, and university research operations (Federal Transit Administration [FTA] 2018) are considered "vibration-sensitive." The degree of sensitivity depends on the specific equipment that would be affected by the ground-borne vibration. In addition, excessive levels of ground-borne vibration of either a regular or an intermittent nature can result in annoyance to residential uses or schools. Vibration-sensitive land uses in the project area include the adjacent single-family residences.

4.0 Regulatory Setting

4.1. Federal Transit Administration

This analysis uses the guidelines established by the FTA in the Transit Noise and Vibration Impact Assessment (FTA 2018). The guidelines establish impact criteria for noise and vibration, define sensitive receivers, and provide methodology for assessing impacts.

4.1.1. Construction Noise

No standardized criteria have been developed by the FTA for assessing construction noise impacts. FTA recommends the following criteria for determining whether detailed assessment of construction noise is warranted, and provides two analysis and assessment options to do so. This analysis compares the combined construction equipment noise to identify locations where noise may exceed the criteria as specified in Table 4-1. If these criteria are exceeded, there may be adverse community reaction.

Table 4-1. Detailed Analysis Criteria for Construction Noise

Land Use	8-Hour L_{EQ} (dBA) Day	8-Hour L_{EQ} (dBA) Night	L_{DN} (dBA) 30-Day Average
Residential	80	70	75
Commercial	85	85	80
Industrial	90	90	85*

Source: FTA 2018
* 24-hour L_{EQ}, not L_{DN}

4.1.2. Vibration

The FTA specifies human annoyance criteria to assess potential construction vibration impacts. Table 4-2 describes the FTA's ground-borne vibration and ground borne noise impact criteria for general assessment. For the purposes of this project, the general assessment criteria would be applicable to construction vibration. The impact criteria for general assessment are based on the vibration-sensitive land use categories. Normal construction activities would be considered infrequent events, and nearby residences would be considered Category 2 land uses (see Table 4-2). Separate criteria are used assess potential structural damage due to construction. Table 4-3 describes the FTA's vibration criteria for four structural categories.

Table 4-2. Ground-Borne Vibration and Ground-Borne Noise Impact Criteria for General Assessment

Land Use Category	Frequent Events[1]	Occasional Events[2]	Infrequent Events[3]	Frequent Events[1]	Occasional Events[2]	Infrequent Events[3]
Category 2: Residences and buildings where people normally sleep	72 VdB	75 VdB	80 VdB	35 dBA	38 dBA	43 dBA

Source: FTA 2018
[1] Frequent Events are defined as more than 70 vibration events of the same source per day
[2] Occasional Events are defined as between 30 and 70 vibration events of the same source per day
[3] Infrequent Events are defined as fewer than 30 vibration events of the same kind per day lbs./day
* Impact Levels (VdB re 1 micro-in/sec)
** Impact Level (dB re 20 mPa)

Table 4-3. Construction Vibration Damage Criteria

Building/Structural Category	PPV, in/sec	Approximate L_v[1]
I. Reinforced concrete, steel, or timber (no plaster)	0.5	102
II. Engineered concrete and masonry (no plaster)	0.3	98
III. Non-engineered timber and masonry buildings	0.2	94
IV. Buildings extremely susceptible to vibration damage	0.12	90

Source: FTA 2018
[1] RMS velocity in decibels, VdB re 1 micro in/sec

4.1.3. Operational Noise

The FTA provides different operational noise criteria for different scenarios and for different land uses. Noise impact criteria can be assessed for projects that generate new sources of transit noise and for projects that propose changes to an existing transit system. The proposed project would involve modifications to an existing transit facility, therefore the impact criteria for that scenario is used herein. Three land-use categories are identified by the FTA for impact assessment. For Category 2 land uses (residential areas where people sleep), noise exposure is characterized using L_{DN}. For Category 1 and Category 3 land uses (areas with primarily daytime use), noise exposure is characterized using the peak hour noise equivalent level (L_{EQ}), which is a time-averaged sound level over the noisiest hour of transit-related activity.

The FTA noise impact criteria are represented by a sliding scale based on existing noise exposure and land use of sensitive receivers. The basic concept of the FTA noise impact criteria is that more project noise is allowed in areas where existing noise is higher. However, in areas where existing noise exposure is higher, the allowable increase above the existing noise exposure decreases. FTA defines two levels of noise impact: moderate and severe. In accordance with FTA guidance, mitigation to reduce noise levels must be considered for both degrees of impact. Figure 4-1, Allowed Increase in Noise Levels (Category 2 Land Uses) and Figure 4-2, Allowed Increase in Noise Levels (Category 3 Land Uses) depict the amount of project-added noise that is allowed for Category 2 (e.g., residences) and Category 3 land (e.g., parks).

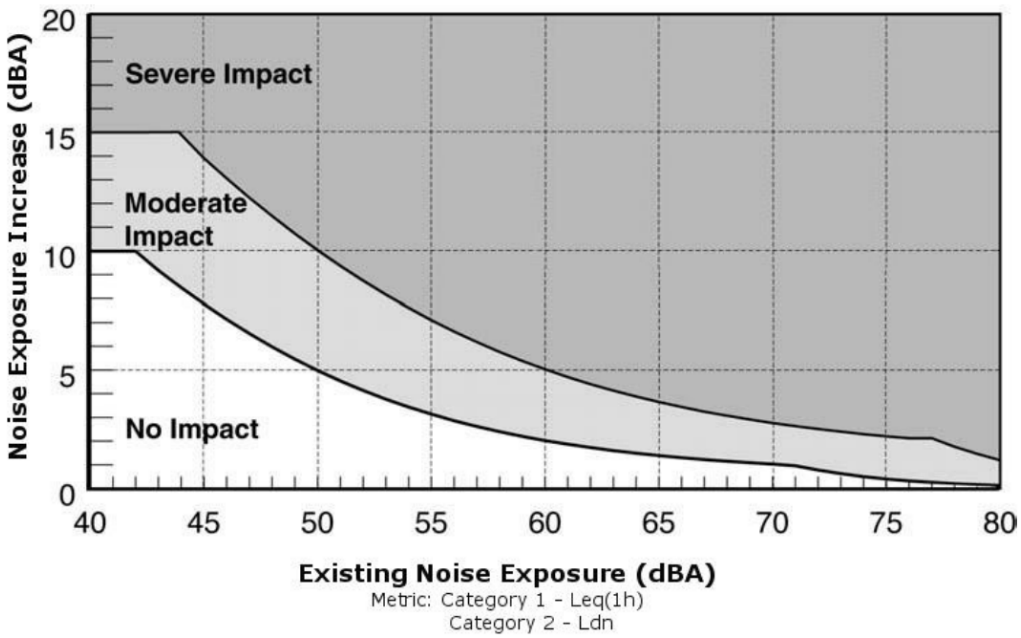


Figure 4-1. Allowed Increase in Noise Levels (Category 2 Land Uses)

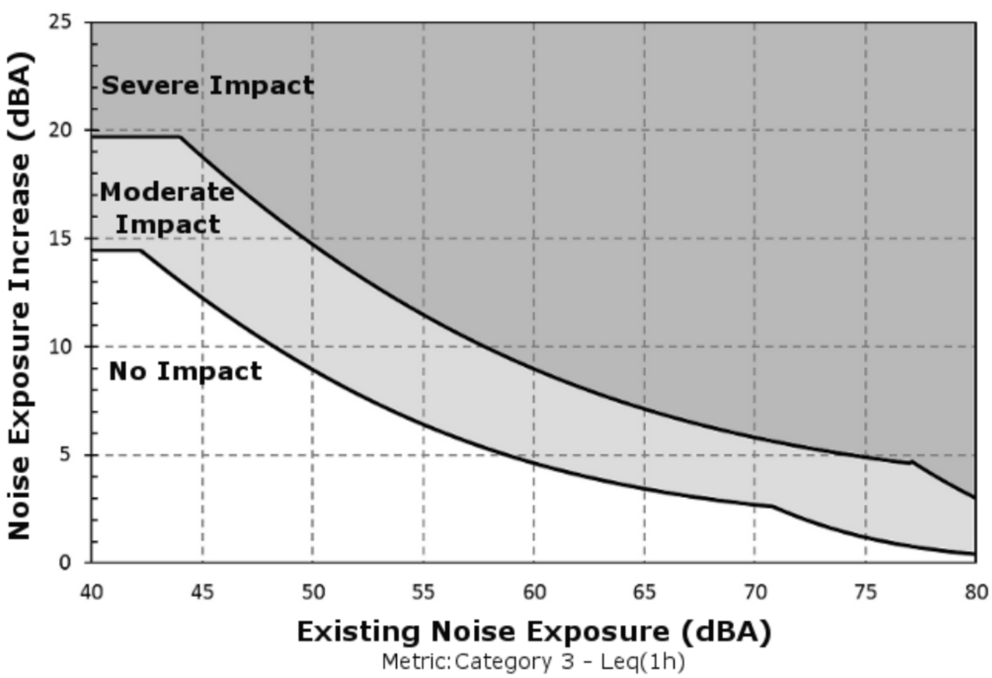


Figure 4-2. Allowed Increase in Noise Levels (Category 3 Land Uses)

For residential land uses, the noise criteria are applied outside the building locations at noise-sensitive areas with frequent human use, including outdoor patios, decks, pools, and play areas. If none of these areas are present, the criteria should be applied near building doors and windows. For parks and other significant outdoor use, the criteria are applied at the property line.

4.2. State Regulations

4.2.1. California Environmental Quality Act

Appendix G of the State CEQA Guidelines provides a list of potential environmental factors that would be potentially affected by a given project. The guidelines provide a list of questions that can be used to determine whether a project would generate an impact on a specific issue area. For noise, Appendix G asks whether a project would result in the following:

a) Generation of a substantial temporary or permanent increase in ambient noise levels in the vicinity of the project in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies?

b) Generation of excessive groundborne vibration or groundborne noise levels?

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

4.3. Local Regulations

The project would make every effort to be consistent with local standards as applicable. Local regulations and standards are included and addressed below.

4.3.1. City of Riverside Municipal Code

Table 7.25.010A of the City of Riverside's (City's) Municipal Code regulates the exterior noise levels for land use categories. These limits are shown in Table 4-4.

Table 4-4. City of Riverside Exterior Noise Standards

Land Use Category	Time Period	Noise Level
Residential	Night (10 p.m. to 7 a.m.) Day (7 a.m. to 10 p.m.)	45 dBA 55 dBA
Office/Commercial	Any time	65 dBA
Industrial	Any time	70 dBA
Community Support	Any time	60 dBA
Public Recreation Facility	Any time	65 dBA
Nonurban	Any time	70 dBA

Source: City Municipal Code Table 7.25.010A (City 2019)

Table 7.30.015 of the City's Municipal Code regulates the interior noise levels for land use categories. These limits are shown in Table 4-5.

Table 4-5. City of Riverside Interior Noise Standards

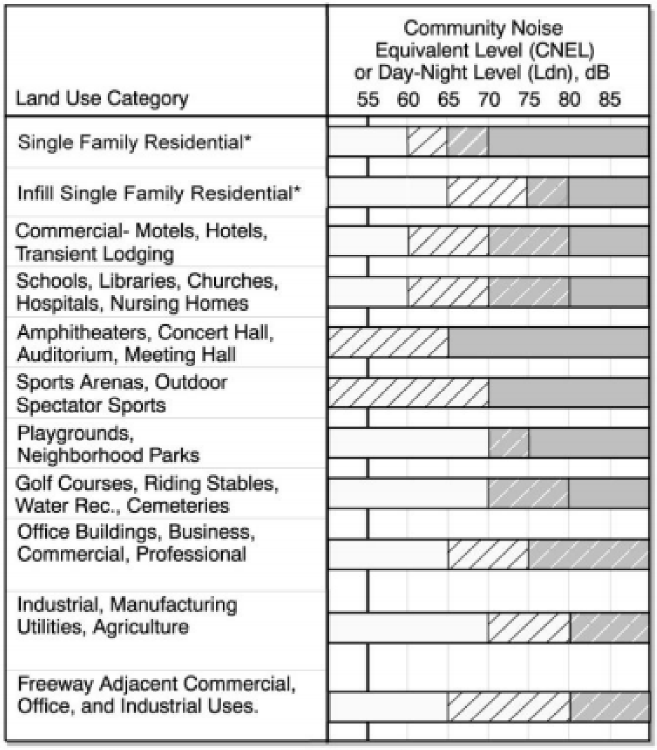
Land Use Category	Time Period	Noise Level
Residential	Night (10 p.m. to 7 a.m.) Day (7 a.m. to 10 p.m.)	35 dBA 45 dBA
School	7 a.m. to 10 p.m.[1]	45 dBA
Hospital	Any time	45 dBA

Source: City Municipal Code Table 7.30.015 (City 2019)
[1] Hours are while school is in session.

According to Section 7.35.020 of the City's Municipal Code, construction noise sources are exempt from City requirements shown in Tables 4-4 and 4-5 if construction does not take place between the hours of 7:00 p.m. and 7:00 a.m. on weekdays, between the hours of 5:00 p.m. and 8:00 a.m. on Saturdays, or at any time on Sunday or a federal holiday.

4.3.2. City of Riverside General Plan Noise Element

The City General Plan regulates new uses and development (City 2007). The Noise Element provides noise and land use compatibility guidelines that show a range of noise standards for various land use categories. These standards are shown in Figure 4-3, Noise/Land Use Compatibility Criteria.



Nature of the noise environment where the CNEL or Ldn level is:

Below 55 dB
Relatively quiet suburban or urban areas, no arterial streets within 1 block, no freeways within 1/4 mile.

55-65 dB
Most somewhat noisy urban areas, near but not directly adjacent to high volumes of traffic.

65-75 dB
Very noisy urban areas near arterials, freeways or airports.

75+ dB
Extremely noisy urban areas adjacent to freeways or under airport traffic patterns. Hearing damage with constant exposure outdoors.

Normally Acceptable
Specific land use is satisfactory, based on the assumption that any building is of normal conventional construction, without any special noise insulation requirements.

Conditionally Acceptable
New construction or development should be undertaken only after a detailed analysis of noise reduction requirements is made and needed noise insulation features included in design. Conventional construction, but with closed windows and fresh air supply systems or air conditioning, will normally suffice.

Normally Unacceptable
New construction or development should generally be discouraged. If new construction or development does proceed, a detailed analysis of noise reduction requirements must be made and needed noise insulation features included in design.

Conditionally Unacceptable
New construction or development should generally not be undertaken, unless it can be demonstrated that noise reduction requirements can be employed to reduce noise impacts to an acceptable level. If new construction or development does proceed, a detailed analysis of noise reduction requirements must be made and needed noise insulation features included in the design.

The Community Noise Equivalent Level (CNEL) and Day-Night Noise Level (Ldn) are measures of the 24-hour noise environment. They represent the constant A-weighted noise level that would be measured if all the sound energy received over the day were averaged. In order to account for the greater sensitivity of people to noise at night, the CNEL weighting includes a 5-decibel penalty on noise between 7:00 p.m. and 10:00 p.m. and a 10-decibel penalty on noise between 10:00 p.m. and 7:00 a.m. of the next day. The Ldn includes only the 10-decibel weighting for late-night noise events. For practical purposes, the two measures are equivalent for typical urban noise environments.

* For properties located within airport influence areas, acceptable noise limits for single family residential uses are established by the Riverside County Airport Land Use Compatibility Plan.

SOURCE: STATE DEPARTMENT OF HEALTH, AS MODIFIED BY THE CITY OF RIVERSIDE

Figure 4-3. Noise/Land Use Compatibility Criteria

5.0 Existing Conditions

5.1. Surrounding Land Uses

Adjacent lands surrounding the project site include single-family residences to the east, industrial uses and Lincoln Park to the south, commercial uses to the west, and industrial and residential uses to the north. Other nearby land uses in the vicinity include churches and vacant lots. See Figure 5-1, Nearby Land Uses and Site Visit Measurement Locations.

5.2. General Site Survey

A general site survey was conducted on December 10, 2020. Six measurements were taken in and around the project site for the ambient noise survey. Measurements were conducted to assess the general noise conditions of the site, gain insight on noise sources, and to conduct specific measurements throughout the project vicinity.

The six measurement locations are depicted on Figure 5-1. Measurement M1 was recorded within Lincoln Park south of the project. Measurement M2 was taken adjacent to the SolarMax building south of the project. Measurement M3 was taken adjacent to the existing railroad platform at the western end of 12th Street. Measurements M4 and M5 were taken along Park Avenue within the existing residential neighborhood. Measurement M6 was taken adjacent to existing residences between 9th Street and 10th Street. The measured noise levels and site visit sheets are included in Appendix A, Site Survey Results. Measurement locations are shown on Figure 5-1.

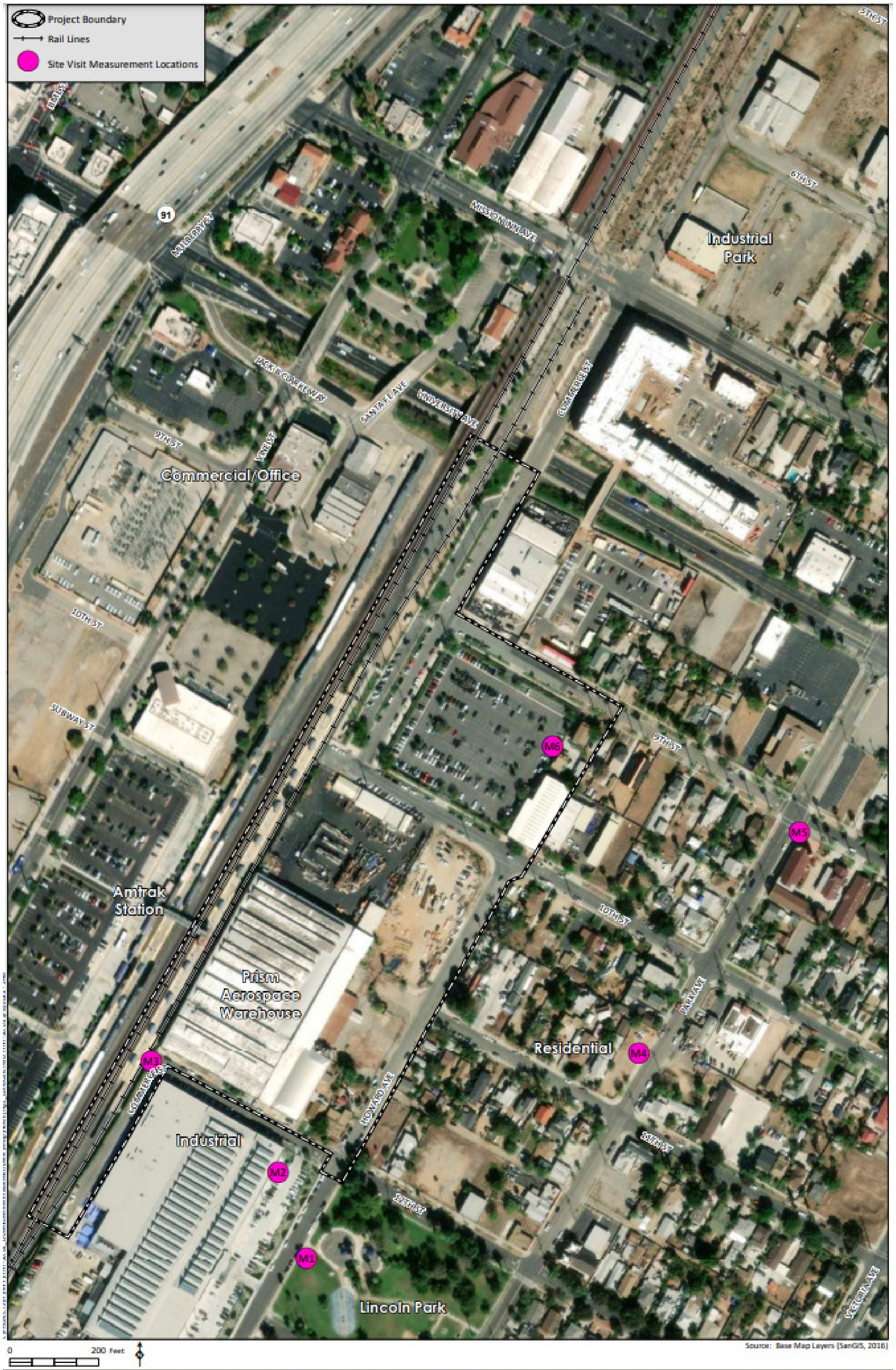


Figure 5-1. Nearby Land Uses and Site Visit Measurement Locations

6.0 Methodology and Assumptions

6.1. Existing Conditions Methodology

Although an ambient noise site survey was conducted at the project and in the project vicinity, as described in Section 5.2, the existing noise conditions are not defined by these measurements. A noise model was created to establish the existing conditions of the project. The operational assumptions used in this model are described in detail in Section 6.5, below.

The Project's Notice of Preparation (NOP) was published in January 2020. For the purposes of this project, the existing conditions would reflect the conditions at the project site as they existed at the time of the NOP. In March 2020, a state of emergency was ordered due to the COVID-19 coronavirus pandemic. Following that declaration, commuting patterns and traffic levels have been altered, typically resulting in reduced vehicular use and traffic throughout the state at the time the noise analysis commenced.

Freight and passenger train services, due to their proximity to nearby residences, are a source of a substantial amount of existing noise, and were largely unchanged during the COVID-19 pandemic. However, vehicular noise, particularly along SR 91, also contributes ambient noise to the Project vicinity. Noise level measurements conducted during the December 2020 noise survey are therefore expected to be substantially lower than noise levels at the time of the NOP's publication. A noise model was created to approximate the existing ambient noise conditions of the project vicinity to present a fair and accurate description of the Project's environmental impacts. As described in Section 6.5, noise sources were applied to the model to approximate transportation noise from vehicle and train traffic.

Using the noise model methodology to estimate existing conditions results in higher existing noise levels than what was obtained during the December 2020 ambient noise survey. As described in Section 5.2, this generally results in more conservative noise impact conclusions, as the FTA thresholds for areas affected by higher existing noise levels are more restrictive.

6.2. Ambient Noise Survey

The following equipment was used to measure existing noise levels at the project site:

- Larson Davis System LxT Integrating Sound Level Meters
- Larson Davis Model CAL150 Calibrator
- Spark Sound Level Meter
- Windscreen and tripod for the sound level meter
- Digital camera

6.3. Noise Modeling Software

The sound level meter was field-calibrated immediately prior to the noise measurements to ensure accuracy. All measurements were made with a meter that conforms to the American National Standards Institute (ANSI) specifications for sound level meters (ANSI SI.4 1983 R2006). All instruments were maintained with National Institute of Standards and Technology traceable calibration per the manufacturers' standards.

Modeling of the exterior noise environment for this report was accomplished using two computer noise models: Computer Aided Noise Abatement (CadnaA) version 2019 and Traffic Noise Model (TNM) version 2.5. CadnaA is a model-based computer program developed by DataKustik for predicting noise impacts in a wide variety of conditions. CadnaA assists in the calculation, presentation, assessment, and mitigation of noise exposure. It allows for the input of project related information, such as noise source data, barriers, structures, and topography to create a detailed CadnaA model, and uses the most up-to-date calculation standards to predict outdoor noise impacts. CadnaA traffic noise prediction is based on the data and methodology used in the TNM.

TNM was released in February 2004 by the U.S. Department of Transportation (USDOT) and calculates the daytime average hourly L_{EQ} from three-dimensional model inputs and traffic data (California Department of Transportation [Caltrans] 2004). TNM was developed from Computer Aided Design (CAD) plans provided by the project applicant. Input variables included road alignment, elevation, lane configuration, area topography, existing and planned noise control features, projected traffic volumes, estimated truck composition percentages, and vehicle speeds.

Project construction noise was analyzed using the Roadway Construction Noise Model (RCNM; USDOT 2008), which utilizes estimates of sound levels from standard construction equipment.

6.4. Construction Assumptions

Construction would require the use of equipment throughout the site for the full term of construction. General project construction activities would include site clearing, demolition, grading, track construction, and bridge and platform construction, and paving. The most prominent noise-generating standard construction equipment anticipated to be used on the site includes excavators, front-end loaders, backhoes, scrapers, dozers, rollers, and pavers. Construction equipment for each phase is listed in Table 6-1.

Table 6-1. Construction Equipment and Assumptions

Construction Phase	Equipment	Number
Demolition	Skid Steer Loader	2
	Bulldozer	1
	Excavator	2
	Wheel Loader	1
	Backhoe Loader	2
	Water Truck	1
Site Preparation	Skid Steer Loader	2
	Bulldozer	1
	Excavator	2
	Wheel Loader	1

Construction Phase	Equipment	Number
	Backhoe Loader	2
	Water Truck	1
Grading	Skid Steer Loader	2
	Bulldozer	1
	Grader	1
	Excavator	2
	Wheel Loader	1
	Backhoe Loader	2
	Water Truck	1
	Dump Truck	4
Paving	Paver	2
	Paving Equipment	2
	Roller	2
Track Construction	Crane	2
	Excavator	1
	Grader	1
	Roller	1
	Tractor/Loader/Backhoe	2
Bridge/Platform Construction	Crane	1
	Forklift	3
	Generator Set	3
	Tractor/Loader/Backhoe	3
	Welder	1

Demolition would be required for an existing on-site structure and pavements. Construction of Design Option 1A is anticipated to require the export of 1,000 cubic yards (CY) of vegetation/debris during site preparation and 6,000 CY of material during demolition. Design Option 2A is anticipated to require the export of 1,200 CY of vegetation/debris during site preparation and 6,940 CY during demolition. All design options are expected to involve the import of 5,100 SF of aggregate/sleepers/rails during track construction. Construction excavation and hauling to and from the project site are not anticipated to generate a high number of truck trips. It is assumed that 3 or 4 trucks per hour would travel along the short segment of Howard Avenue adjacent to 14th Street or along Commerce Street to Mission Inn Avenue.

Construction schedules were based on information provided by RCTC. Site preparation and demolition are anticipated to take approximately 30 working days.

6.5. Operational Assumptions

Both the existing and future noise environment scenarios assume the presence of vehicular traffic, railroad traffic, and parking lot noise. The future noise environment assumes the additional project-related roadway noise and parking lot noise, but rail operations are assumed to remain relatively unchanged, as the project would not increase the frequency of train trips along the corridor. The project does not propose the addition of noise-generating sources such as equipment or machinery.

6.5.1. Railroad Noise

Noise sources from the existing railroad include passenger and freight trains. Train noise occurs during both daytime and nighttime hours, and noise levels from 24-hour train operations are incorporated into the noise analysis. The RDS serves multiple passenger trains including Amtrak's daily Southwest Chief and Metrolink's commuter rail. Passenger train modeling is based on Metrolink train schedules used prior to the COVID-19 pandemic (Metrolink 2018) and two daily Amtrak trains. Passenger train data used to assess potential noise includes future passenger train traffic. Future passenger train traffic includes the Riverside Line, 91/Perris Valley Line, and the Orange County-Inland Empire Line. Per Metrolink's Strategic Business Plan (Metrolink 2021), future train traffic for Year 2050 includes 40 trains for 91/PVL, 42 trains for IE-OC. Although the Strategic Plan did not include Year 2050 estimates for the Riverside Line, RCTC's Short Range Transit Plan (RCTC 2020) indicate that up to 16 trains would service the Riverside-Downtown Station by 2025. It has been assumed that an additional six trains could be in operation by 2050 for a total of 22 for the Riverside Line. Moreover, the analysis assumed an increase in Amtrak trips from the existing two trains to four trains in future Year 2050 conditions. Future year conditions have been assumed in the analysis to ensure that potential noise impacts are adequately addressed, and if noise impacts are identified, effective noise abatement measures could be incorporated into the design to reduce future noise levels.

Although train pass-bys from passenger trains can be as low as 30 per day, the noise analysis conservatively assumes 108 passenger trains per day, with a maximum of six trains in a given hour, each with one engine and five cars. Because passenger trains would stop at the RDS, passenger trains are modeled as traveling at an average speed of 15 miles per hour.

Detailed freight train schedules are not publicly available, but are estimated to range from 60 to 126 pass-bys per 24-hour period. Based on observations during the site visit, it was noted that approximately three trains passed the project each hour. In addition, freight trains utilize an average of two engines and 100 cars. This analysis assumes three freight trains pass the project site per direction in a given daytime hour. During nighttime hours from 10:00 p.m. to 4:00 a.m., one freight train per hour was assumed for a total of 126 freight trains over a 24-hour period. Although they may travel at varying speeds, freight trains were conservatively modeled at approximately 50 miles per hour.

Both passenger and freight trains were modeled with the assumption that train horns would be sounded prior to the railroad crossing with Mission Inn Avenue for all trains. The crossing is located approximately 1,000 feet north of the project platforms, and horns for northbound trains are assumed to be used adjacent to the project. Due to their distance from the project site, grade crossing bells are not included in the noise model.

Daytime pass-bys are modeled using the CadnaA software to generate the hourly noise levels and both daytime and nighttime pass-bys modeled using the CadnaA software and combined to generate the L_{DN}.

6.5.2. Vehicular Traffic

Vehicular noise in the project vicinity consists of traffic on local roadways and vehicles travelling along SR 91. Traffic volume data along local roadways were provided by the project's Traffic Impact Analysis (TIA; HNTB 2020). Existing traffic volumes were calculated in the TIA from traffic counts for each roadway in the project vicinity. Project trip generation for the project was calculated for the future parking lot expansion. Future traffic levels on nearby roadways accounted for additional project traffic minus the trips generated by the existing Prism Aerospace warehouse use in the building that would be demolished. The net project trips are incorporated into this analysis.

Roadway segment traffic volumes used in the project's analysis are provided in Table 6-2. Volumes for Opening Year (2025) No Project and Opening Year (2025) with Project are provided.

Roadway volumes for SR 91 used in the model are provided peak hour traffic counts conducted by Caltrans (Caltrans 2017).

Table 6-2. Existing and Future Traffic Volumes

Roadways	PM Peak Hour Trips Opening Year (2025) No Project	PM Peak Hour Trips Opening Year (2025) with Project
University Avenue	2,273	2,289
9th Street	47	45
10th Street	71	71
11th Street	71	71
12th Street	43	43
13th Street	43	43
14th Street	2,518	2,536
Commerce Street	144	196
Howard Avenue	223	223
Howard Avenue Extension	N/A	343
Park Avenue North	306	322
State Route 91	14,400	14,400

Source: HNTB 2020; Caltrans 2017

The TIA provided roadway segment data for AM and PM peak hours. The higher PM peak hour data for each roadway segment was conservatively incorporated into the CadnaA model to generate one-hour noise levels. These noise levels were then weighted for a 24-hour period to generate the L_{DN} from roadway traffic.

6.6. Significance Criteria

6.6.1. California Environmental Quality Act

As described in Section 4.3.1, Appendix G of the State CEQA Guidelines provides a list of questions that can be used to determine whether a project would generate an impact on a specific issue area under CEQA. For noise, Appendix G asks whether a project would result in the following:

a) Generation of a substantial temporary or permanent increase in ambient noise levels in the vicinity of the project in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies?

b) Generation of excessive groundborne vibration or groundborne noise levels?

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

6.6.2. Permanent Increase in Ambient Noise

Impacts to existing residential land uses would be substantial if implementation of the project leads to an increase in noise levels exceeding severe impact levels shown in Figure 4-1.

Impacts to existing park land uses would be substantial if implementation of the project leads to an increase in noise levels exceeding the severe impact levels shown in Figure 4-2.

Per FTA guidance, severe impacts have the greatest adverse impact on the community and noise level increases considered severe should strongly consider mitigation.

6.6.3. Temporary Increase in Ambient Noise

Construction impacts would occur if daytime project construction noise exceeds 80 dBA L_{EQ} (8-hour) or if nighttime project construction noise exceeds 70 dBA L_{EQ} (8-hour) at nearby residences. As stated in Section 4.3.1, according to Section 7.35.020 of the City's Municipal Code, construction noise sources are exempt from City requirements if construction does not take place between the hours of 7:00 p.m. and 7:00 a.m. on weekdays, between the hours of 5:00 p.m. and 8:00 a.m. on Saturdays, or at any time on Sunday or a federal holiday.

6.6.4. Vibration

Vibration impacts to people at existing residential land uses would be substantial if construction of the project leads to an increase in vibration levels exceeding the impact levels shown in Table 4-2.

Vibration impacts to structures would be substantial if construction of the project leads to an increase in vibration levels exceeding the impact levels shown in Table 4-3.

7.0 Noise Impact Analysis

This section evaluates potential impacts of the proposed project related to permanent and temporary increases in noise levels.

7.1. Permanent Increase in Ambient Noise

The noise levels associated with train and vehicular traffic were modeled using CadnaA at multiple receiver locations, including residences and parks. Noise levels were generated for the project's existing conditions which include the Prism Aerospace Warehouse building and other structures. Opening Year (2025) with Project conditions account for increased vehicular traffic and the removal of structures to accommodate the project components. Figure 7-1, Modeled Noise Receiver Locations, shows the receiver locations for residential receivers 1 through 35 and park receivers 1 through 4. Table 7-1 shows the existing noise levels at each residential receiver location along with the associated increases at which point impacts would be considered significant and/or substantial for those locations. Table 7-2 shows the existing noise at the four park receiver locations. Appendix B, Operational Noise Modeling Results, provides the full modeling outputs.

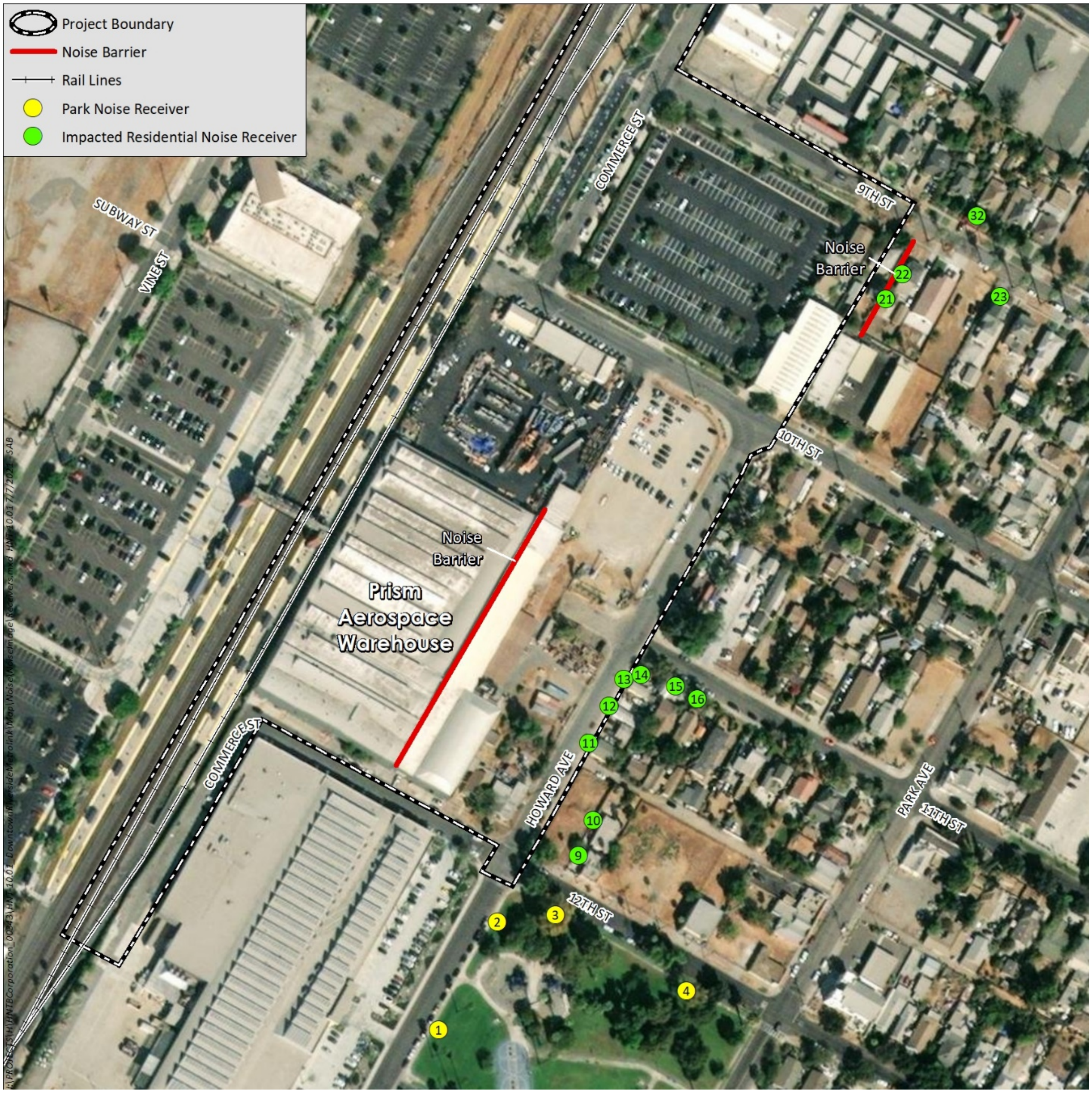


Figure 7-1. Modeled Noise Receiver Locations

Table 7-1. Existing Noise Levels and Impact Thresholds – Residential Receivers

Residential Receiver	Modeled Noise (dBA LDN)	Increase Threshold for Moderate Impact[1] (dBA LDN)	Increase Threshold for Severe Impact[1] (dBA LDN)
1	62.7	1.4	4.4
2	60.8	1.8	4.8
3	58.6	2.2	5.4
4	55.6	2.8	6.6
5	56.3	2.8	6.6
6	55.1	3	7
7	55.0	3	7
8	54.6	3	7
9	58.0	2.4	5.8
10	54.5	3	7
11	60.5	2	5
12	61.6	1.6	4.6
13	62.3	1.6	4.6
14	62.8	1.4	4.4
15	62.7	1.4	4.4
16	62.5	1.6	4.6
17	65.7	1	3.8
18	64.6	1	4
19	72.7	0.5	3
20	71.2	0.5	3
21	61.6	1.6	4.6
22	61.0	1.8	4.8
23	64.0	1.2	4.2
24	63.8	1.2	4.2
25	63.5	1.4	4.4
26	63.2	1.4	4.4
27	62.8	1.4	4.4
28	69.3	1	3.2
29	68.6	1	3.2
30	68.0	1	3.4
31	67.1	1	3.6
32	66.2	1	3.8
33	65.6	1	3.8
34	65.1	1	4
35	63.6	1.2	4.2

[1] Approximate noise increase threshold based on graph depicted in Figure 4-1

Table 7-2. Existing Noise Levels and Impact Thresholds – Park Receivers

Park Receivers	Modeled Noise (dBA LDN)	Increase Threshold for Moderate Impact[1] (dBA LDN)	Increase Threshold for Severe Impact[1] (dBA LDN)
1	58.6	5	9
2	59.1	5	9
3	61.0	4	8
4	61.0	4	8

1 Approximate noise increase threshold based on graph depicted in Figure 4-2

7.1.1. Opening Year (2025) Residential Impacts

The Opening Year (2025) scenario's modeled noise levels for residential receivers, corresponding noise level increases above existing conditions, and determination of moderate and severe impacts are provided below. Table 7-3 provides the results for Design Options 1A and 1B, Table 7-4 provides the results for Design Options 2A and 2B, and Table 7-5 provides the results for Design Options 3A and 3B.

Table 7-3. Opening Year (2025) Option 1A/1B Impacts – Residential Receivers

Residential Receivers	Existing Noise Levels (dBA L_{DN})[2]	Modeled Noise Levels (dBA L_{DN})	Noise Level Increase (dBA L_{DN})	Moderate Impact?	Severe Impact?
1	62.7	63.0	0.3	No	No
2	60.8	61.2	0.4	No	No
3	58.6	59.9	1.3	No	No
4	55.6	**58.6**	**3.0**	**Yes**	No
5	56.3	**59.3**	**3.0**	**Yes**	No
6[1]	55.1	**69.8[1]**	**14.7[1]**	**Yes[1]**	**Yes[1]**
7[1]	55.0	**67.6[1]**	**12.6[1]**	**Yes[1]**	**Yes[1]**
8[1]	54.6	**65.2[1]**	**10.6[1]**	**Yes[1]**	**Yes[1]**
9	58.0	**64.1**	**6.1**	**Yes**	**Yes**
10	54.5	**64.7**	**10.2**	**Yes**	**Yes**
11	60.5	**67.4**	**6.9**	**Yes**	**Yes**
12	61.6	**67.9**	**6.3**	**Yes**	**Yes**
13	62.3	**68.0**	**5.7**	**Yes**	**Yes**
14	62.8	**67.8**	**5.0**	**Yes**	**Yes**
15	62.7	**66.4**	**3.7**	**Yes**	No
16	62.5	**65.6**	**3.1**	**Yes**	No
17	65.7	**67.4**	**1.7**	**Yes**	No
18	64.6	**66.3**	**1.7**	**Yes**	No
19	72.7	72.9	0.2	No	No
20	71.2	71.6	0.4	No	No

Residential Receivers	Existing Noise Levels (dBA L_{DN})[2]	Modeled Noise Levels (dBA L_{DN})	Noise Level Increase (dBA L_{DN})	Moderate Impact?	Severe Impact?
21	61.6	61.6	0.0	No	No
22	61.0	61.0	0.0	No	No
23	64.0	64.1	0.1	No	No
24	63.8	63.8	0.0	No	No
25	63.5	63.5	0.0	No	No
26	63.2	63.5	0.3	No	No
27	62.8	63.4	0.6	No	No
28	69.3	69.6	0.3	No	No
29	68.6	69.1	0.5	No	No
30	68.0	68.2	0.2	No	No
31	67.1	67.1	0.0	No	No
32	66.2	66.2	0.0	No	No
33	65.6	65.6	0.0	No	No
34	65.1	65.1	0.0	No	No
35	63.6	63.7	0.1	No	No

1 Residential receivers 6 through 8 would not exist in the Design Option 1A scenario as the residences these receivers represent would be demolished.
2 Existing noise levels are those modeled and shown in Table 7-1.

Table 7-4. Opening Year (2025) Option 2A/2B Impacts – Residential Receivers

Residential Receivers	Existing Noise Levels (dBA L_{DN})[3]	Modeled Noise Levels (dBA L_{DN})	Noise Level Increase (dBA L_{DN})	Moderate Impact?	Severe Impact?
1	62.7	63.0	0.3	No	No
2	60.8	61.2	0.4	No	No
3	58.6	59.8	1.2	No	No
4	55.6	**58.6**	**3.0**	**Yes**	No
5	56.3	**59.2**	**2.9**	**Yes**	No
6[1]	55.1	**68.3**	**13.2**	**Yes**[1]	**Yes**[1]
7[1]	55.0	**65.1**	**10.1**	**Yes**[1]	**Yes**[1]
8[1]	54.6	**65.2**	**10.6**	**Yes**[1]	**Yes**[1]
9	58.0	**63.9**	**5.9**	**Yes**	**Yes**
10	54.5	**64.7**	**10.2**	**Yes**	**Yes**
11	60.5	**67.4**	**6.9**	**Yes**	**Yes**
12	61.6	**67.7**	**6.1**	**Yes**	**Yes**
13	62.3	**67.8**	**5.5**	**Yes**	**Yes**
14	62.8	**67.6**	**4.8**	**Yes**	**Yes**
15	62.7	**66.4**	**3.7**	**Yes**	No

Residential Receivers	Existing Noise Levels (dBA L_{DN})[3]	Modeled Noise Levels (dBA L_{DN})	Noise Level Increase (dBA L_{DN})	Moderate Impact?	Severe Impact?
16	62.5	**65.8**	**3.3**	**Yes**	No
17	65.7	**68.1**	**2.4**	**Yes**	No
18	64.6	**67.9**	**3.3**	**Yes**	No
19[2]	72.7	N/A	N/A	N/A	N/A
20[2]	71.2	N/A	N/A	N/A	N/A
21	61.6	**68.0**	**6.4**	**Yes**	**Yes**
22	61.0	**68.2**	**7.2**	**Yes**	**Yes**
23	64.0	**65.3**	**1.3**	**Yes**	No
24	63.8	64.9	1.1	No	No
25	63.5	64.5	1.0	No	No
26	63.2	64.4	1.2	No	No
27	62.8	64.2	1.4	No	No
28	69.3	69.6	0.3	No	No
29	68.6	69.1	0.5	No	No
30	68.0	68.5	0.5	No	No
31	67.1	67.9	0.8	No	No
32	66.2	**67.3**	**1.1**	**Yes**	No
33	65.6	66.4	0.8	No	No
34	65.1	65.8	0.7	No	No
35	63.6	64.6	1.0	No	No

1 Residential receivers 6 through 8 would not exist in the Design Option 2A scenario as the residences these receivers represent would be demolished.

2 Residential receivers 19 and 20 would not exist in the Design Option 2A or 2B scenarios as the residences these receivers represent would be demolished.

3 Existing noise levels are those modeled and shown in Table 7-1.

Table 7-5. Opening Year (2025) Option 3A/3B Impacts – Residential Receivers

Residential Receivers	Existing Noise Levels (dBA L_{DN})[2]	Modeled Noise Levels (dBA L_{DN})	Noise Level Increase (dBA L_{DN})	Moderate Impact?	Severe Impact?
1	62.7	63.0	0.3	No	No
2	60.8	61.2	0.4	No	No
3	58.6	59.9	1.3	No	No
4	55.6	**58.6**	**3.0**	**Yes**	No
5	56.3	**59.3**	**3.0**	**Yes**	No
6[1]	55.1	**69.8**	**14.7**	**Yes[1]**	**Yes[1]**
7[1]	55.0	**67.6**	**12.6**	**Yes[1]**	**Yes[1]**
8[1]	54.6	**65.2**	**10.6**	**Yes[1]**	**Yes[1]**
9	58.0	**64.1**	**6.1**	**Yes**	**Yes**

Residential Receivers	Existing Noise Levels (dBA L_{DN})[2]	Modeled Noise Levels (dBA L_{DN})	Noise Level Increase (dBA L_{DN})	Moderate Impact?	Severe Impact?
10	54.5	**64.7**	**10.2**	**Yes**	**Yes**
11	60.5	**67.4**	**6.9**	**Yes**	**Yes**
12	61.6	**67.9**	**6.3**	**Yes**	**Yes**
13	62.3	**68.0**	**5.7**	**Yes**	**Yes**
14	62.8	**67.8**	**5.0**	**Yes**	**Yes**
15	62.7	**66.4**	**3.7**	**Yes**	No
16	62.5	**65.6**	**3.1**	**Yes**	No
17	65.7	**67.3**	**1.6**	**Yes**	No
18	64.6	**66.1**	**1.5**	**Yes**	No
19	72.7	69.5	-3.2	No	No
20	71.2	69.3	-1.9	No	No
21	61.6	61.4	-0.2	No	No
22	61.0	61.0	0.0	No	No
23	64.0	64.0	0.0	No	No
24	63.8	63.8	0.0	No	No
25	63.5	63.5	0.0	No	No
26	63.2	63.5	0.3	No	No
27	62.8	63.4	0.6	No	No
28	69.3	69.6	0.3	No	No
29	68.6	69.0	0.4	No	No
30	68.0	68.1	0.1	No	No
31	67.1	67.1	0.0	No	No
32	66.2	66.2	0.0	No	No
33	65.6	65.6	0.0	No	No
34	65.1	65.1	0.0	No	No
35	63.6	63.7	0.1	No	No

1 Residential receivers 6 through 8 would not exist in the Design Option 3A scenario as the residences these receivers represent would be demolished.
2 Existing noise levels are those modeled and shown in Table 7-1.

Implementation of the project would lead to noise level increases at multiple receivers for each design option. Noise levels would increase primarily due to the removal of the existing Prism Aerospace warehouse. This structure currently provides noise attenuation for the major railroad and freeway noise sources to the east of multiple residential receivers. With the removal of this structure and its replacement with a level parking lot, the barrier to noise would be removed, and would therefore expose residences to elevated noise levels. Similarly, the Scenario 2A/2B Option would result in the removal of existing structures, replacing them with the extension of Howard Avenue, leading to a relative noise level increase for those residences.

Noise level increases range from 0.1 dBA L_{DN} to 14.6 dBA L_{DN}. The largest increase would occur for the Design Option 1B, 2B, and 3B scenarios, at the residences at the northern corner of Howard Avenue and 12th Street. Noise levels at residential receiver 6 would increase by 14.6 dBA L_{DN}, which is above the 7 dBA L_{DN} threshold for severe impacts and well above the 3 dBA L_{DN} threshold for moderate impacts.

As shown in the tables above, moderate and severe impacts to nearby residences would occur for all options, and mitigation would be required. Design Options 1A and 3A would have the fewest number of impacted locations, with 12 receivers modeled with a moderate impact and six receivers modeled with a severe impact. Design Option 2B would have the highest number of impacted locations, with 19 receivers modeled with a moderate impact and 11 receivers modeled with a severe impact. Design Options 1A, 2A, and 3A would not have noise impacts at the residences at the northern corner of Howard Avenue and 12th Street, as those residences would be demolished as part of the project.

7.1.2. Opening Year (2025) Park Receiver Impacts

The Opening Year (2025) scenario's modeled noise levels for park receivers, corresponding noise level increases above existing conditions, and determination of moderate and severe impacts are provided below. Table 7-6 provides the results for Design Options 1A and 1B, Table 7-7 provides the results for Design Options 2A and 2B, and Table 7-8 provides the results for Design Option 3A and 3B.

Table 7-6. Opening Year (2025) Option 1A/1B Impacts – Park Receivers

Park Receiver	Existing Noise Levels (dBA L_{DN})	Modeled Noise Levels (dBA L_{EQ})	Noise Level Increase (dBA L_{EQ})	Moderate Impact?	Severe Impact?
1	58.6	61.4	2.8	No	No
2	59.1	**64.7**	**5.6**	**Yes**	No
3	61.0	**66.5**	**5.5**	**Yes**	No
4	61.0	63.7	2.7	No	No

Table 7-7. Opening Year (2025) Option 2A/2B Impacts – Park Receivers

Park Receiver	Existing Noise Levels (dBA L_{DN})	Modeled Noise Levels (dBA L_{EQ})	Noise Level Increase (dBA L_{EQ})	Moderate Impact?	Severe Impact?
1	58.6	61.5	2.9	No	No
2	59.1	**64.7**	**5.6**	**Yes**	No
3	61.0	**66.5**	**5.5**	**Yes**	No
4	61.0	63.8	2.8	No	No

Table 7-8. Opening Year (2025) Option 3A/3B Impacts – Park Receivers

Park Receiver	Existing Noise Levels (dBA L_{DN})	Modeled Noise Levels (dBA L_{EQ})	Noise Level Increase (dBA L_{EQ})	Moderate Impact?	Severe Impact?
1	58.6	61.4	2.8	No	No
2	59.1	**64.7**	**5.6**	**Yes**	No
3	61.0	**66.5**	**5.5**	**Yes**	No
4	61.0	63.7	2.7	No	No

Implementation of the project would lead to noise level increases for each option. Noise levels at the northern corner of the park (receivers 2 and 3) for all scenarios would increase by 5.6 dBA L_{EQ} and 5.5 dBA L_{EQ}, respectively, which is above their respective 5 dBA L_{EQ} and 4 dBA L_{EQ} thresholds for moderate impacts. Receivers 1 and 4 are generally located further from noise sources or are blocked by intervening structures. No park receiver would have a severe impact.

7.1.3. Construction Noise

Construction noise impacts would occur if noise from daytime construction work exceeds 80 dBA L_{EQ} (8-hour), or if nighttime project construction work exceeds 70 dBA L_{EQ} (8-hour) at nearby residences.

Construction of the project would require demolition of existing structures, installation of utilities, and construction of new platform and tracks. The magnitude of the impact would depend on the type of construction activity, equipment, duration of each construction phase, distance between the noise source and receiver, and any intervening structures. Due to the proximity of residences both adjacent to the project and across Howard Avenue from the project site, construction would generate elevated noise levels that may disrupt nearby residences for all design options.

Construction equipment would not all operate at the same time or location and would not be in constant use during a typical 8-hour operating day. Therefore, a conservative average distance between the project's closest residence and general construction activity is estimated at 250 feet. Multiple construction equipment types would be in use throughout the day. For example, a dozer and an excavator may be working on the site simultaneously but would not be working in close proximity to one another at a given time due to the nature of their respective operations. An excavator, loader, and dump truck were analyzed together for construction noise impacts during demolition due to their likelihood of being used in conjunction with one another.

Based on these assumptions, general construction using an excavator, loader, and dump truck at the nearest NSLU would be 67.4 dBA L_{EQ} (8-hour) at 250 feet (see Appendix C, Construction Noise Modeling Outputs). Additional modeled construction equipment is provided in Table 7-9. At these distances throughout a given workday, construction equipment is not anticipated to exceed the 80 dBA L_{EQ} (8-hour) screening level for noise. However, on individual days, construction activities may occur at distances closer to residences than those analyzed in Table 7-9 below. Because heavy equipment may be required near residences, construction noise impacts would be temporary but may be substantial.

Table 7-9. Construction Equipment Noise Levels

Equipment	Percent Use Per Day	Noise Levels (dBA L_{EQ} [8-hour]) at 250 feet
Loader/Dozer/Excavator	40	67.4
Loader	40	61.2
Dozer	40	63.7
Excavator	40	62.8
Grader	40	67.0
Paver	50	60.2
Roller	20	59.0
Crane	16	58.6
Tractor	40	66.0
Backhoe	40	59.6
Generator	40	63.6

During demolition of the Prism Aerospace warehouse, demolition would be required at the property line of the residence at 3021 12th Street. Because heavy equipment would be required during demolition of the warehouse, and because this work would be located at the residence's shared property line and within 10 feet of the residence itself, noise impacts from the use of anticipated demolition equipment such as an excavator, loader, and dump truck, are assessed as significant and/or substantial.

Hauling would be required to remove existing on-site material and import aggregate/sleepers/rails during construction. Approximately four trucks would be required per hour during site preparation, demolition, and construction. Haul routes to reach the project site would likely be along short segments of Howard Avenue and Commerce Street. Truck noise is not anticipated to generate noise impacts along those roadways, and impacts from material hauling would temporary and not anticipated to be substantial.

7.1.4. Construction Vibration

A possible source of vibration during general project construction activities would be a vibratory roller, which may be used for compaction of soil beneath the parking lots. A vibratory roller would be expected to create the highest vibration levels during fill compaction. Table 7-4 of the FTA's Transit Noise and Vibration Impact Assessment provides vibration source levels for common construction equipment and lists a vibratory roller as generating approximately 94 VdB at 25 feet. As discussed under Section 6.1.3, construction equipment would be mobile throughout the site and is assessed as operating at an average distance of 250 feet from the off-site residential uses. Using the vibration formula provided in that table, a roller would generate approximately 64 VdB at 250 feet, which would be below the 80 VdB threshold for infrequent events affecting residences and buildings where people normally sleep.

A vibratory roller would create approximately 0.210 inch per second PPV at a distance of 25 feet (Caltrans 2013). A 0.210 inch per second PPV vibration level would equal 0.007 inch per second PPV at a distance of 250 feet. This would be lower than the structural damage impact to non-engineered timber and masonry buildings of 0.2 inches per second PPV. Additionally, off-site exposure to such ground-borne vibration would be short-term and temporary. Therefore, even though vibration may be perceptible at nearby residences, temporary impacts associated with the roller (and other potential equipment) would not be considered significant and/or substantial.

7.1.5. Operational Vibration

The project does not propose the addition of vibration-generating sources such as permanent equipment or machinery. Additionally, rail operations are assumed to remain relatively unchanged, as the project would not directly result or influence the increase the frequency of train trips along the corridor. Therefore, no project-related vibration would during operations.

7.2. Conformance with Local Regulations

7.2.1. Permanent Increase in Ambient Noise

As described in Section 7.1.1, implementation of all project options would result in the exposure of existing residences to elevated noise levels. As shown in Tables 7-1, and 7-3 through 7-5, noise levels for multiple single-family residential receptors would increase by significant and/or substantial amounts leading to moderate and severe impacts, as classified by the FTA. Additionally, multiple single-family residential locations would be exposed to noise levels exceeding the limits required for new development per the City General Plan Noise Element shown in Figure 4-3. As shown in Tables 7-1 and 7-3 through 7-5, receptors would move from the “Normally Acceptable” category (below 60 L_{DN}) to “Conditionally Acceptable” category (60 to 65 L_{DN}). The project would also move some receptors from “Conditionally Acceptable” to “Normally Unacceptable” (65 to 70 L_{DN}).

7.2.2. Temporary Increase in Ambient Noise

The City Municipal Code requires that construction shall not occur between the hours of 7:00 p.m. and 7:00 a.m. on weekdays, between the hours of 5:00 p.m. and 8:00 a.m. on Saturdays, or at any time on Sunday or a federal holiday. The City does not provide specific limits on construction noise, however, as described in Section 7.1.3, noise generated by construction equipment would exceed the FTA’s construction noise thresholds for daytime or nighttime hours.

7.3. Noise Reduction Measures

This section describes potential measures to reduce noise levels from project-related operations and construction. One measure is provided to reduce construction noise, and two options are presented to reduce operational noise through the use of noise barriers. This section provides a discussion on measures to reduce noise levels through noise abatement and acoustical feasibility of noise abatement. The design of noise barriers presented in this report are preliminary at a level appropriate for environmental review and not for final design. Preliminary information on the physical location, length, and height of noise barriers is provided in this report. Other considerations, such as structural, engineering, safety, access, potential secondary impacts, legal, or fiscal feasibility are not discussed herein.

Noise barriers are effective in reducing severe and moderate impacts to affected properties; the technique is recognized by FTA as effective and is used by state agencies and RCTC. The length of the barrier is important to its effectiveness so that noise generated beyond the ends of the barrier do not compromise the effectiveness of the barrier at noise-sensitive locations. A solid, impervious noise barrier that is sufficiently high would block the direct view of the noise source to reduce community noise levels.

7.3.1. Operational – Noise Barrier

Noise reduction measures would be required to reduce severe impacts at nearby noise-sensitive receivers in the vicinity of the project site. As shown in Tables 7-3 through 7-8, severe impacts were identified at multiple residential locations based on the thresholds provided in Tables 7-1. For the purposes of this analysis, impacted receivers for the Scenario 2A Option are modeled[2].

Figure 7-2 shows two locations for noise barriers to reduce severe noise impacts at nearby residential receivers. As shown in the Figure 7-2, an approximately 500-foot noise barrier was modeled along the eastern edge of the existing warehouse structure and a noise barrier along the potential extension of Howard Avenue near 9th Street. The noise barrier was modeled to reduce severe impacts to receivers 9 through 14 for all Options.

The noise barrier along the potential extension of Howard Avenue near 9th Street would only be required for the Option 2A/2B scenarios, as severe impacts to receivers 21 and 22 were only identified in that option. That noise barrier's location would generally be on the eastern edge of the potential extension of Howard Avenue at the existing western property wall of 2982 9th Street.

Table 7-10 shows the results of the noise reductions for severe and moderate impacted residential receivers with the implementation of the noise barrier near the existing warehouse location. Noise level increases over existing conditions are provided for walls with heights ranging from 8 feet to 12 feet. Table 7-11 shows the results of noise reductions for moderate impacted park receivers with the implementation of this barrier.

Table 7-12 shows the results of the noise reductions with implementation of the noise barrier along the potential extension of Howard Avenue.

[2] Measures to reduce noise at Receivers 6 through 8 for the Scenario 1B, 2B, and 3B Options are not considered in this mitigation analysis.

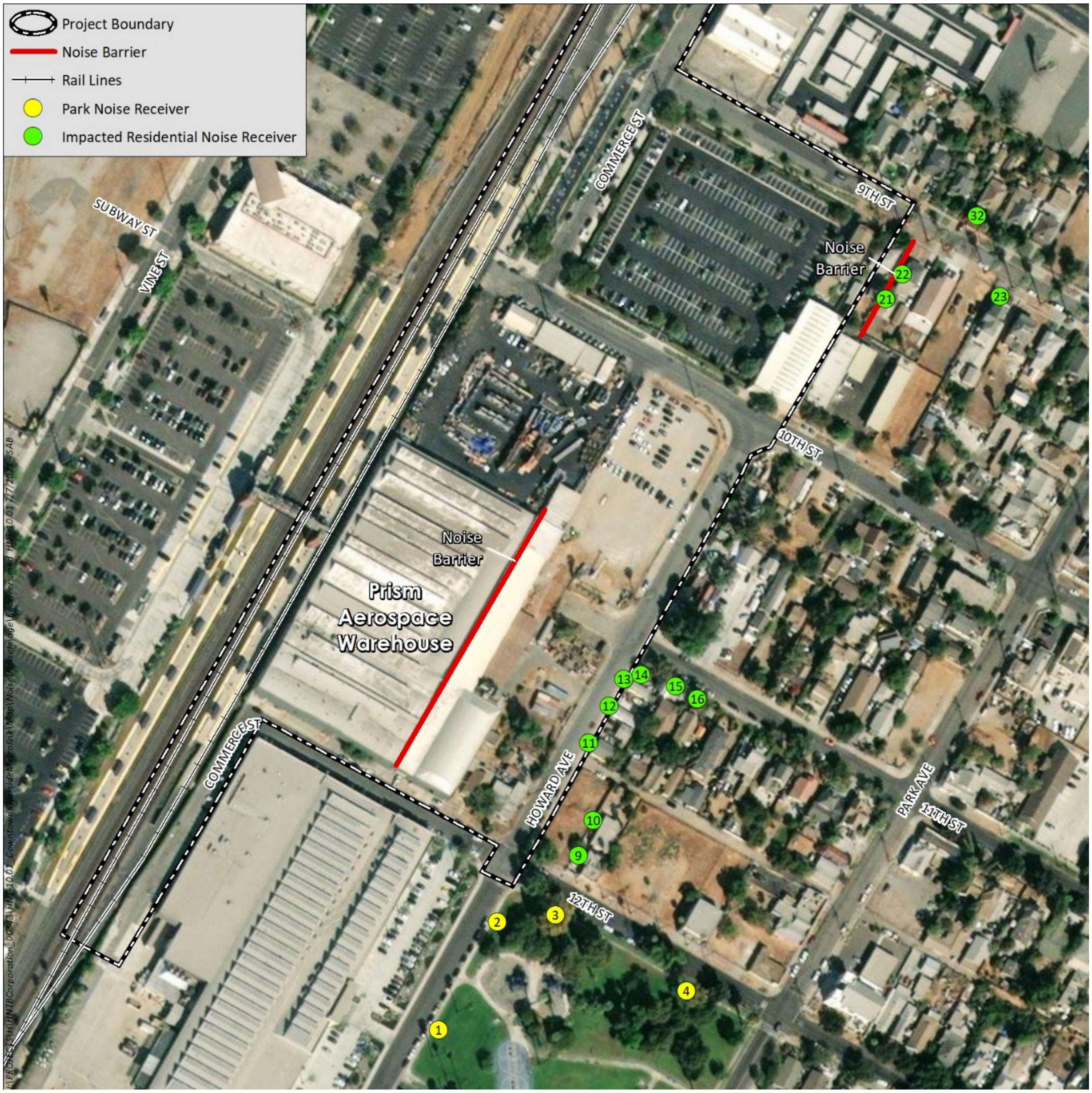


Figure 7-2. Noise Barriers and Modeled Noise Receiver Locations

THIS PAGE INTENTIONALLY LEFT BLANK

Table 7-10. Opening Year (2025) Option 2A Impacts – Residential Receivers with 500-foot Noise Barrier Along Existing Warehouse Structure

Residential Receivers	No Wall				With 8-Foot Wall				With 10-Foot Wall				With 12-Foot Wall			
	Modeled Noise Levels (dBA L_{DN})	Noise Level Increase (dBA L_{DN})	Moderate Impact?	Severe Impact?	Modeled Noise Levels (dBA L_{DN})	Noise Level Increase (dBA L_{DN})	Moderate Impact?	Severe Impact?	Modeled Noise Levels (dBA L_{DN})	Noise Level Increase (dBA L_{DN})	Moderate Impact?	Severe Impact?	Modeled Noise Levels (dBA L_{DN})	Noise Level Increase (dBA L_{DN})	Moderate Impact?	Severe Impact?
4	58.6	3.1	**Yes**	No	58.6	3.0	**Yes**	No	58.5	2.9	**Yes**	No	58.4	2.8	**Yes**	No
5	59.3	3.0	**Yes**	No	59.1	2.8	No	No	59.0	2.7	No	No	58.8	2.5	No	No
9	64.1	6.1	**Yes**	**Yes**	62.4	4.4	**Yes**	No	61.0	3.0	**Yes**	No	60.0	2.0	No	No
10	64.7	10.2	**Yes**	**Yes**	62.9	8.5	**Yes**	**Yes**	61.7	7.2	**Yes**	**Yes**	60.8	6.3	**Yes**	No
11	67.4	6.9	**Yes**	**Yes**	66.1	5.6	**Yes**	**Yes**	65.0	4.5	**Yes**	No	64.2	3.7	**Yes**	No
12	67.9	6.3	**Yes**	**Yes**	67.5	5.9	**Yes**	**Yes**	66.9	5.4	**Yes**	**Yes**	66.2	4.6	**Yes**	No
13	68.0	5.7	**Yes**	**Yes**	67.8	5.5	**Yes**	**Yes**	67.3	4.9	**Yes**	**Yes**	66.6	4.2	**Yes**	No
14	67.8	5.0	**Yes**	**Yes**	67.3	4.6	**Yes**	**Yes**	67.0	4.2	**Yes**	No	66.5	3.8	**Yes**	No
15	66.4	3.7	**Yes**	No	65.6	2.9	**Yes**	No	65.2	2.5	**Yes**	No	64.6	1.9	**Yes**	No
16	65.6	3.2	**Yes**	No	64.6	2.1	**Yes**	No	64.1	1.6	**Yes**	No	63.5	1.0	No	No

Table 7-11. Opening Year (2025) Option 2A Impacts – Park Receivers with Noise Barriers

Park Receivers[1]	No Wall				With 8-Foot Wall				With 10-Foot Wall				With 12-Foot Wall			
	Modeled Noise Levels (dBA L_{EQ})	Noise Level Increase (dBA L_{EQ})	Moderate Impact?	Severe Impact?	Modeled Noise Levels (dBA L_{EQ})	Noise Level Increase (dBA L_{EQ})	Moderate Impact?	Severe Impact?	Modeled Noise Levels (dBA L_{EQ})	Noise Level Increase (dBA L_{EQ})	Moderate Impact?	Severe Impact?	Modeled Noise Levels (dBA L_{EQ})	Noise Level Increase (dBA L_{EQ})	Moderate Impact?	Severe Impact?
1	61.4	2.8	No	No	61.6	3.0	No	No	61.7	3.1	No	No	61.3	2.7	No	No
2	64.7	5.6	**Yes**	No	63.6	4.5	No	No	63.6	4.5	No	No	62.9	3.8	No	No
3	66.5	5.5	**Yes**	No	65.8	4.8	**Yes**	No	65.8	4.8	**Yes**	No	65.3	4.3	**Yes**	No
4	63.7	2.7	No	No	63.9	2.9	No	No	64.0	3.0	No	No	63.7	2.7	No	No

Table 7-12. Opening Year (2025) Option 2A/2B Impacts – Residential Receivers with Noise Barrier Along Future Howard Avenue Extension Near 9th Street

Residential Receivers	No Wall				With 8-Foot Wall			
	Modeled Noise Levels (dBA L_{DN})	Noise Level Increase (dBA L_{DN})	Moderate Impact?	Severe Impact?	Modeled Noise Levels (dBA L_{DN})	Noise Level Increase (dBA L_{DN})	Moderate Impact?	Severe Impact?
21	68.0	6.5	**Yes**	**Yes**	58.4	-3.2	No	No
22	68.2	7.2	**Yes**	**Yes**	54.5	-6.5	No	No
23	65.3	1.2	**Yes**	No	64.9	0.8	No	No
32	67.2	1.1	**Yes**	No	66.8	0.6	No	No

As shown in Table 7-10, to reduce severe impacts for residential receivers 9 through 14, the 500-foot noise barrier along the existing Warehouse wall location would need to be constructed at a height of at least 12 feet. For residential receivers 21 and 22, the noise barrier along the potential extension of Howard Avenue near 9th Street would need to be at least 8 feet in height, as shown in Table 7-12. As shown in Table 7-11, moderate impacts at the park receivers at all but one location would be reduced with an 8-foot wall.

Based on the results depicted in Tables 7-10 and 7-12, to reduce noise to levels below the severe impact threshold limit, noise barriers would be required to be constructed at the locations shown in Figure 7-2. At this point in project design, specifications for all potential noise barriers shall include the following:

- For Options 1A, 1B, 2A, 2B, 3A, and 3B, a barrier would be constructed along the eastern edge of the existing warehouse structure, with a length of approximately 500 feet. The barrier height for this wall would be at least 12 feet in height to reduce severe noise impacts to at least moderate levels.

- For Design Option 2A and 2B only, a noise barrier would be constructed along the entirety of the existing western property wall of 2982 9th Street. The barrier would be at least 8 feet in height to reduce severe noise impacts to at least moderate levels.

- The noise barriers would be required to meet a minimum Sound Transmission Class (STC) rating of 22 to 23 to adequately ensure noise reduction. It can be constructed of masonry, wood, plastic, fiberglass, plexiglass, steel, or a combination of those materials, if it meets the STC rating described above and there are no cracks or gaps, through or below the wall. Any seams or cracks must be filled or caulked.

7.3.2. Construction

Construction noise would be potentially significant at nearby residences. To reduce noise levels, a Construction Noise Management Plan would be required as described below.

Construction Noise Management Plan. Noise levels from project-related construction activities shall not exceed the noise limits specified in Table 4-1 of this report, when measured at the noise-sensitive land use. A Construction Management Plan that describes the measures included on the construction plans to ensure compliance with the noise limit shall be prepared for approval by RCTC prior to issuance of the grading permit. The following measures may be included to reduce construction noise:

- Construction equipment to be properly outfitted and maintained with manufacturer-recommended noise-reduction devices.

- Diesel equipment to be operated with closed engine doors and equipped with factory-recommended mufflers.

- Mobile or fixed “package” equipment (e.g., arc-welders and air compressors) to be equipped with shrouds and noise control features that are readily available for that type of equipment.

- Electrically powered equipment to be used instead of pneumatic or internal-combustion powered equipment, where feasible.
- Unnecessary idling of internal combustion engines (e.g., in excess of 5 minutes) to be prohibited.
- Material stockpiles and mobile equipment staging, parking, and maintenance areas to be located as far as practicable from noise sensitive receptors.
- The use of noise-producing signals, including horns, whistles, alarms, and bells, shall be for safety warning purposes only.
- No project-related public address or music system shall be audible at any adjacent sensitive receptor.
- Temporary sound barriers or sound blankets shall be installed between construction operations and adjacent noise-sensitive receptors. Due to equipment exhaust pipes being approximately 7 to 8 feet above ground, temporary sound barriers at least 10 feet in height above grade may be utilized. To effectively reduce noise levels, the temporary sound barrier shall be constructed of a material with a minimum weight of two pounds per square foot with no gaps or perforations and remain in place until the conclusion of demolition, grading, and construction activities.
- RCTC shall notify residences within 100 feet of the project's property line in writing within two weeks of any construction activity such as demolition, asphalt removal, and/or heavy grading operations. The notification shall describe the activities anticipated, provide dates and hours, and provide contact information with a description of a complaint and response procedure.
- The on-site construction supervisor shall have the responsibility and authority to receive and resolve noise complaints. A clear appeal process for the affected resident shall be established prior to construction commencement to allow for resolution of noise problems that cannot be immediately solved by the site supervisor.
- For the Option 1B, 2B, and 3B scenarios, to reduce noise impacts for the residents of 3021 12th Street, temporary accommodations shall be provided during periods of demolition work to remove the existing warehouse walls immediately adjacent to the property.

7.4. Build Alternative Conclusions

Implementation of noise reduction measures would be required to attenuate operational noise levels. Noise abatement measures described in Section 7.3.1 would reduce noise impacts for design options 1A, 2A, and 3A of the Build Alternative to below the FTA's severe impact thresholds described in Tables 7-1 and 7-2. Additionally, implementation of a construction noise management plan as described in Section 7.3.2 would be required to reduce construction noise for all design options. Operational and construction noise impacts would not be significant and/or substantial following implementation of mitigation.

7.5. No Project Alternative Impact Analysis

Under the No Project Alternative, implementation of improvements at the RDS would not be constructed, and the current configuration of the RDS would remain the same. Noise levels at nearby residential and park receivers would continue to be attenuated by the existing Prism Aerospace warehouse building for all design options. Noise levels at residential receivers along 9th Street would continue to be attenuated by existing structures under Options 2A and 2B. Therefore, no noise impacts would occur under the No Project Alternative.

THIS PAGE INTENTIONALLY LEFT BLANK

8.0 References

California Department of Transportation (Caltrans). 2017. 2017 Traffic Volumes: Route 87-91. Available at: https://dot.ca.gov/programs/traffic-operations/census/traffic-volumes/2017/route-87-91.

2013. Technical Noise Supplement to the Traffic Noise Protocol. September.

2004. California Department of Transportation, Traffic Noise Model (TNM).

Federal Transit Administration (FTA). 2018. Transit Noise and Vibration Impact Assessment Manual. September.

HNTB. 2020. Riverside-Downtown Station Improvements Project Traffic Impact Analysis. November.

Metrolink. 2021. Strategic Business Plan. January 22.

2018. Metrolink Timetable. October 8. Available at: https://metrolinktrains.com/globalassets/schedules/1st-all-lines-timetable-final.pdf.

Riverside, City of (City). 2019. City Municipal Code, Title 7, Noise Control.

2007. Riverside General Plan 2025. November.

Riverside County Transportation Commission (RCTC). 2020. Short Range Transit Plan.

U.S. Department of Transportation (USDOT). 2008. Roadway Construction Noise Model.

THIS PAGE INTENTIONALLY LEFT BLANK

Appendix A Site Survey Results

Ambient Noise Survey - Measurement Results

Measurement 1	
Date:	December 10, 2020
Conditions:	63 F, sunny
Time:	12:18 p.m. to 12:33 p.m.
Location:	Lincoln Park
Measured Noise Level:	53.3 dBA L_{EQ}
Notes:	Ambient nature sounds, train and traffic noise from 14th Street.
Measurement 2	
Date:	December 10, 2020
Conditions:	63 F, sunny
Time:	11:17 a.m. to 11:23 a.m.
Location:	Across the street from 3021 12th Street
Measured Noise Level:	70.6
Notes:	
Measurement 3	
Date:	December 10, 2020
Conditions:	63 F, sunny
Time:	11:45 a.m. to 2:40 p.m.
Location:	Intersection of 12th Street and Commerce Street, adjacent to train station platforms
Measured Noise Level:	72.2 dBA L_{EQ}
Notes:	
Measurement 4	
Date:	December 10, 2020
Conditions:	63 F, sunny
Time:	12:53 p.m. to 1:08 p.m.
Location:	Park Avenue between 10th and 11th Streets
Measured Noise Level:	59.0 dBA L_{EQ}
Notes:	Ambient nature sounds, noise from train horn, traffic noise from Park Avenue

Measurement 5	
Date:	December 10, 2020
Conditions:	64 F, sunny
Time:	2:44 p.m. to 2:59 p.m.
Location:	Intersection of 9th Street and Park Avenue
Measured Noise Level:	63.6 dBA L_{EQ}
Notes:	Traffic noise from 9th Street, Park Avenue, and University Avenue. Occasional construction noise. Train noise.
Measurement 6	
Date:	December 10, 2020
Conditions:	63 F, sunny
Time:	10:58 a.m. to 4:58 p.m.
Location:	Eastern edge of the existing Riverside-Downtown Station parking lot
Measured Noise Level:	54.7 dBA L_{EQ}
Notes:	

Site Survey

Job #	Project Name:

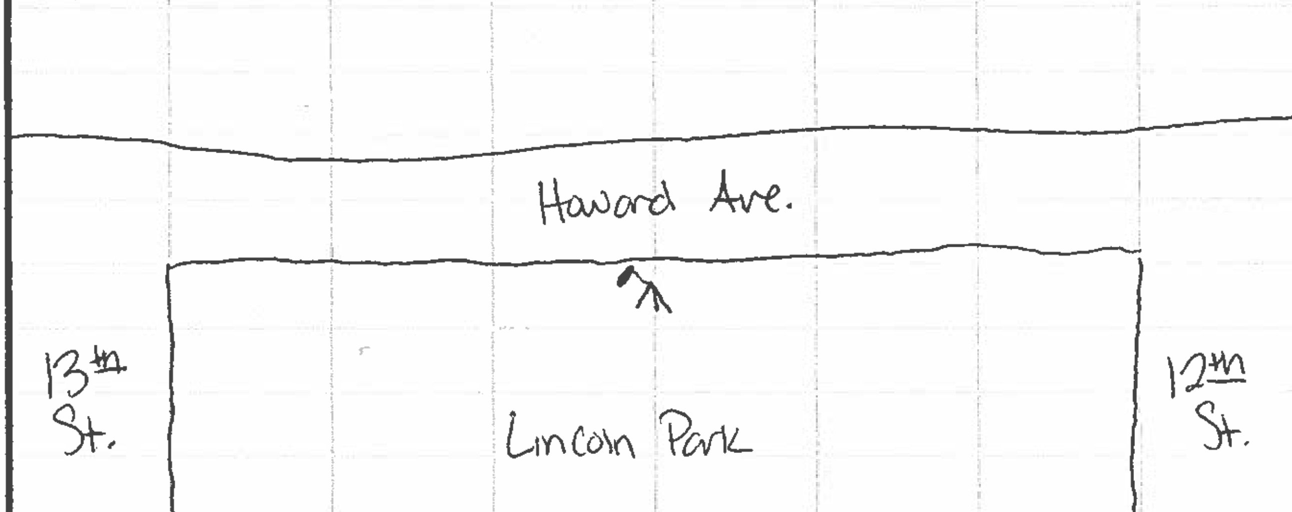
Date: 12/10/20	Site #: 1 (Lincoln Park)	Engineer: Kristen Garcia

Address: Howard Ave., Riverside, CA 92507

Meter: LXT	Serial #: 0001741	Calibrator: CA250	Serial #: 1544

Notes: Ambient nature sounds. Train noise. Traffic noise from 14th Street, occasional traffic noise on Howard Ave. Noise from Kids on playground + people walking by. LXT-Data.173

Sketch:



Temp: 63°F	Wind Spd: 2 mph	Humidity: 34 %

Start of Measurement: 12:18 pm	End of Measurement: 12:33pm	53.3 dBA L_{EQ}

Cars (tally per 5 cars)	Medium Trucks (MT)	Heavy Trucks (HT)
9 cars	0	2

Noise Measurement for Information Only

No Through Roadways

No Calibration Analysis Will Be Provided

Site Survey

Job #	Project Name:

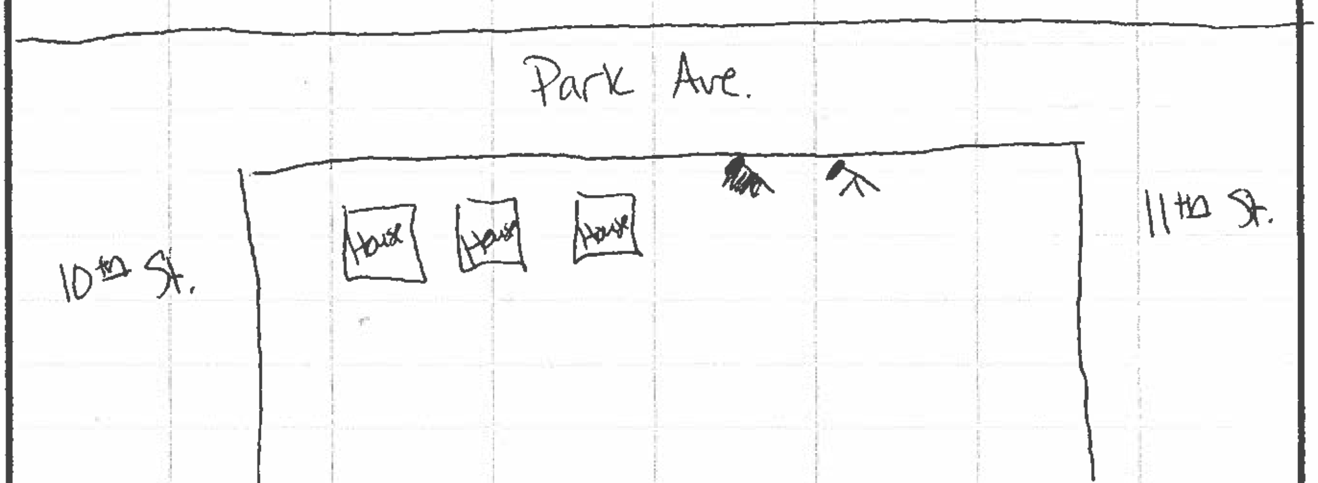
Date: 12/10/20	Site #: 2 (Park Ave.)	Engineer: Kristen Garcia

Address: Park Avenue, Riverside, CA 92507

Meter: LXT	Serial #: 0001741	Calibrator: CA250	Serial #: 1544

Notes: Ambient nature sounds. Noise from train horn. Traffic noise from Park Ave. Distant sirens. Neighbor using occasional hand tools. Church bells at 1pm. LXT-Data.174

Sketch:



Temp: 64 °F	Wind Spd: 2 mph	Humidity: 32 %

Start of Measurement: 12:53pm	End of Measurement: 1:08pm	59.0 dBA L_{EQ}

Cars (tally per 5 cars)	Medium Trucks (MT)	Heavy Trucks (HT)
28 cars	Ø	Ø

Noise Measurement for Information Only

No Through Roadways

No Calibration Analysis Will Be Provided

Site Survey

Job #		Project Name:	
Date: 12/10/20	Site #: 3 (9th St + Park Ave)	Engineer: Kristen Garcia	
Address: Park Ave. + 9th St., Riverside, CA 92507			
Meter: LXT	Serial #: 0001741	Calibrator: CA250	Serial #: 1544

Notes: Traffic noise from 9th St, Park Ave, + University Ave. Occasional sporadic construction noise from diagonal corner. Train horn noise. Meter reads 57-58 dBA when no construction and no cars, and up to 63 dBA when cars drive by with no construction.

Sketch:

Temp: 66 °F	Wind Spd: 6 mph	Humidity: 30 %
Start of Measurement: 2:44 pm	End of Measurement: 2:59 pm	63.6 dBA L_{EQ}

Cars (tally per 5 cars)	Medium Trucks (MT)	Heavy Trucks (HT)
56 cars	Ø	Ø

Noise Measurement for Information Only

No Through Roadways

No Calibration Analysis Will Be Provided

Appendix B Operational Noise Modeling Results

	Existing						Option 1A/1B							Option 2A/2B							Option 3A/3B							
	Day Trains	Night Trains	Roads	Parking	Full Noise	L_{DN}	Day Trains	Night Trains	Roads	Parking	Full Noise	Change	L_{DN}	Day Trains	Night Trains	Roads	Parking	Full Noise (Leq)	Change	L_{DN}	Day Trains	Night Trains	Roads	Parking	Full Noise	Change	L_{DN}	Change
R 01	58.4	53.2	61.0	28.7	62.9	**62.7**	58.6	53.5	61.0	32.2	63.0	0.1	**63.0**	58.6	53.5	61.0	29.0	63.0	0.1	**63.0**	58.6	53.5	61.0	32.1	63.0	0.1	**63.0**	0.3
R 02	56.5	51.2	57.1	29.2	59.8	**60.8**	56.9	51.6	57.3	32.9	60.1	0.3	**61.2**	56.9	51.6	57.3	29.6	60.1	0.3	**61.2**	56.9	51.6	57.3	32.8	60.1	0.3	**61.2**	0.4
R 03	54.4	48.9	52.9	29.7	56.7	**58.6**	55.6	50.2	55.6	33.6	58.6	1.9	**59.9**	55.6	50.2	55.6	30.0	58.6	1.9	**59.8**	55.6	50.2	55.7	33.6	58.6	1.9	**59.9**	1.3
R 04	50.7	46.8	55.0	30.1	56.4	**55.6**	53.9	49.5	58.6	34.2	59.9	3.5	**58.6**	53.9	49.5	58.6	30.4	59.9	3.5	**58.6**	53.9	49.5	58.6	34.2	59.9	3.5	**58.6**	3.1
R 05	51.5	47.3	56.3	30.2	57.6	**56.3**	54.6	50.2	58.5	34.2	60.0	2.4	**59.3**	54.6	50.2	58.4	30.3	60.0	2.4	**59.2**	54.6	50.2	58.5	34.1	60.0	2.4	**59.3**	3.0
Park 01	50.4	46.3	57.9	31.3	58.6	**55.4**	54.5	50.0	60.4	36.3	61.4	2.8	**59.3**	54.5	50.0	60.4	31.6	61.5	2.9	**59.2**	54.5	50.0	60.4	36.3	61.4	2.8	**59.3**	3.9
Park 02	52.2	48.1	58.1	33.1	59.1	**57.1**	58.0	53.4	63.7	40.1	64.7	5.6	**62.8**	58.0	53.4	63.7	33.3	64.7	5.6	**62.6**	58.0	53.4	63.7	40.1	64.7	5.6	**62.8**	5.7
Park 03	54.5	49.7	59.9	33.6	61.0	**59.1**	59.2	54.4	65.6	39.9	66.5	5.5	**63.9**	59.2	54.4	65.6	33.6	66.5	5.5	**63.8**	59.2	54.4	65.6	39.9	66.5	5.5	**63.9**	4.8
Park 04	53.9	49.4	60.0	32.7	61.0	**58.6**	56.9	52.4	62.6	36.3	63.7	2.7	**61.6**	57.4	53.0	62.6	32.8	63.8	2.8	**62.1**	56.9	52.4	62.6	36.2	63.7	2.7	**61.6**	3.0
R 06	50.8	46.0	44.4	21.5	51.7	**55.1**	63.8	59.0	67.7	55.7	69.4	17.7	**69.8**	63.8	59.0	67.7	25.4	69.4	17.7	**68.3**	63.8	59.0	67.7	55.7	69.4	17.7	**69.8**	14.6
R 07	50.6	45.7	53.1	19.6	55.0	**55.0**	60.6	55.7	65.9	55.2	67.3	12.3	**67.6**	60.6	55.7	65.9	20.0	67.3	12.3	**65.1**	60.6	55.7	65.9	55.2	67.3	12.3	**67.6**	12.6
R 08	50.1	45.3	53.1	21.4	54.9	**54.6**	53.9	49.1	62.1	55.4	63.4	8.5	**65.2**	53.9	49.1	62.1	21.6	63.4	8.5	**58.6**	53.9	49.1	62.1	55.4	63.4	8.5	**65.2**	10.7
R 09	53.4	48.6	57.8	34.1	59.1	**58.0**	59.4	54.6	64.4	41.6	65.6	6.5	**64.1**	59.4	54.6	64.4	34.2	65.6	6.5	**63.9**	59.4	54.6	64.4	41.6	65.6	6.5	**64.1**	6.1
R 10	49.7	45.0	53.5	33.6	55.0	**54.5**	60.0	55.2	65.2	42.1	66.4	11.4	**64.7**	60.0	55.2	65.2	42.1	66.4	11.4	**64.7**	60.0	55.2	65.2	42.1	66.4	11.4	**64.7**	10.2
R 11	55.8	51.3	59.5	36.8	61.0	**60.5**	62.6	57.9	67.5	46.6	68.7	7.7	**67.4**	62.6	57.9	67.5	46.6	68.7	7.7	**67.4**	62.6	57.9	67.5	46.6	68.7	7.7	**67.4**	6.9
R 12	56.9	52.4	60.2	37.6	61.9	**61.6**	63.1	58.4	68.0	46.9	69.3	7.4	**67.9**	63.1	58.4	68.0	37.6	69.3	7.4	**67.7**	63.1	58.4	68.0	46.8	69.3	7.4	**67.9**	6.3
R 13	57.7	53.1	61.3	38.3	62.9	**62.3**	63.2	58.5	68.2	47.1	69.4	6.5	**68.0**	63.2	58.5	68.2	38.3	69.4	6.5	**67.8**	63.2	58.5	68.2	47.1	69.4	6.5	**68.0**	5.7
R 14	58.1	53.6	61.1	38.4	62.9	**62.8**	63.0	58.4	68.0	45.6	69.2	6.3	**67.8**	63.0	58.4	68.0	38.5	69.2	6.3	**67.6**	63.0	58.4	68.0	45.6	69.2	6.3	**67.8**	5.0
R 15	58.1	53.5	61.6	38.2	63.2	**62.7**	61.7	57.0	66.6	43.0	67.9	4.7	**66.4**	61.8	57.1	66.6	38.3	67.9	4.7	**66.4**	61.7	57.0	66.6	42.9	67.9	4.7	**66.4**	3.7
R 16	57.9	53.1	62.0	38.0	63.4	**62.5**	61.0	56.2	65.8	42.0	67.0	3.6	**65.6**	61.2	56.5	65.8	38.0	67.1	3.7	**65.8**	61.0	56.2	65.8	41.8	67.0	3.6	**65.6**	3.1
R 17	60.9	56.2	66.1	45.2	67.3	**65.7**	62.5	57.8	67.6	47.4	68.8	1.5	**67.4**	63.4	58.8	67.6	45.3	69.3	2.0	**68.1**	62.5	57.8	67.6	45.8	68.8	1.5	**67.3**	1.5
R 18	59.6	54.9	65.3	45.2	66.4	**64.6**	61.4	56.7	66.8	46.8	68.0	1.6	**66.3**	63.2	58.5	66.8	45.4	69.1	2.7	**67.9**	61.4	56.7	66.8	43.6	67.9	1.5	**66.1**	1.6
R 19	64.0	59.3	67.8	61.9	70.1	**72.7**	64.5	59.9	68.1	61.9	70.4	0.3	**72.9**	64.5	59.9	68.1	61.9	70.5	0.4	**72.9**	64.5	59.9	68.2	50.7	69.7	-0.4	**69.5**	-3.2
R 20	64.0	59.3	68.0	59.2	69.8	**71.2**	64.5	59.8	68.2	59.3	70.1	0.3	**71.6**	64.5	59.8	68.2	59.3	70.3	0.5	**71.6**	64.5	59.8	68.2	49.6	69.8	0.0	**69.3**	-1.9
R 21	56.4	52.4	59.7	43.2	61.4	**61.6**	56.4	52.4	59.7	43.3	61.5	0.1	**61.6**	63.3	58.7	59.7	48.1	69.0	7.6	**68.0**	56.4	52.4	59.8	40.8	61.4	0.0	**61.4**	-0.2
R 22	56.2	52.3	58.5	35.5	60.5	**61.0**	56.2	52.3	58.5	35.7	60.5	0.0	**61.0**	63.5	58.9	58.5	48.3	69.2	8.7	**68.2**	56.2	52.3	58.6	34.3	60.5	0.0	**61.0**	0.0
R 23	59.3	55.0	65.0	36.4	66.0	**64.0**	59.3	55.0	65.0	36.9	66.0	0.0	**64.1**	60.6	56.2	65.0	39.2	66.8	0.8	**65.3**	59.3	55.0	65.0	35.9	66.0	0.0	**64.0**	0.0
R 24	59.0	54.7	64.9	36.8	65.9	**63.8**	59.0	54.7	64.9	37.3	65.9	0.0	**63.8**	60.2	55.8	64.9	39.1	66.7	0.8	**64.9**	59.0	54.7	64.9	36.0	65.9	0.0	**63.8**	0.0
R 25	58.7	54.4	64.7	36.9	65.7	**63.5**	58.7	54.5	64.8	37.6	65.7	0.0	**63.5**	59.8	55.5	64.8	38.8	66.4	0.7	**64.5**	58.7	54.5	64.8	35.9	65.7	0.0	**63.5**	0.0
R 26	58.4	54.2	64.7	36.7	65.6	**63.2**	58.7	54.4	64.8	37.5	65.8	0.2	**63.5**	59.6	55.3	64.8	38.4	66.3	0.7	**64.4**	58.7	54.4	64.8	35.7	65.8	0.2	**63.5**	0.2
R 27	58.0	53.8	64.7	36.3	65.6	**62.8**	58.6	54.3	64.9	37.1	65.8	0.2	**63.4**	59.5	55.1	64.9	37.9	66.4	0.8	**64.2**	58.6	54.3	64.9	35.4	65.8	0.2	**63.4**	0.5
R 28	64.5	59.9	68.5	48.3	70.0	**69.3**	64.9	60.2	68.5	48.5	70.1	0.1	**69.6**	64.9	60.2	68.5	48.3	70.1	0.1	**69.6**	64.9	60.2	68.5	47.2	70.1	0.1	**69.6**	0.3
R 29	63.8	59.2	68.5	47.2	69.8	**68.6**	64.3	59.7	68.6	47.4	70.0	0.2	**69.1**	64.3	59.7	68.6	47.3	70.0	0.2	**69.1**	64.3	59.7	68.6	46.0	70.0	0.2	**69.0**	0.4
R 30	63.3	58.7	68.4	44.9	69.5	**68.0**	63.4	58.9	68.5	45.0	69.7	0.2	**68.2**	63.7	59.2	68.5	46.0	69.8	0.3	**68.5**	63.4	58.9	68.5	44.4	69.7	0.2	**68.1**	0.1
R 31	62.4	57.8	67.3	42.5	68.5	**67.1**	62.4	57.8	67.3	42.5	68.5	0.0	**67.1**	63.2	58.7	67.3	44.8	69.2	0.7	**67.9**	62.4	57.8	67.3	42.4	68.5	0.0	**67.1**	0.0
R 32	61.5	57.1	67.1	40.4	68.1	**66.2**	61.5	57.1	67.1	40.5	68.2	0.1	**66.2**	62.6	58.1	67.1	43.5	68.9	0.8	**67.3**	61.5	57.1	67.1	40.4	68.2	0.1	**66.2**	0.0
R 33	60.9	56.5	66.5	38.9	67.6	**65.6**	60.9	56.5	66.5	39.2	67.6	0.0	**65.6**	61.7	57.3	66.5	42.1	68.1	0.5	**66.4**	60.9	56.5	66.5	39.1	67.6	0.0	**65.6**	0.0
R 34	60.3	56.0	66.3	37.8	67.3	**65.1**	60.3	56.0	66.3	38.2	67.3	0.0	**65.1**	61.1	56.7	66.3	40.8	67.7	0.4	**65.8**	60.3	56.0	66.3	38.0	67.3	0.0	**65.1**	0.0
R 35	58.8	54.6	65.5	36.0	66.3	**63.6**	58.9	54.7	65.5	36.7	66.3	0.0	**63.7**	59.8	55.5	65.5	38.0	66.9	0.6	**64.6**	58.9	54.7	65.5	35.9	66.3	0.0	**63.7**	0.1

Residential Receivers															
Existing				Options 1A/1B				Options 2A/2B				Options 3A/3B			
Receiver	Noise (Ldn)	Moderate	Severe	Noise (Ldn)	Change	Moderate?	Severe?	Noise (Ldn)	Change	Moderate?	Severe?	Noise (Ldn)	Change	Moderate?	Severe?
R 01	62.7	1.4	4.4	63.0	0.3	No	No	63.0	0.2	No	No	63.0	0.3	No	No
R 02	60.8	1.8	4.8	61.2	0.4	No	No	61.2	0.4	No	No	61.2	0.4	No	No
R 03	58.6	2.2	5.4	59.9	1.3	No	No	59.8	1.2	No	No	59.9	1.3	No	No
R 04	55.6	2.8	6.6	58.6	3.1	Yes	No	58.6	3.0	Yes	No	58.6	3.1	Yes	No
R 05	56.3	2.8	6.6	59.3	3.0	Yes	No	59.2	3.0	Yes	No	59.3	3.0	Yes	No
R 06	55.1	3	7	69.8	14.6	Yes	Yes	68.3	13.1	Yes	Yes	69.8	14.6	Yes	Yes
R 07	55.0	3	7	67.6	12.6	Yes	Yes	65.1	10.1	Yes	Yes	67.6	12.6	Yes	Yes
R 08	54.6	3	7	65.2	10.7	Yes	Yes	65.2	10.7	Yes	Yes	65.2	10.7	Yes	Yes
R 09	58.0	2.4	5.8	64.1	6.1	Yes	Yes	63.9	5.9	Yes	Yes	64.1	6.1	Yes	Yes
R 10	54.5	3	7	64.7	10.2	Yes	Yes	64.7	10.2	Yes	Yes	64.7	10.2	Yes	Yes
R 11	60.5	2	5	67.4	6.9	Yes	Yes	67.4	6.9	Yes	Yes	67.4	6.9	Yes	Yes
R 12	61.6	1.6	4.6	67.9	6.3	Yes	Yes	67.7	6.1	Yes	Yes	67.9	6.3	Yes	Yes
R 13	62.3	1.6	4.6	68.0	5.7	Yes	Yes	67.8	5.4	Yes	Yes	68.0	5.7	Yes	Yes
R 14	62.8	1.4	4.4	67.8	5.0	Yes	Yes	67.6	4.9	Yes	Yes	67.8	5.0	Yes	Yes
R 15	62.7	1.4	4.4	66.4	3.7	Yes	No	66.4	3.6	Yes	No	66.4	3.7	Yes	No
R 16	62.5	1.6	4.6	65.6	3.2	Yes	No	65.8	3.3	Yes	No	65.6	3.1	Yes	No
R 17	65.7	1	3.8	67.4	1.6	Yes	No	68.1	2.4	Yes	No	67.3	1.5	Yes	No
R 18	64.6	1	4	66.3	1.8	Yes	No	67.9	3.3	Yes	No	66.1	1.6	Yes	No
R 19	72.7	0.5	3	72.9	0.2	No	No	N/A	N/A	N/A	N/A	69.5	-3.2	No	No
R 20	71.2	0.5	3	71.6	0.3	No	No	N/A	N/A	N/A	N/A	69.3	-1.9	No	No
R 21	61.6	1.6	4.6	61.6	0.0	No	No	68.0	6.5	Yes	Yes	61.4	-0.2	No	No
R 22	61.0	1.8	4.8	61.0	0.0	No	No	68.2	7.2	Yes	Yes	61.0	0.0	No	No
R 23	64.0	1.2	4.2	64.1	0.0	No	No	65.3	1.2	Yes	No	64.0	0.0	No	No
R 24	63.8	1.2	4.2	63.8	0.0	No	No	64.9	1.1	No	No	63.8	0.0	No	No
R 25	63.5	1.4	4.4	63.5	0.0	No	No	64.5	1.1	No	No	63.5	0.0	No	No
R 26	63.2	1.4	4.4	63.5	0.3	No	No	64.4	1.1	No	No	63.5	0.2	No	No
R 27	62.8	1.4	4.4	63.4	0.6	No	No	64.2	1.4	No	No	63.4	0.5	No	No
R 28	69.3	1	3.2	69.6	0.3	No	No	69.6	0.3	No	No	69.6	0.3	No	No
R 29	68.6	1	3.2	69.1	0.5	No	No	69.1	0.5	No	No	69.0	0.4	No	No
R 30	68.0	1	3.4	68.2	0.1	No	No	68.5	0.4	No	No	68.1	0.1	No	No
R 31	67.1	1	3.6	67.1	0.0	No	No	67.9	0.8	No	No	67.1	0.0	No	No
R 32	66.2	1	3.8	66.2	0.0	No	No	67.3	1.1	Yes	No	66.2	0.0	No	No
R 33	65.6	1	3.8	65.6	0.0	No	No	66.4	0.8	No	No	65.6	0.0	No	No
R 34	65.1	1	4	65.1	0.0	No	No	65.8	0.8	No	No	65.1	0.0	No	No
R 35	63.6	1.2	4.2	63.7	0.1	No	No	64.6	0.9	No	No	63.7	0.1	No	No

Park Receivers															
Existing				Options 1A/1B				Options 2A/2B				Options 3A/3B			
Receiver	Noise (Leq)	Moderate	Severe	Noise (Leq)	Change	Moderate?	Severe?	Noise (Leq)	Change	Moderate?	Severe?	Noise (Leq)	Change	Moderate?	Severe?
Park 1	58.6	5	8	61.4	2.8	No	No	61.5	2.9	No	No	61.4	2.8	No	No
Park 2	59.1	5	8	64.7	5.6	Yes	No	64.7	5.6	Yes	No	64.7	5.6	Yes	No
Park 3	61.0	4	7	66.5	5.5	Yes	No	66.5	5.5	Yes	No	66.5	5.5	Yes	No
Park 4	61.0	4	7	63.7	2.7	No	No	63.8	2.8	No	No	63.7	2.7	No	No

Appendix C Construction Noise Modeling Outputs

Roadway Construction Noise Model (RCNM),Version 1.1

Report dat 2/5/2021
Case Description:

---- Receptor #1 ----

		Baselines (dBA)		
Descriptior	Land Use	Daytime	Evening	Night
1	Residential	40	40	40

Description	Impact Device	Usage(%)	Equipment Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Front End Loader	No	40		79.1	250	0
Dozer	No	40		81.7	250	0
Excavator	No	40		80.7	250	0
Grader	No	40	85		250	0
Paver	No	50		77.2	250	0
Roller	No	20		80	250	0
Crane	No	16		80.6	250	0
Tractor	No	40	84		250	0
Backhoe	No	40		77.6	250	0
Generator	No	50		80.6	250	0

Results

	Calculated (dBA)		Noise Limits (dBA)			
			Day		Evening	
Equipment	*Lmax	Leq	Lmax	Leq	Lmax	Leq
Front End Loader	65.1	61.2	N/A	N/A	N/A	N/A
Dozer	67.7	63.7	N/A	N/A	N/A	N/A
Excavator	66.7	62.8	N/A	N/A	N/A	N/A
Grader	71	67	N/A	N/A	N/A	N/A
Paver	63.2	60.2	N/A	N/A	N/A	N/A
Roller	66	59	N/A	N/A	N/A	N/A
Crane	66.6	58.6	N/A	N/A	N/A	N/A
Tractor	70	66	N/A	N/A	N/A	N/A
Backhoe	63.6	59.6	N/A	N/A	N/A	N/A
Generator	66.7	63.6	N/A	N/A	N/A	N/A
Total	71	73.1	N/A	N/A	N/A	N/A

*Calculated Lmax is the Loudest value.

Roadway Construction Noise Model (RCNM),Version 1.1

Report dat 2/9/2021
Case Description:

---- Receptor #1 ----

Descriptior	Land Use	Baselines (dBA) Daytime	Evening	Night
1	Residential	40	40	40

Description	Impact Device	Usage(%)	Equipment Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Front End Loader	No	40		79.1	250	0
Dozer	No	40		81.7	250	0
Excavator	No	40		80.7	250	0
Grader	No	40	85		250	0
Paver	No	50		77.2	250	0
Roller	No	20		80	250	0
Crane	No	16		80.6	250	0
Tractor	No	40	84		250	0
Backhoe	No	40		77.6	250	0
Generator	No	50		80.6	250	0

Results

	Calculated (dBA)		Noise Limits (dBA)			
			Day		Evening	
Equipment	*Lmax	Leq	Lmax	Leq	Lmax	Leq
Front End Loader	65.1	61.2	N/A	N/A	N/A	N/A
Dozer	67.7	63.7	N/A	N/A	N/A	N/A
Excavator	66.7	62.8	N/A	N/A	N/A	N/A
Grader	71	67	N/A	N/A	N/A	N/A
Paver	63.2	60.2	N/A	N/A	N/A	N/A
Roller	66	59	N/A	N/A	N/A	N/A
Crane	66.6	58.6	N/A	N/A	N/A	N/A
Tractor	70	66	N/A	N/A	N/A	N/A
Backhoe	63.6	59.6	N/A	N/A	N/A	N/A
Generator	66.7	63.6	N/A	N/A	N/A	N/A
Total	71	73.1	N/A	N/A	N/A	N/A

*Calculated Lmax is the Loudest value.