Los Angeles County
Metropolitan Transportation Authority

West Santa Ana Branch Transit Corridor

Draft EIS/EIR Appendix M
Final Noise and Vibration Impact Analysis Report

WEST SANTA ANA BRANCH TRANSIT CORRIDOR PROJECT

Draft EIS/EIR Appendix M Final Noise and Vibration Impact Analysis Report Part 1 of 2

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Metro

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Metropolitan Transportation Authority

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ACRONYMS AND ABBREVIATIONS

AA	Alternatives Analysis
BRT	Bus Rapid Transit
Caltrans	California Department of Transportation
CEQA	California Environmental Quality Act
CHSRA	California High-Speed Rail Authority
CPUC	California Public Utilities Commission
dB	Decibel
dBA	A-weighted Decibel
DF	Direct Fixation
EIR	Environmental Impact Report
EIS	Environmental Impact Statement
FHWA	Federal Highway Administration
FTA	Federal Transit Administration
GBN	Groundborne Noise
GBV	Groundborne Vibration
GCCOG	Gateway Cities Council of Governments
LA	Los Angeles
L_{dn}	Day-Night Noise Level
L_{eq}	Equivalent Noise Level
L_{max}	Maximum Noise Level
LPA	Locally Preferred Alternative
LRT	Light Rail Transit
LRV	Light Rail Vehicle
Metro	Los Angeles County Metropolitan Transportation Authority
MFR	Multi-Family Residential
MOS	Minimum Operable Segment
MPH	Mile Per Hour
MRDC	Metro Rail Design Criteria
MSF	Maintenance and Storage Facility
NEPA	National Environmental Policy Act
NOP	Notice to Proceed
OCTA	Orange County Transportation Authority

PA	Public Address
PEROW	Pacific Electric Right-of-Way
PPV	Peak Particle Velocity
RCNM	Roadway Construction Noise Model
RMS	Root Mean Square
ROD	Record of Decision
ROW	Right-of-Way
RTP	Regional Transportation Plan
SCAG	Southern California Association of Governments
SCS	Sustainable Communities Strategy
SEL	Sound Exposure Level
SFR	Single-Family Residential
TBM	Tunnel Boring Machine
TPSS	Traction Power Substation
TRS	Technical Refinement Study
UPRR	Union Pacific Railroad
VdB	Decibel notation
WSAB	West Santa Ana Branch

1 INTRODUCTION

1.1 Study Background

The West Santa Ana Branch (WSAB) Transit Corridor (Project) is a proposed light rail transit (LRT) line that would extend from four possible northern termini in southeast Los Angeles (LA) County to a southern terminus in the City of Artesia, traversing densely populated, low-income, and heavily transit-dependent communities. The Project would provide reliable, fixed guideway transit service that would increase mobility and connectivity for historically underserved, transit-dependent, and environmental justice communities; reduce travel times on local and regional transportation networks; and accommodate substantial future employment and population growth.

1.2 Alternatives Evaluation, Screening, and Selection Process

A wide range of potential alternatives have been considered and screened through the alternatives analysis processes. In March 2010, the Southern California Association of Governments (SCAG) initiated the Pacific Electric Right-of-Way (PEROW)/WSAB Alternatives Analysis (AA) Study (SCAG 2013) in coordination with the relevant cities, Orangeline Development Authority (now known as Eco-Rapid Transit), the Gateway Cities Council of Governments, the Los Angeles County Metropolitan Transportation Authority (Metro), the Orange County Transportation Authority, and the owners of the right-of-way (ROW)—Union Pacific Railroad (UPRR), BNSF Railway, and the Ports of Los Angeles and Long Beach. The AA Study evaluated a wide variety of transit connections and modes for a broader 34-mile corridor from Union Station in downtown Los Angeles to the City of Santa Ana in Orange County. In February 2013, SCAG completed the PEROW/WSAB Corridor Alternatives Analysis Report and recommended two LRT alternatives for further study: West Bank 3 and the East Bank.

Following completion of the AA, Metro completed the WSAB Technical Refinement Study in 2015 focusing on the design and feasibility of five key issue areas along the 19-mile portion of the WSAB Transit Corridor within LA County:

- Access to Union Station in downtown Los Angeles
- Northern Section Options
- Huntington Park Alignment and Stations
- New Metro C (Green) Line Station
- Southern Terminus at Pioneer Station in Artesia

In September 2016, Metro initiated the WSAB Transit Corridor Environmental Study with the goal of obtaining environmental clearance of the Project under the California Environmental Quality Act (CEQA) and the National Environmental Policy Act (NEPA).

Metro issued a Notice of Preparation (NOP) on May 25, 2017, with a revised NOP issued on June 14, 2017, extending the comment period. In June 2017, Metro held public scoping meetings in the Cities of Bellflower, Los Angeles, South Gate, and Huntington Park. Metro provided Project updates and information to stakeholders with the intent to receive comments and questions through a comment period that ended in August 2017. A total of 1,122 comments were received during the public scoping period from May through August

2017. The comments focused on concerns regarding the Northern Alignment options, with specific concerns related to potential impacts to Alameda Street with an aerial alignment. Given potential visual and construction issues raised through public scoping, additional Northern Alignment concepts were evaluated.

In February 2018, the Metro Board of Directors approved further study of the alignment in the Northern Section due to community input during the 2017 scoping meetings. A second alternatives screening process was initiated to evaluate the original four Northern Alignment options and four new Northern Alignment concepts. The *Final Northern Alignment Alternatives and Concepts Updated Screening Report* was completed in May 2018 (Metro 2018a). The alternatives were further refined and, based on the findings of the second screening analysis and the input gathered from the public outreach meetings, the Metro Board of Directors approved Build Alternatives E and G for further evaluation (now referred to as Alternatives 1 and 2, respectively, in this report).

On July 11, 2018, Metro issued a revised and recirculated CEQA Notice of Preparation, thereby initiating a scoping comment period. The purpose of the revised Notice of Preparation was to inform the public of the Metro Board's decision to carry forward Alternatives 1 and 2 into the Draft Environmental Impact Statement/Environmental Impact Report (EIS/EIR). During the scoping period, one agency and three public scoping meetings were held in the Cities of Los Angeles, Cudahy, and Bellflower. The meetings provided Project updates and information to stakeholders with the intent to receive comments and questions to support the environmental process. The comment period for scoping ended in August 24, 2018; over 250 comments were received.

Following the July 2018 scoping period, a number of Project refinements were made to address comments received, including additional grade separations, removing certain stations with low ridership, and removing the Bloomfield extension option. The Metro Board adopted these refinements to the project description at their November 2018 meeting.

1.3 Report Purpose and Structure

This Impact Analysis Report examines the environmental effects of the Project as it relates to noise and vibration. The report is organized into nine sections:

- Section 1 – Introduction
- Section 2 – Project Description
- Section 3 – Regulatory Framework
- Section 4 – Affected Environment / Existing Conditions
- Section 5 – Environmental Consequences / Environmental Impacts
- Section 6 – CEQA Determination
- Section 7 – Construction Impacts
- Section 8 – Project Measures and Mitigation Measures
- Section 9 – References

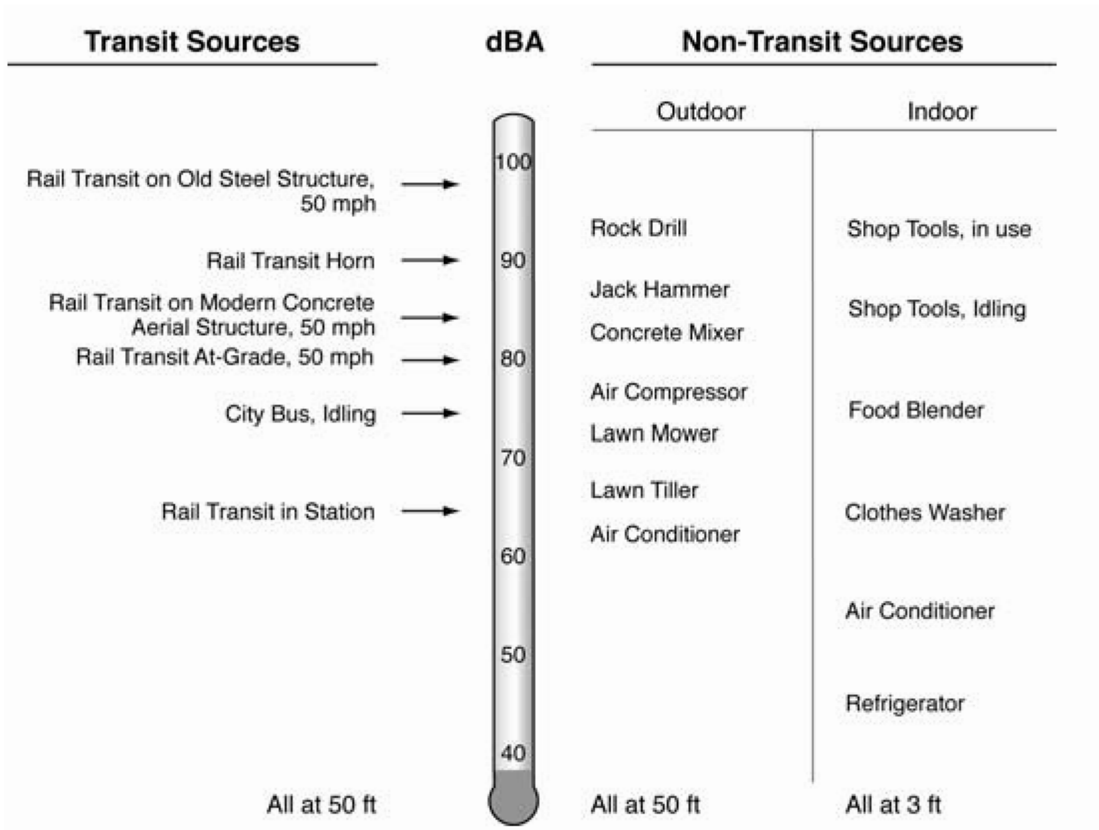
For the purposes of analyzing noise and vibration impacts associated with the Project, this impact analysis report subdivides the Project corridor into two geographic sections: Northern and Southern.

1.4 General Background

1.4.1 Noise Definitions, Characteristics, and Effects

Sound is technically described in terms of the amplitude (loudness) and pitch (frequency) of the sound. Sound is transmitted as acoustic energy, which is vibration (sound waves) transmitted through various media. The standard unit of measurement for sound is the decibel (dB). The human ear is not equally sensitive to sound at all frequencies. The A-weighted scale, abbreviated dBA, reflects the normal hearing sensitivity range of the human ear. Human hearing extends from a range of approximately 3 to 130 dBA. Figure 1-1 provides examples of the typical noise levels of transit and non-transit sources.

Figure 1-1. A-Weighted Decibel Scale



Source: FTA, 2018

This noise analysis discusses sound levels in terms of equivalent noise level (L_{eq}), day-night noise level (L_{dn}), and sound exposure level (SEL), and maximum sound level (L_{max}). L_{eq} is the average noise level on an energy basis for any specific time period. The L_{eq} for one hour is the energy average noise level during the hour. The L_{eq} for 8-hours is the energy average noise level over eight consecutive hours. The average noise level is based on the energy content (acoustic energy) of the sound. L_{eq} can be thought of as the level of a continuous noise which has the same energy content as the fluctuating noise level. The L_{eq} is expressed in units of dBA.

L_{dn} is a 24-hour L_{eq} with an adjustment to reflect the greater sensitivity of most people to nighttime noise. The adjustment is a 10-dBA penalty for all sound that occurs in the nighttime hours of 10:00 p.m. to 7:00 a.m. The effect of the penalty is that in the calculation of L_{dn}, any event that occurs during the nighttime hours is equivalent to ten of the same events during the daytime hours.

SEL is the cumulative noise exposure from a single noise event. The fact that SEL is a cumulative measure means that (1) louder events have greater SELs than do quieter ones, and (2) events that last longer in time have greater SELs than do shorter ones.

L_{max} is the maximum A-weighted sound level reached during a single noise event. However, L_{max} is not used as the descriptor for transit environmental noise impact assessment for several reasons. L_{max} ignores the number and duration of transit events, which are important to people's reaction to noise, and cannot be totaled into a one-hour or a 24-hour cumulative measure of impact. For the purposes of this analysis L_{max} was used to obtain SEL.

Noise is generally defined as unwanted sound. The degree to which noise can impact the human environment ranges from levels that interfere with speech and sleep (annoyance and nuisance) to levels that cause adverse health effects (hearing loss and psychological effects). Human response to noise is subjective and can vary greatly from person to person. Factors that influence individual response include the intensity, frequency, and pattern of noise as well as the amount of background noise present before the intruding noise and the nature of work or human activity that is exposed to the noise source.

A person exposed to high noise levels can suffer hearing damage, either gradual or traumatic. Sustained exposure to moderately high noise levels over a period of time can cause gradual hearing loss. It starts out as a temporary hearing loss, such as immediately after a loud rock concert. The hearing usually restores itself within a few hours after exposure, although not quite to its pre-exposure level. This is also called a temporary threshold shift. Although the permanent deterioration may be negligible, it will become significant after many repetitions of the exposure. At that time, it is considered permanent hearing damage. The primary cause of permanent hearing damage is daily exposure to industrial noise.

Short, sudden exposure to an extremely high noise level, such as a gunshot or explosion at very close range, can cause a traumatic hearing loss, which is very sudden and can be permanent. Occupational exposure to noise is controlled at the federal level by Occupational Safety and Health Administration and at the state level by the state level by the California Division of Safety and Health. A sound level of 82 dBA is protective of hearing for a continuous exposure of 24 hours (29 CFR 1910.95). The maximum allowable noise exposure over an eight hours period is a level of 90 dBA. For each halving of the exposure time, the maximum noise level is allowed to increase 5 dBA. Therefore, the maximum allowable noise exposure (100 percent) is 90 dBA for 8 hours, 95 dBA for four hours, 100 dBA for 2 hours, 105 dBA for 1 hour, 110 dBA for 30 minutes, and 115 dBA for 15 minutes.

Noise can cause stress in humans and may be responsible for stress-related diseases, such as hypertension, anxiety, and heart disease. Although noise is probably not the sole culprit in these diseases, it can be a contributor. The degree to which noise contributes to stress-related diseases depends on noise frequencies, their bandwidths, noise levels, and time patterns. In general, higher frequencies, pure tones, and fluctuating noise levels tend to be more stressful than lower frequencies, broadband, and constant-level noise.

Studies have shown that the smallest perceptible change in sound level for a person with normal hearing sensitivity is approximately 3 dBA. A change of at least 5 dBA would be noticeable and would likely evoke a community reaction. A 10-dBA increase is subjectively heard as a doubling in loudness and would cause a community response.

Noise levels decrease as the distance from the noise source to the receiver increases. Noise generated by a stationary noise source, or "point source," will decrease by approximately 6 dBA over hard surfaces (e.g., reflective surfaces, such as parking facilities or smooth bodies of water) and 7.5 dBA over soft surfaces (e.g., absorptive surfaces such as soft dirt, grass, or scattered bushes and trees) for each doubling of the distance. For example, if a noise source produces a noise level of 89 dBA across a hard surface at a reference distance of 50 feet, then the noise level would be 83 dBA at a distance of 100 feet from the noise source, 77 dBA at a distance of 200 feet and so on. Noise generated by a mobile source will decrease by approximately 3 dBA over hard surfaces and 4.8 dBA over soft surfaces for each doubling of the distance.

Generally, noise is most audible when traveling by direct line-of-sight. Barriers, such as walls, berms or buildings that break the line-of-sight between the source and the receiver greatly reduce noise levels from the source since sound can only reach the receiver by bending over the top of the barrier. However, if a barrier is not high or long enough to break the line-of-sight from the source to the receiver, its effectiveness is greatly reduced.

1.4.2 Noise Associated with Light Rail Transit (LRT) Systems

The Project would generate operational noise associated with light rail activity along the alignment and stations. The following is a summary of the noise and vibration sources that have been evaluated in this study.

- **Light Rail Vehicle (LRV) Operations**: This is the normal noise from the operation of LRVs and includes noise from steel wheels rolling on steel rails (wheel/rail noise) and from propulsion motors, air conditioning, and other auxiliary equipment on the vehicles.
- **Audible Warnings**: Audible warnings are required by the California Public Utilities Commission (CPUC) at all gate-protected at-grade crossings. The required audible warnings are ringing bells that are located on the masts of the crossing gates and sounding of horns located on the lead vehicle of the trains. There are three vehicle-mounted warning devices: a horn, a "quacker," and a "gong." The horn is a high-intensity horn used by Metro for emergencies only, while the quacker is a low-intensity horn used by Metro for standard operations. The gong is a relatively low-volume bell sound that is sometimes used when trains enter stations. All devices would comply with requirements of the CPUC. The CPUC requires that the horn create a minimum sound level of 85 dBA at 100 feet in front of the train. This is a higher noise level than a typical automobile horn. The quacker is a relatively low-volume sound (75 dBA at 100 feet in front of the lead vehicle) and has a marginal effect on community noise exposure at train speeds greater than 35 miles per hour (mph).
- **Station Public Address (PA) System**: PA systems will be installed at the stations to announce when trains are arriving at the stations and to provide other information to patrons. These systems will have automatic volume adjustment controls that are designed so the announcements are only a few decibels above ambient noise levels. With proper design of the PA systems and the automatic volume adjustment, the noise from the PA system should not generate any adverse effects in communities near the stations.

- **Special Trackwork**: The Project will be constructed of continuously welded rail as are virtually all modern light-rail systems. Welded rail eliminates most rail joints, which means that the "clickety-clack" noise associated with older rail systems is eliminated. The one exception is at the special trackwork for turnouts and crossovers. Turnouts and crossovers require that two rails cross; the special fixture used where two rails cross is referred to as a "frog." Standard frogs have gaps where the two rails cross and the wheels must "jump" across the gap. The wheels striking the ends of the gap increases noise levels near special trackwork by approximately 5 dBA. Because noise levels are higher near special trackwork, it is common for many of the predicted noise effects to be near special trackwork.
- **Wheel Squeal**: Wheel squeal can be generated when steel-wheel transit vehicles traverse tight radius curves. It is very difficult to predict when and where wheel squeal would occur. A general guideline is that there is potential for wheel squeal at any curve with a radius that is less than 600 feet.
- **Ancillary Facilities**: Traction power substations (TPSS) and ventilation shafts are the only Ancillary Facilities associated with the Project with potential for creating noise effect. The ventilation fans at the substation are the dominant noise source of most TPSS units.
- **Parking Facility**: Parking would be provided at five stations. Typical parking lot sources of noise are vehicle idling, opening and closing of car doors, and people talking.
- **Maintenance and Storage Facility (MSF)**: The MSF would accommodate daily servicing and cleaning, inspection and repairs, and storage of LRVs. Noise sources associated with the MSF would include LRV repair areas which would produce noise associated with use of hand tools and mechanical equipment, blowers associated with the enclosed car wash, the vacuum system and an air compressor associated with the vehicle blow down facility, horn testing, wheel squeal, employee vehicle trips, train movements within the yard, and on-site TPSS sites.
- **Construction Noise**: All the sources discussed above are associated with operation of the Project. Similar to any other major infrastructure project, construction would require use of heavy equipment that generates relatively high noise levels.

1.4.3 Vibration Definitions, Characteristics, and Effects

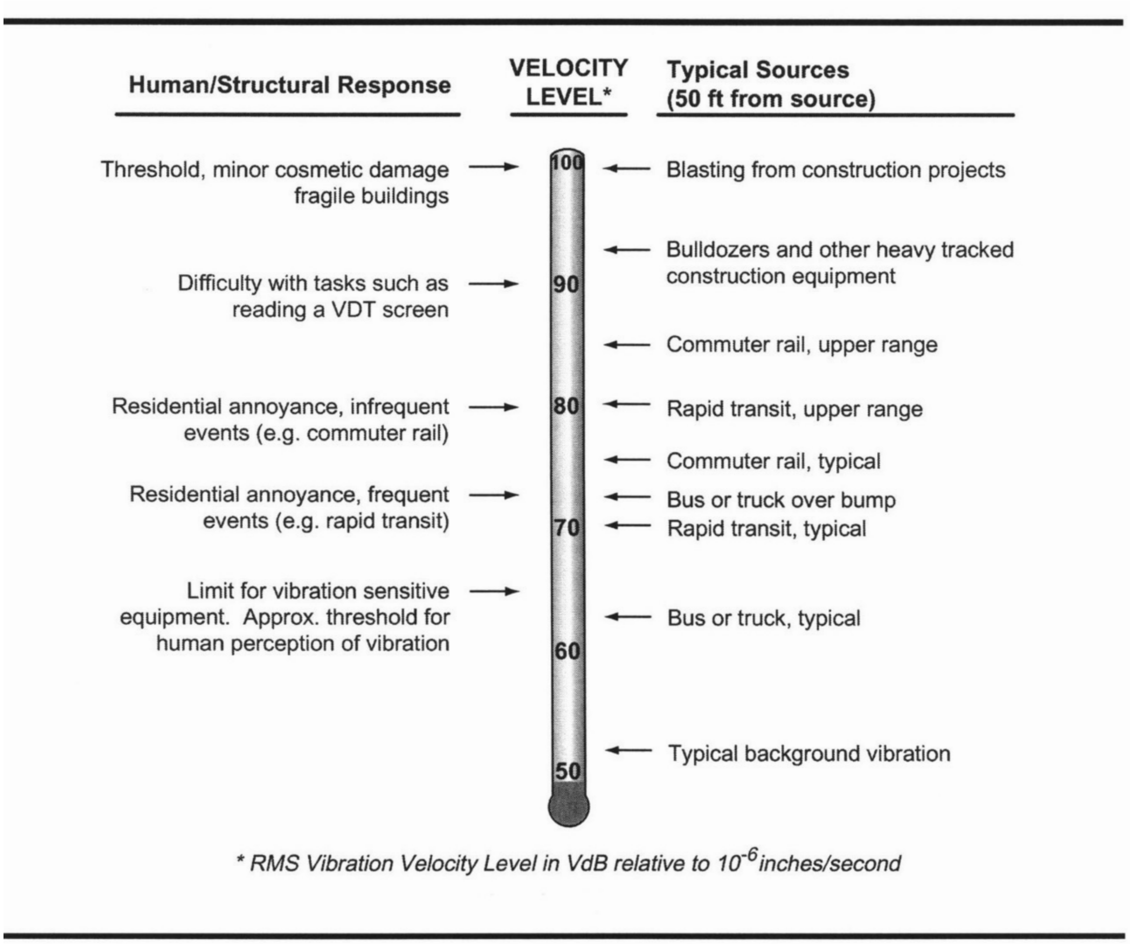
Vibration is an oscillatory motion through a solid medium in which the motion's amplitude can be described in terms of displacement, velocity, or acceleration. Vibration can cause buildings to shake and rumbling sounds to be heard. It is unusual for vibration from sources such as buses and trucks to be perceptible, even in locations close to major roads. Some common sources of vibration are trains, buses on rough roads, and construction activities, such as blasting, pile driving, and heavy earth-moving equipment.

Several different methods are used to quantify vibration. The peak particle velocity (PPV) is defined as the maximum instantaneous peak of the vibration signal. The PPV is most frequently used to describe vibration impacts to buildings and is usually measured in inches per second. The root mean square (RMS) amplitude is most frequently used to describe the effect of vibration on the human body. The RMS amplitude is defined as the square root of the average of the squared amplitude of the signal. Decibel notation (VdB) is used in this study to report RMS particle velocity.

High levels of vibration may cause physical personal injury or damage to buildings. However, ground vibration levels rarely affect human health. Instead, most people consider groundborne vibration (GBV) to be an annoyance that can affect concentration or disturb sleep. In addition, high levels of ground vibration can damage fragile buildings or interfere with equipment that is highly sensitive to ground vibration (e.g., electron microscopes).

Unlike noise, ground vibration is not a phenomenon that most people experience every day. The background vibration velocity level in residential areas is usually 50 VdB RMS or lower, well below the threshold of perception for humans which is around 65 VdB RMS. Most perceptible indoor vibration is caused by sources within buildings, such as operation of mechanical equipment, movement of people or slamming of doors. Typical outdoor sources of perceptible ground vibration are construction equipment, steel-wheeled trains and traffic on rough roads. If the roadway is smooth, the vibration from traffic is rarely perceptible. Typical levels of ground vibration are shown in Figure 1-2.

Figure 1-2. Typical Levels of Ground Vibration



Source: FTA, 2018

1.4.4 Vibration Associated with Light Rail Transit (LRT) Systems

The Project would generate operational vibration associated with light rail activity along the alignment and stations. The following is a summary of the vibration sources evaluated in this study.

- **LRV Operations**: The vibration from the operation of LRVs is generated by the steel wheels rolling on steel rails.
- **Special Trackwork**: As discussed above, special trackwork may increase GBV by approximately 10 VdB. Because vibration levels are higher near special trackwork, it is common for many of the predicted vibration effects to be near special trackwork.
- **Maintenance and Storage Facility**: The MSF would accommodate daily servicing and cleaning, inspection and repairs, and storage of LRVs. Vibration sources associated with the MSF would include LRV movements on tangent and special track.
- **Construction Vibration**: All the sources discussed above are associated with Project operation. Similar to other major transportation infrastructure project, construction would require use of heavy equipment that generate GBV.

1.5 Methodology

To satisfy National Environmental Policy Act (NEPA) requirements the analysis utilizes Federal Transit Administration (FTA) *Transit Noise and Vibration Impact Assessment* guidance for assessing operational noise and vibration associated with transit projects. Impacts are analyzed in accordance with the FTA noise and vibration impact criteria.

FTA standards and criteria for assessing noise impacts related to transit projects are based on community reactions to noise. The criteria reflect changes in noise exposure using a sliding scale where the higher the level of existing noise, the smaller increase in total noise exposure is allowed. FTA has also developed impact criteria for acceptable levels of groundborne noise (GBN) and GBV. These criteria, as summarized in Table 3.5 and are presented in terms of acceptable indoor ground-borne vibration and noise levels. Impacts will occur if these levels are exceeded. Criteria for ground-borne vibration are expressed in terms of rms velocity levels in VdB, and criteria for ground-borne noise are expressed in terms of A-weighted sound pressure levels in dBA. The criteria for special buildings such as concert halls, television and recording studios, auditoriums, and theaters, which are also sensitive to vibration but do not fit into the three FTA sensitive land use categories previously described, are presented in Table 3.6.

To satisfy California Environmental Quality Act (CEQA) requirements, noise and vibration impacts are analyzed in accordance with Appendix G of the *CEQA Guidelines* and considered significant if the Project has the potential to:

- Result in the generation of a substantial temporary or permanent increase in ambient noise levels in the vicinity of the project in excess of standards established by FTA or in the local general plan or noise ordinances;
- Result in generation of excessive GBV or GBN levels; and/or
- 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.

1.5.1 Operational Noise

FTA screening distances were used to identify the receivers that would be included in the detailed assessment:

- **Operational Transit Noise**: 350 feet for unobstructed receivers and 175 feet for obstructed.
- **MSF Noise**: 1,000 feet for unobstructed receivers and 650 feet for obstructed.
- **TPSS Noise**: 250 feet for unobstructed receivers and 125 feet for obstructed.
- **Parking Facility Noise**: 125 feet for unobstructed receivers and 75 feet for obstructed.

Sensitive land uses were then clustered dependent on the similarity of existing noise conditions, distance to the alignment, LRT system operating parameters, trackwork, and LRT speed along the alignment. Each cluster (group of sensitive land uses with similar existing noise conditions, distance to the alignment and other similar conditions) was categorized as FTA Land Use Categories 1, 2, or 3 and assigned a representative receiver for modeling noise impacts for the cluster.

An analysis of operational noise levels at sensitive land uses was completed using the FTA Detailed Noise Analysis procedure. A general outline of the procedures follows below.

- **Receivers of Interest**: Cluster sensitive land uses and select receivers of interest.
- **Project Noise**: Identify the project noise sources that are in the vicinity of receivers of interest. For these sources, determine the source reference noise in terms of SEL. Convert each source SEL to noise exposure (L_{dn} or L_{eq} (h)) at 50 feet, for the appropriate project operating parameters.
- **Propagation and Summation of Project Noise at Receivers of Interest**: Draw a noise exposure-vs. distance curve for each relevant source. This curve will show source noise as a function of distance, accounting for shielding along the path, as well as any propagation-path mitigation that will be included in the Project. From these curves, determine the total project noise exposure at all receivers of interest by combining the levels from all relevant sources.
- **Existing Noise in the Study Area**: Estimate the existing noise exposure at each receiver of interest.
- **Noise Impact Assessment**: Assess noise impact at each receiver of interest using the impact criteria defined in Table 3.5.
- **Mitigation of Noise Impact**: Where the assessment shows either Severe Impact or Moderate Impact, evaluate alternative mitigation measures. Then loop back to modify the Project-noise computations, thereby accounting for the adopted mitigation, and reassess the remaining noise impact.

1.5.1.1 Light Rail Vehicle Operations Noise Model

Operating conditions were obtained from projected Project operating parameters as shown in Table 1.1 and Table 1.2. These parameters are used as inputs to predict train noise associated with the Project using the below formulas included in the FTA *Transit Noise and Vibration Impact Assessment* guidance. Reference noise levels were obtained from the previous studies of Metro LRT cars, including noise measurements of L (Gold) Line vehicles, as included in the E (Expo) Phase 2 Final Environmental Impact Report (EIR).

Table 1.1. LRT Operating Schedule

Time	Headway (minutes)	Train Length	Trains per Hour
4:00 a.m. – 6:00 a.m. (Early)	15	3	8
6:00 a.m. – 9:00 a.m. (AM Peak)	5	3	24
9:00 a.m. – 4:00 p.m. (Base)	10	3	12
4:00 p.m. – 7:00 p.m. (PM Peak)	5	3	24
7:00 p.m. – 10:00 p.m. (Early Evening)	10	3	12
10:00 p.m. – 12:00 a.m. (Late Evening)	20	1	6
12:00 a.m. – 2:00 a.m.	20	1	3

Source: Metro, 2017

Table 1.2. LRT Daytime and Nighttime Train Volumes

Time	Train Volume
Daytime (7:00 a.m. – 10:00 p.m.)	240
Nighttime (10:00 p.m. – 7:00 a.m.)	64

Source: Metro, 2017

1.5.2 Reference Data

- **Maximum Sound Level (L_{max})**: Two-car train operating at 40 mph on a ballast and tie track at a distance of 50 feet (77 dBA). The reference data which is based upon a two-car train, was translated to a three-car train using FTA guidance.
- **Reference SEL**: 81 dBA. Obtained using formula in Section 1.5.3.1.

1.5.3 Operating Condition

- **L_{eq} or L_{dn}**: Calculated based upon a three-car train operating at various speeds.
- **Train speed**: Based on maximum design speeds and deceleration/acceleration coming into/leaving stations. As expected, the wheel/rail noise increases with speed. At speeds greater than 20 to 30 mph, the wheel/rail noise usually dominates noise from the vehicle auxiliary equipment.

1.5.3.1 Conversion of L_{max} to Source Reference Level (SELref) at 50 Feet for Light Rail Noise

$SEL_{ref} = L_{max} + 10 \times Log (L_{meas}/50) + 10 \times LOG (D_{meas}/50) - 10 \times Log [2 X arctan + Sin(2 \times arctan)] -10 Log (N) - 30 \times Log (S_{meas}/50) + 3.3$

L_{max} = source maximum noise level.

L_{meas} = total length of measured group of locomotives or rail cars in feet (a three-car light rail train is 270 feet long).

D_{meas} = closest distance between the measurement position and source in feet.

S_{meas} = speed of measured vehicle(s) in mph

N = consist (number of locomotives or rail cars in a measured group)

Arctan = $[L_{meas}/(2 X D_{meas})]$ in radians

1.5.3.2 Computation of L_{dn} and L_{eq} at 50 Feet for Light Rail Noise

Hourly L_{eq} *at 50 feet* $[L_{eq}(h)] = SEL_{ref} + 10 \times Log(N_{cars}) + 20 \times Log(S/50) + 10 \times Log(V) - 35.6$

Daytime L_{eq} *at 50 feet* $[L_{eq}(day)] = L_{eq}(h)$ *where* $V = Vd$

Nighttime L_{eq} *at 50 feet* $[L_{eq}(night)] = L_{eq}(h)$ *where* $V = Vn$

N_{cars} = average number of cars per train

S = train speed in mph

V = Average hourly volume of train traffic

V_d = Average hourly daytime volume of traffic in trains per hour

= Number of trains 7:00 a.m. to 10:00 p.m./15 hours

Vn = Average hourly nighttime volume of train traffic in trains per hour

= Number of trains 10:00 p.m. to 7:00 a.m./9 hours

Day/Night at 50 feet (L_{dn}) = 10 x Log [(15) x $10^{\wedge(Leq\ (day)/19)}$ + 9 x $10^{\wedge((Leq\ (night)10)/10))}$] -13.8

1.5.3.3 LRT Noise Exposure Over Distance Formula

L_{dn} or L_{eq} = (L_{dn} or L_{eq}) at 50 feet - 10 x Log (D/50) – 10 x G x Log (D/42)

L_{dn} at 50 feet = Reference L_{dn} from previous calculation

D = Distance to receiver location

G = Ground absorption, G is 0 for "acoustically hard (non-absorptive) conditions"

1.5.3.4 LRT Pass-By Noise Adjustments

The following adjustments have been made to LRT Pass-By Noise levels by location:

- +5 dB for jointed track or crossover within 300 feet of a receptor
- +4 dB for aerial structure with slab track
- +3 dB for embedded track on grade, commonly occurring at grade crossings
- -4.5 dB for first row of intervening buildings
- -1.5 dB for second row of intervening buildings

1.5.3.5 Wheel Squeal Noise Model

Metro LRT vehicles are equipped with resilient wheels instead of solid steel wheels such as those used on freight rail systems. There are several different types of resilient wheels used on light-rail vehicles; the most common resilient wheels have small rubber blocks that separate the wheel tread from the hub. Both the tread and hub are made of steel. The use of resilient wheels substantially reduces the occurrence and amplitudes of wheel squeal, but do not always eliminate wheel squeal. The following analysis assumes that LRT activity on curves with a radius less than 600 feet would increase pass-by noise by 10 dBA due to wheel squeal.

1.5.3.6 Maintenance and Storage Facility Noise Model

Train Movement on Tracks

Train movements within the MSF would generate noise from steel wheels rolling on steel rails. Trains would travel at low speeds within the MSF. As described in Section 7 of the *Metro Rail Rule Book for the A/E (Blue/Expo) Line*, the trains are anticipated to move with an average speed of 10 mph within the yard and 5 mph along curves. Train movement noise within the yard was calculated using the same formulas for the calculation of light rail noise.

Crossovers

Turnouts and crossovers require that two rails cross; the special fixture used where two rails cross is referred to as a “frog.” Standard frogs have gaps where the two rails cross and the wheels must “jump” across the gap. The wheels striking the ends of the gap increases noise levels near special trackwork by approximately 5 dBA.

Wheel Squeal

The MSF would include tight curves that may generate wheel squeal. The analysis assumes that LRT activity on tight curves within the yard would add 10 dBA due ranging from wheel squeal to light rail noise.

Maintenance Shops

The maintenance shop would accommodate daily servicing and cleaning, inspection and repairs, and storage of LRVs. A reference noise level for the maintenance shops was obtained from the E (Expo) Phase 2 Final EIR noise measurements at the C (Green) Line Maintenance Yard. The reference noise level was 62 dBA L_{eq} at 30 feet for a period of 30 minutes. The noise level from the maintenance shops is assumed to be continuous. The L_{dn} was calculated using an FTA methodology for determining L_{dn} from a one-hour L_{eq} measurement.

L_{eq}: 62 dBA at 30 feet

L_{dn}: 69 dBA at 30 feet (L_{eq} + 8)

L_{dn} or L_{eq} = (L_{dn} or L_{eq}) at 50 feet - 20 x Log (D/30)

L_{dn} at 30 feet = Reference L_{dn} from previous calculation

Car Wash

The car wash would include one vehicle wash bay and servicing area for daily cleaning. The mechanical system would operate 50 percent of the time both day and night. The FTA *Transit Noise and Vibration Impact Assessment* guidance provides a reference SEL for car washes of 111 dBA at 50 feet (75 dBA L_{max} at 50 feet). However, it is noted that FTA would prefer measurements for this noise source. For this project the SEL is based on measurements taken for other recent Metro Studies, such as the E (Expo) Phase 2 Project, a reference SEL of 85 dBA (64 dBA L_{max}) at 20 feet was used.

- SEL: 85 dBA at 20 feet
- Based upon wash cycle information from the A (Blue) Line, a three-car train would typically take five minutes with a maximum of 22 three-car trains able to be washed per day. This would lead to a total operation time of 110 minutes per day of the car wash. The car wash was assumed to operate two hours during the day and two hours during the night.

Vehicular Traffic

Employee parking would be onsite at the MSF. Employee trips would not double traffic volumes along any roadway and therefore would not result in a substantial permanent increase in noise levels. As such, employee trips have not been further assessed in this analysis.

Combined Noise Level

Noise levels from MSF noise sources was combined and used to assess impacts at receivers. The combined L_{dn} was calculated using the following FTA methodology.

L_{dn} (total) = 10 x LOG (ΣAll sources $10^{(Ldn/10)}$)

Σ= Sum

L_{dn} (total) = Total L_{dn} from all sources combined.

1.5.3.7 Audible Warnings at Crossing Gates and Stations Noise Model

Crossing signal noise was modeled for all at-grade gate-protected crossings. The model does not include quacker noise or train horn noise. Quacker noise is not included as a separate noise source because at speeds greater than 35 mph the noise from the quacker adds less than 1 dBA to the noise exposure caused by light-rail train operations. However, where the trains are coming into a station with speeds less than 35 mph, 1 dBA has been included for quacker noise. The train horn would not be a regularly occurring noise source and only sounded during emergencies. As such, with its infrequent use, the train horn is not included in the analysis.

A reference noise level for crossing signals was obtained from the FTA *Transit Noise and Vibration Impact Assessment* guidance, which provides an SEL of 109 dBA at 50 feet.

- SEL: 109 dBA for crossing signals
- Duration of event: 50 seconds.
  - The automatic warnings at at-grade crossings, including the bells, must be activated at least 20 seconds before the light-rail train reaches the at-grade crossing and must continue until the trailing car of the train is completely through the crossing (CPUC General Order 75D). The crossing signals will continue to sound for as long as the at-grade crossing gates have been activated.
- Number of events: based on train volumes per hour and during daytime and nighttime hours, as described in Table 1.1 and Table 1.2 above.

  Hourly L_{eq} *at 50 feet* $[L_{eq}(h)] = SEL_{ref} + 10 \times Log\ (N) + 10 \times Log\ (E/3600) - 35.6$

  Daytime L_{eq} *at 50 feet* $[L_{eq}\ (day)] = L_{eq}\ (h)$ *where* $N = Nd$

  Nighttime L_{eq} *at 50 feet* $[L_{eq}\ (night)] = L_{eq}\ (h)$ *where* $N = Nn$

  E = Duration of one event in seconds

  N = Number of events of this type that occur during one hour

  Nd = hourly average number of events of this types that occur during daytime (7:00 a.m. to 10:00 p.m.)

  = number that occur between 7:00 a.m. and 10:00 p.m./15 hours

  Nn = hourly average number of events of this types that occur during nighttime (7:00 a.m. to 10:00 p.m.)

  = number that occur between 10:00 p.m. and 7:00 a.m./9 hours

  Day/Night at 50 feet $(L_{dn}) = 10 \times Log\ [15 \times 10^{\wedge(Leq(day))/10)} + 9 \times 10^{\wedge[(Leq(night)+10)/10]} - 13.8$

1.5.3.8 Audible Warning Noise Exposure Over Distance

$$(L_{dn} \text{ or } L_{eq}) = (L_{dn} \text{ or } L_{eq}) \text{ at 50 feet } -20 \times Log\,(D/50) - 10 \times G \times Log(D/50)$$

L_{dn} at 50 feet = Reference L_{dn} from previous calculation

G = Ground absorption, G is 0 for "acoustically hard (non-absorptive) conditions"

1.5.3.9 Special Trackwork

Standard frogs have gaps where the two rails cross and the wheels must "jump" across the gap. The wheels striking the ends of the gap increases noise levels near special trackwork by approximately 5 dBA. A 5-dBA adjustment has been applied for receivers within 300 feet of a crossover.

1.5.3.10 Ancillary Facilities Noise Model

TPSS units would be the only ancillary facility noise considered for the operational noise analysis. Emergency, standby, and critical operations power system generators, located along the alignment, at maintenance facilities, and at a rail operations control center would be another potential source of noise. Reduction of noise from these sources will be provided by barriers, enclosures, sound absorptive materials, and engine silencers as applicable to the individual facility or unit design. Operation of the generators would not be a part of regular operation and would only be used during emergency situations and during weekly testing for approximately 20 minutes. Thus, generator operation has not been included as part of the operational analysis.

Sources of TPSS noise include heating, ventilation, and cooling systems (HVAC) and transformer hum. The HVAC system is the primary source of sound emitted from a TPSS. TPSS noise levels were measured at seven feet from the cooling fan of the TPSS unit located at Farmdale Avenue and Exposition Boulevard. The resulting noise level was 66.5 dBA L_{eq} at seven feet. The equivalent noise level is approximately 49.4 dBA L_{eq} at 50 feet. The measured noise level is consistent with the specifications used for the purchase of the TPSS units for the Metro L (Gold) Line Phase 1 and the East Side extension to the L (Gold) Line.

The specifications limit TPSS noise to a maximum of 50 dBA at 50 feet from any side of the TPSS.

- Reference noise level ($TPSS_{ref}$): 50.0 dBA
- Reference Distance (D_{ref}): 50 feet

$$Ldn_{TPSS} = 10 \times Log\,(15 \times 10^{(SPL/10)} + 9 \times 10^{([SPL+10]/10)} - 13.8 - 20 \times Log\,(D/Dref)$$

Ldn_{TPSS} = Project TPSS Day-Night noise level at the receiver

SPL = TPSS reference sound pressure level of 50 dBA

D_{ref} = Reference distance for reference TPSS sound pressure noise level

D = Distance of receiver from TPSS unit

1.5.3.11 Sound Barrier Attenuation Noise Model

Sound barriers would effectively mitigate noise when the barriers break the line-of-sight between source and receiver. The necessary height of a barrier depends on factors, such as source height and distance from the source to the barrier. For example, if a barrier is located close to a rapid transit train, the barrier would need to be three to four feet above the top of rail to be effective. Barriers close to vehicles can provide noise reductions of 6 to 10 dBA. For barriers further away, such as on the ROW line or for trains on the far track, the height must be increased to provide equivalent effectiveness. Otherwise, the effectiveness can drop to 3 dB or less, even if the barrier breaks the line-of-sight.

Barrier Attenuation

$A_{barrier}$ = min {12 or [5.3 x LOG (P) + 6.7]}

$A_{barrier}$ = Barrier attenuation in dB

Min = Chooses the lowest decibel reduction between 12 dB and [5.3 x LOG (P) = 6.7] The maximum decibel reduction is therefore 12 dB

P = Path length distance, in feet

Path Length Difference

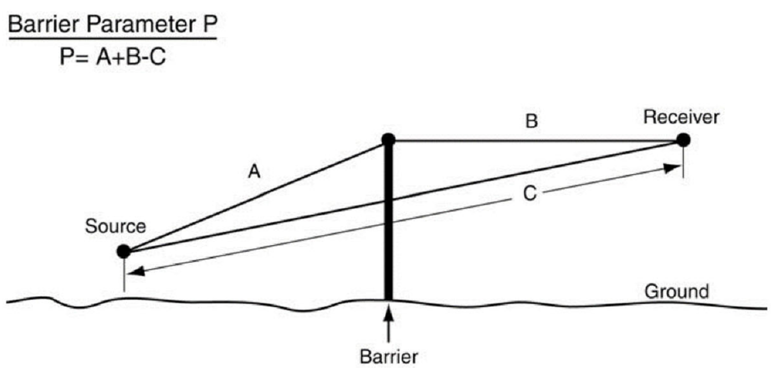
P = A + B – C

P = Path length difference

A = Sloped distance from top of source to top of barrier

B = Sloped distance from top of barrier to top of receiver

C = Sloped distance from top of source to top of receiver



1.5.3.12 Parking Facility Noise Model

Parking facility noise was modeled at each proposed parking facility along the alignment. Sensitive receivers were screened along alignment using the FTA guidance distances and clustered. Each cluster was categorized as FTA Land Use Categories 1, 2, or 3 and assigned a representative receiver for modeling noise impacts for the cluster. A reference noise level for parking facilities was obtained from the FTA *Transit Noise and Vibration Impact Assessment* guidance, which provides an SEL of 92 dBA at 50 feet for a 1,000-car parking facility.

- SEL: 92 dBA for 1,000 cars in peak activity hour.

An adjustment to the reference noise level was made based on the car volume of each parking facility.

Volume Adjustment = 10 x LOG (Na/1,000)

N_a = Average number of automobiles per hour during the day or night

1.5.3.13 Freight Train Noise Model

Construction would require relocation of existing freight tracks. A reference noise level was obtained from the CREATE railroad noise model. A locomotive warning horn noise level was obtained from FTA *Transit Noise and Vibration Impact Assessment* guidance

- Freight Locomotive SEL: 97 dBA for 1,000 cars in peak activity hour.
- Freight Car SEL: 100 dBA for 1,000 cars in peak activity hour.
- Locomotive Warning Horn SEL: 110 dBA

Freight Locomotive Formula

$$Hourly\ L_{eq}\ at\ 50\ feet\ [L_{eq}(1hr)] = SEL_{ref} + 10 \times Log\ (N_{loco}) + 10 \times Log\ (S/50) + 10 \times LOG(V) - 35.6$$

SEL_{ref} = Reference Locomotive Noise Level

N_{loco} = Average number of locomotives per train

S= Train speed, mph

V = Average hourly volume of train traffic

Freight Car Formula

$$Hourly\ L_{eq}\ at\ 50\ feet\ [L_{eq}(1hr)] = SEL_{ref} + 10 \times Log\ (N_{cars}) + 10 \times Log\ (S/50) + 10 \times LOG(V) - 35.6$$

SEL_{ref} = Reference Freight Car Noise Level

N_{cars} = Average number of cars per train (assumes one 2000 foot set of freight cars)

S= Train speed, mph

V = Average hourly volume of train traffic

Transit Warning Horn Formula

$$Hourly\ L_{eq}\ at\ 50\ feet\ [L_{eq}(1hr)] = SEL_{ref} + 10 \times Log\ (N_{loco}) + 10 \times Log\ (S/50) + 10 \times LOG(V) - 35.6$$

SEL_{ref} = Reference locomotive warning horn noise level

N_{loco} = Average number of locomotives per train

S= Train speed, mph

V = Average hourly volume of train traffic

1.5.4 Operations - Vibration

For operational vibration assessment, sensitive receivers were screened along the alignment using the FTA guidance distances for LRT screening presented in Table 1.3.

- 450 feet for buildings where vibration would interfere with interior operations that may be well below those associated with human annoyance (FTA Vibration Category 1);
- 150 feet for residences and buildings where people normally sleep (FTA Vibration Category 2); and
- 100 feet for institutional land uses with primarily daytime use (FTA Vibration Category 3).

Table 1.3. Screening Distances for Vibration Assessment

Type of Projects	Critical Distance for Land Use Categories[1] Distance (feet) from Right-of-Way or Property Line Distance from Right-of-Way or Property Line		
	Vibration Category 1	Vibration Category 2	Vibration Category 3
Conventional Commuter Railroad	600	200	120
Rail Rapid Transit	600	200	120
Light Rail Transit	450	150	100
Intermediate Capacity Transit	200	100	50
Bus Projects	100	50	--

Source: FTA, 2018
Note: [1] The land uses not included in these categories are: concert halls and TV studios which, for the screening procedure, should be evaluated as Category 1; and theaters and auditoriums which should be evaluated as Category 2.

Sensitive receivers near the MSF site options were screened at the same distances. Similar to noise, screening of receivers was completed to ensure that only those identified receivers with the potential to be affected by the Project would be included in the analysis. Sensitive receivers were then clustered dependent on similarity of existing conditions, distance to the alignment, LRT system operating parameters, trackwork, and LRT speed along the alignment. Each cluster was categorized as FTA Vibration Category 1, 2, or 3 and assigned a representative receiver for modeling vibration impacts for the cluster.

The screening distances in Table 1.3 are based on the criteria presented in the FTA *Transit Noise and Vibration Impact Assessment* (Guidance Manual) with a 5 VdB factor of safety included. The distances were determined using the reference vibration levels in the FTA Guidance Manual prediction procedures assuming "normal" vibration propagation. Efficient vibration propagation can result in substantially higher vibration levels than predicted using the FTA Guidance Manual. Because of the 5 VdB safety factor, the screening distances will identify potentially affected areas, even with efficient propagation. While not specifically accounting for the possibility that efficient vibration propagation could fail to identify some impact areas in the screening process, the likelihood is minimal, and the process follows industry-standard procedure.

An analysis of operational vibration levels at sensitive receivers was completed using the FTA General Vibration Analysis procedure. A general outline of the procedures follows below.

- **Receivers of Interest**: Identify cluster of sensitive receivers and select closest receiver to Project alignment.
- **Project Vibration**: Identify the project vibration sources that are within the FTA screening distances (see Table 1.3). For these sources, determine the source reference vibration levels at the distance between the source and receiver, for the appropriate project operating parameters.
- **Vibration Impact Assessment**: Assess vibration impact at each receiver of interest using the impact criteria defined in Table 3.5 and Table 3.6.
- **Mitigation of Vibration Impact**: Where the assessment shows an exceedance of the FTA vibration impact thresholds, evaluate alternative mitigation measures. Then loop

back to modify the Project-vibration computations, thereby accounting for the adopted mitigation, and reassess the remaining vibration impact.

1.5.5 Light Rail Vehicle Operations Vibration Model

The FTA General Assessment procedures outlined in Section 6 of the FTA Guidance Manual General Assessment was used to model the train vibrations in areas where the screening procedure identified that vibration impacts might occur. The General Assessment is an extension of the screening procedure and uses generalized data to develop a curve of vibration level as a function of distance from the track. The GBV levels at specific buildings are estimated by reading values from the curve and applying adjustments to account for factors such as track support system, vehicle speed, type of building, and track and wheel condition. The general level deals only with the overall vibration velocity level and does not consider the frequency spectrum of the vibration.

The General Assessment is a method to estimate overall levels of GBV for comparison to the FTA impact criteria. For projects where no measurements were conducted to determine the line-source transfer mobility of the ground and the force density level of the train, the General Assessment approach will be sufficient for the environmental impact assessment. Where there are potential impacts, a Detailed Analysis can be undertaken during final design to accurately define the level of impact and design mitigation measures. A Detailed Analysis usually would be required when designing special track-support systems such as floating slabs or ballast mats.

The basic approach for the General Assessment is to define a curve, or set of curves, that predicts the overall ground-surface vibration as a function of distance from the source, then apply adjustments to these curves to account for factors such as vehicle speed, building type, and receiver location within the building.

Once the base curve has been selected, the adjustments can be used to develop vibration projections for specific receiver positions inside buildings. The adjustments are given as single numbers to be added to, or subtracted from, the base level. The adjustment parameters include speed, wheel and rail type and condition; type of track support system; type of building foundation; and number of floors above the basement level. Several of these adjustments are strongly dependent on the frequency spectrum of the vibration source and the frequency dependence of the vibration propagation. The single number values are suitable for generalized evaluation of the vibration impact and vibration mitigation measures since they are based on typical vibration spectra. However, the single number adjustments are not adequate for detailed evaluations of impact of sensitive buildings or for detailed specification of mitigation measures. Detailed Analysis requires consideration of the relative importance of different frequency components. However, since there are were no transfer mobility testing conducted, the General Assessment was used to predict where potential vibration impacts would occur. These impacts would be confirmed after transfer mobility testing is completed during the Final EIS. The following guidelines are used to select the appropriate adjustment factors used for the General Assessment.

- **Train Speed**: The FTA Guidance Manual adjustment to the GBV vary approximately as 20 times the logarithm of speed. This means that doubling train speed will increase the vibration levels approximately 6 dB and halving train speed will reduce the levels by 6 dB. Since the publication of the FTA Guidance Manual empirical measurements of train vibration has resulted in a modification of the speed adjustment from 20 to 15 times the logarithm. The FTA reference train vibration levels 50 mph for steel-wheel vehicles were adjusted using the following relationship to calculate the GBV levels for other speeds.

$$adjustment\ (VdB) = 15 \times \log\ (speed/speed_{ref})$$

The FTA Guidance Manual default values is a 20 log speed adjustment. Over past years, LRT FDL measurements at different train speeds have been found to vary by 15 times the log of the ratio of speed rather than 20 log that is recommended by the FTA Guidance Manual. The 15 log speed adjustment has been observed for measurements conducted on several of Metro vehicles used for the vibration impact assessment for many of Metro's recent LRT projects including E (Expo) Phase II, L (Gold) Line Phase 2, Regional Connector and Westside D (Purple) Line Extension. The 2018 FTA Guidance Manual acknowledges that vibration variation with speed has been observed to be as low as 15 log.

- **Special Trackwork**: The additional vibration at special trackwork was accounted for by adding 10 VdB to the predicted vibration levels when the special trackwork frog would be located less than 100 feet from a sensitive receiver. At distances, greater than 100 to 200 feet, the additional vibration from crossovers typically decays at a rate of 15 x log (dist/50 feet) (decay rate based on measured vibration propagation).
- **Transit Structure**: The weight and size of a transit structure affects the vibration radiated by that structure. The general rule-of-thumb is that vibration levels will be lower for heavier transit structures. Hence, the vibration levels from a cut-and-cover concrete double-box subway can be assumed to be lower than the vibration from a lightweight concrete-lined bored tunnel. The vibration from elevated structures is lower than from at-grade track because of the mass and damping of the structure and the extra distance that the vibration must travel before it reaches the receiver.
- **Propagation Characteristics**: In the General Assessment, it is necessary to make a selection among the general propagation characteristics. For a subway, the selection is a fairly straightforward choice of whether or not the subway will be founded in bedrock. Bedrock is considered to be hard rock. It is usually appropriate to consider soft siltstone and sandstone to be more similar to soil than hard rock. When considering at-grade vibration sources, the selection is between "normal" vibration propagation and "efficient" vibration propagation. Efficient vibration propagation results in approximately 10 VdB higher vibration levels. This more than doubles the potential impact zone for GBV. For the at-grade and aerial sections of this Project, a Detailed Analysis during final design would include vibration propagation tests to confirm normal propagation.
- **Theoretical Coupling Loss and Floor Amplification**: For lightweight wood-frame structures, the FTA Guidance Manual suggests +6 VdB for floor amplification and -2 VdB per floor for floor-to-floor attenuation up to five floors above grade, as well as a –5 VdB adjustment for coupling loss. Combining the adjustment factors for a wood-frame structure such as a residence, there is –5 VdB for the coupling loss, +6 VdB for floor amplification and an additional –2 VdB for each floor above the grade level. This leads to a net adjustment of between –1 to +1 VdB for the vibration inside a typical residence. Therefore, no adjustment is applied to account for coupling loss and floor amplification in the prediction model for small single-story residences. For large masonry buildings, the FTA Guidance Manual suggests a –10 VdB

adjustment for coupling loss. This adjustment has been used at most multifamily residences and large office buildings.

- **Conversion of Vibration to Ground-Borne Noise**: Because the type of soil and geology in the subway sections is not known the conversion from vibration to A-weight noise levels used an adjustment of -35 dB. This is the FTA typical vibration characteristic for subways and can be assumed until more detailed information indicates that one of the other assumptions should be used. It was also assumed for this study that no living spaces were located below ground level.
- **Safety Factor**: It is not feasible to consider each receiver individually without conducting line source propagation and building vibration response measurements at that receiver. Therefore, to account for potential amplification effects from buildings and other possible sources of error in the predictions, a safety factor of +3 VdB was added to the predicted vibration levels. This is a conservative approach, ensuring that in the majority of cases the predicted vibration levels are higher than what would occur after the proposed project is operational.
- **Further Study Needs**: The predicted vibration impacts using the FTA General Assessment will be confirmed as part of the Final EIS/EIR when an FTA Detailed Vibration Assessment will be conducted. The Detailed Assessment will require conducting line source transfer mobility tests at at-grade and aerial sections at representative locations where impacts have been identified. Borehole propagation testing will be conducted at the underground alignment locations where impacts were identified. The light rail transit vehicle proposed by Metro will need to be tested to determine its force density level (FDL) at different operating speeds if this data is not already available.

1.5.5.1 Maintenance and Storage Facility Vibration Model

Train movements within the MSF would generate vibration from steel wheels rolling on steel rails. Trains would travel at low speeds within the yard. As described in Section 7 of the *Metro Rail Rule Book for the A/E (Blue/Expo) Line*, the trains are anticipated to move with an average speed of 10 mph within the yard and 5 mph along curves. Train movement vibration within the yard was calculated using the same formulas for the calculation of light rail vibration.

1.5.5.2 Freight Train Vibration Model

As part of the FTA General Assessment generalized ground surface vibration emissions are provided for locomotive powered freight trains at different track centerline distances operating at 50 mph. These vibration emission levels were compared to in-situ measurements conducted of the BNSF operations along the Los Angeles – San Diego – San Luis Obispo Rail Corridor (LOSSAN) train alignment in Carlsbad as part of a double track project conducted for San Diego Association of Governments (SANDAG). The freight train vibration measurements at Carlsbad were conducted for trains operating at 30 mph. At a reference speed of 20 mph and 20 feet the FTA vibration emission levels are 6 VdB higher than the LOSSAN measurements. The FTA General Assessment vibration assessment for freight train operations were adjusted by -6 VdB to determine the predicted levels. This adjustment is used to determine vibration impacts at the freight train relocation sites.

2 PROJECT DESCRIPTION

This section describes the No Build Alternative and the four Build Alternatives studied in the WSAB Transit Corridor Draft EIS/EIR, including design options, station locations, and maintenance and storage facility (MSF) site options. The Build Alternatives were developed through a comprehensive alternatives analysis process to meet the purpose and need of the Project.

The No Build Alternative and four Build Alternatives are generally defined as follows:

- **No Build Alternative** - Reflects the transportation network in the 2042 horizon year without the proposed Build Alternatives. The No Build Alternative includes the existing transportation network along with planned transportation improvements that have been committed to and identified in the constrained Metro 2009 Long Range Transportation Plan (2009 LRTP) (Metro 2009) and SCAG's 2016-2040 Regional Transportation Plan/Sustainable Communities Strategy (RTP/SCS) (SCAG 2016), as well as additional projects funded by Measure M that would be completed by 2042.
- **Build Alternatives**: The Build Alternatives consist of a new LRT line that would extend from different termini in the north to the same terminus in the City of Artesia in the south. The Build Alternatives are referred to as:
  - Alternative 1: Los Angeles Union Station to Pioneer Station; the northern terminus would be located underground at Los Angeles Union Station (LAUS) Forecourt
  - Alternative 2: 7th Street/Metro Center to Pioneer Station; the northern terminus would be located underground at 8th Street between Figueroa Street and Flower Street near 7th Street/Metro Center Station
  - Alternative 3: Slauson/A (Blue) Line to Pioneer Station; the northern terminus would be located just north of the intersection of Long Beach Avenue and Slauson Avenue in the City of Los Angeles, connecting to the current A (Blue) Line Slauson Station
  - Alternative 4: I-105/C (Green) Line to Pioneer Station; the northern terminus would be located at I-105 in the city of South Gate, connecting to the C (Green) Line along the I-105

Two design options are under consideration for Alternative 1. Design Option 1 would locate the northern terminus station box at the LAUS Metropolitan Water District (MWD) east of LAUS and the MWD building, below the baggage area parking facility. Design Option 2 would add the Little Tokyo Station along the WSAB alignment. The Design Options are further discussed in Section 2.3.6.

Figure 2-1 presents the four Build Alternatives and the design options. In the north, Alternative 1 would terminate at LAUS and primarily follow Alameda Avenue south underground to the proposed Arts/Industrial District Station. Alternative 2 would terminate near the existing 7th Street/Metro Center Station in the Downtown Transit Core and would primarily follow 8th Street east underground to the proposed Arts/Industrial District Station.

Figure 2-1. Project Alternatives

Source: Metro, 2020

From the Arts/Industrial District Station to the southern terminus at Pioneer Station, Alternatives 1 and 2 share a common alignment. South of Olympic Boulevard, the Alternatives 1 and 2 would transition from an underground configuration to an aerial configuration, cross over the Interstate (I-) 10 freeway and then parallel the existing Metro A (Blue) Line along the Wilmington Branch ROW as it proceeds south. South of Slauson Avenue, which would serve as the northern terminus for Alternative 3, Alternatives 1, 2, and 3 would turn east and transition to an at-grade configuration to follow the La Habra Branch ROW along Randolph Street. At the San Pedro Subdivision ROW, Alternatives 1, 2, and 3 would turn southeast to follow the San Pedro Subdivision ROW and then transition to the Pacific Electric Right-of-Way (PEROW), south of the I-105 freeway. The northern terminus for Alternative 4 would be located at the I-105/C Line Station. Alternatives 1, 2, 3, and 4 would then follow the PEROW to the southern terminus at the proposed Pioneer Station in Artesia. The Build Alternatives would be grade-separated where warranted, as indicated on Figure 2-2.

Figure 2-2. Project Alignment by Alignment Type

Source: Metro, 2020

2.1 Geographic Sections

The approximately 19-mile corridor is divided into two geographic sections—the Northern and Southern Sections. The boundary between the Northern and Southern Sections occurs at Florence Avenue in the City of Huntington Park.

2.1.1 Northern Section

The Northern Section includes approximately 8 miles of Alternatives 1 and 2 and 3.8 miles of Alternative 3. Alternative 4 is not within the Northern Section. The Northern Section covers the geographic area from downtown Los Angeles to Florence Avenue in the City of Huntington Park and would generally traverse the Cities of Los Angeles, Vernon, Huntington Park, and Bell, and the unincorporated Florence-Firestone community of LA County (Figure 2-3). Alternatives 1 and 2 would traverse portions of the Wilmington Branch (between approximately Martin Luther King Jr Boulevard along Long Beach Avenue to Slauson Avenue). Alternatives 1, 2, and 3 would traverse portions of the La Habra Branch ROW (between Slauson Avenue along Randolph Street to Salt Lake Avenue) and San Pedro Subdivision ROW (between Randolph Street to approximately Paramount Boulevard).

Figure 2-3. Northern Section

Source: Metro, 2020

2.1.2 Southern Section

The Southern Section includes approximately 11 miles of Alternatives 1, 2, and 3 and includes all 6.6 miles of Alternative 4. The Southern Section covers the geographic area from south of Florence Avenue in the City of Huntington Park to the City of Artesia and would generally traverse the Cities of Huntington Park, Cudahy, South Gate, Downey, Paramount, Bellflower, Cerritos, and Artesia (Figure 2-4). In the Southern Section, all four Build Alternatives would utilize portions of the San Pedro Subdivision and the Metro-owned PEROW (between approximately Paramount Boulevard to South Street).

Figure 2-4. Southern Section

Source: Metro, 2020

2.2 No Build Alternative

For the NEPA evaluation, the No Build Alternative is evaluated in the context of the existing transportation facilities in the Transit Corridor (the Transit Corridor extends approximately 2 miles from either side of the proposed alignment) and other capital transportation improvements and/or transit and highway operational enhancements that are reasonably foreseeable. Because the No Build Alternative provides the background transportation network, against which the Build Alternatives' impacts are identified and evaluated, the No Build Alternative does not include the Project.

The No Build Alternative reflects the transportation network in 2042 and includes the existing transportation network along with planned transportation improvements that have been committed to and identified in the constrained Metro 2009 LRTP and the SCAG 2016 RTP/SCS, as well as additional projects funded by Measure M, a sales tax initiative approved by voters in November 2016. The No Build Alternative includes Measure M projects that are scheduled to be completed by 2042.

Table 2.1 lists the existing transportation network and planned improvements included as part of the No Build Alternative.

Table 2.1. No Build Alternative – Existing Transportation Network and Planned Improvements

Project	To / From	Location Relative to Transit Corridor
Rail (Existing)		
Metro Rail System (LRT and Heavy Rail Transit)	Various locations	Within Transit Corridor
Metrolink (Southern California Regional Rail Authority) System	Various locations	Within Transit Corridor
Rail (Under Construction/Planned)[1]		
Metro Westside D (Purple) Line Extension	Wilshire/Western to Westwood/VA Hospital	Outside Transit Corridor
Metro C (Green) Line Extension[2] to Torrance	96th Street Station to Torrance	Outside Transit Corridor
Metro C (Green) Line Extension	Norwalk to Expo/Crenshaw[3]	Outside Transit Corridor
Metro East-West Line/Regional Connector/Eastside Phase 2	Santa Monica to Lambert Santa Monica to Peck Road	Within Transit Corridor
Metro North-South Line/ Regional Connector/Foothill Extension to Claremont Phase 2B	Long Beach to Claremont	Within Transit Corridor
Metro Sepulveda Transit Corridor	Metro G (Orange) Line to Metro E (Expo) Line	Outside Transit Corridor
Metro East San Fernando Valley Transit Corridor	Sylmar to Metro G (Orange) Line	Outside Transit Corridor
Los Angeles World Airport Automated People Mover	96th Street Station to LAX Terminals	Outside Transit Corridor
Metrolink Capital Improvement Projects	Various projects	Within Transit Corridor
California High-Speed Rail	Burbank to LA LA to Anaheim	Within Transit Corridor
Link US	LAUS	Within Transit Corridor

Project	To / From	Location Relative to Transit Corridor
Bus (Existing)		
Metro Bus System (including BRT, Express, and local)	Various locations	Within Transit Corridor
Municipality Bus System[4]	Various locations	Within Transit Corridor
Bus (Under Construction/Planned)		
Metro G (Orange) Line (BRT)	Del Mar (Pasadena) to Chatsworth Del Mar (Pasadena) to Canoga Canoga to Chatsworth	Outside Transit Corridor
Vermont Transit Corridor (BRT)	120th Street to Sunset Boulevard	Outside Transit Corridor
North San Fernando Valley BRT	Chatsworth to North Hollywood	Outside Transit Corridor
North Hollywood to Pasadena	North Hollywood to Pasadena	Outside Transit Corridor
Highway (Existing)		
Highway System	Various locations	Within Transit Corridor
Highway (Under Construction/Planned)		
High Desert Multi-Purpose Corridor	SR-14 to SR-18	Outside Transit Corridor
I-5 North Capacity Enhancements	SR-14 to Lake Hughes Rd	Outside Transit Corridor
SR-71 Gap Closure	I-10 to Rio Rancho Rd	Outside Transit Corridor
Sepulveda Pass Express Lane	I-10 to US-101	Outside Transit Corridor
SR-57/SR-60 Interchange Improvements	SR-70/SR-60	Outside Transit Corridor
I-710 South Corridor Project (Phase 1 & 2)	Ports of Long Beach and LA to SR-60	Within Transit Corridor
I-105 Express Lane	I-405 to I-605	Within Transit Corridor
I-5 Corridor Improvements	I-605 to I-710	Outside Transit Corridor

Source: Metro 2018, WSP 2019
Notes: [1] Where extensions are proposed for existing Metro rail lines, the origin/destination is defined for the operating scheme of the entire rail line following completion of the proposed extensions and not just the extension itself.
[2] Metro C (Green) Line extension to Torrance includes new construction from Redondo Beach to Torrance; however, the line will operate from Torrance to 96th Street.
[3] The currently under construction Metro Crenshaw/LAX Line will operate as the Metro C (Green) Line.
[4] The municipality bus network system is based on service patterns for Bellflower Bus, Cerritos on Wheels, Cudahy Area Rapid Transit, Get Around Town Express, Huntington Park Express, La Campana, Long Beach Transit, Los Angeles Department of Transportation, Norwalk Transit System and the Orange County Transportation Authority.
BRT = Bus Rapid Transit; LAUS = Los Angeles Union Station; LAX = Los Angeles International Airport; VA = Veterans Affairs

2.3 Build Alternatives

2.3.1 Proposed Alignment Configuration for the Build Alternatives

This section describes the alignment for each of the Build Alternatives. The general characteristics of the four Build Alternatives are summarized in Table 2.2. Figure 2-5 illustrates the freeway crossings along the alignment. Additionally, the Build Alternatives would require relocation of existing freight rail tracks within the ROW to maintain existing operations where there would be overlap with the proposed light rail tracks. Figure 2-6 depicts the alignment sections that would share operation with freight and the corresponding ownership.

Table 2.2. Summary of Build Alternative Components

Component	Quantity			
Alternatives	**Alternative 1**	**Alternative 2**	**Alternative 3**	**Alternative 4**
Alignment Length	19.3 miles	19.3 miles	14.8 miles	6.6 miles
Stations Configurations	11 3 aerial; 6 at-grade; 2 underground[3]	12 3 aerial; 6 at-grade; 3 underground	9 3 aerial; 6 at-grade	4 1 aerial; 3 at-grade
Parking Facilities	5 (approximately 2,780 spaces)	5 (approximately 2,780 spaces)	5 (approximately 2,780 spaces)	4 (approximately 2,180 spaces)
Length of underground, at-grade, and aerial	2.3 miles underground; 12.3 miles at-grade; 4.7 miles aerial[1]	2.3 miles underground; 12.3 miles at-grade; 4.7 miles aerial[1]	12.2 miles at-grade; 2.6 miles aerial[1]	5.6 miles at-grade; 1.0 miles aerial[1]
At-grade crossings	31	31	31	11
Freight crossings	10	10	9	2
Freeway Crossings	6 (3 freeway undercrossings[2] at I-710; I-605, SR-91)	6 (3 freeway undercrossings[2] at I-710; I-605, SR-91)	4 (3 freeway undercrossings[2] at I-710; I-605, SR-91)	3 (2 freeway undercrossings[2] at I-605, SR-91)
Elevated Street Crossings	25	25	15	7
River Crossings	3	3	3	1
TPSS Facilities	22[3]	23	17	7
Maintenance and Storage Facility site options	2	2	2	2

Source: WSP, 2020
Notes: [1] Alignment configuration measurements count retained fill embankments as at-grade.
[2] The light rail tracks crossing beneath freeway structures.
[3] Under Design Option 2 – Add Little Tokyo Station, an additional underground station and TPSS site would be added under Alternative 1

Figure 2-5. Freeway Crossings

Source: WSP, 2020

Figure 2-6. Existing Rail Right-of-Way Ownership and Relocation

Source: WSP, 2020

2.3.2 Alternative 1: Los Angeles Union Station to Pioneer Station

The total alignment length of Alternative 1 would be approximately 19.3 miles, consisting of approximately 2.3 miles of underground, 12.3 miles of at-grade, and 4.7 miles of aerial alignment. Alternative 1 would include 11 new LRT stations, 2 of which would be underground, 6 would be at-grade, and 3 would be aerial. Under Design Option 2, Alternative 1 would have 12 new LRT stations, and the Little Tokyo Station would be an additional underground station. Five of the stations would include parking facilities, providing a total of up to 2,780 new parking spaces. The alignment would include 31 at-grade crossings, 3 freeway undercrossings, 2 aerial freeway crossings, 1 underground freeway crossing, 3 river crossings, 25 aerial road crossings, and 10 freight crossings.

In the north, Alternative 1 would begin at a proposed underground station at/near LAUS either beneath the LAUS Forecourt or, under Design Option 1, east of the MWD building beneath the baggage area parking facility (Section 2.3.6). Crossovers would be located on the north and south ends of the station box with tail tracks extending approximately 1,200 feet north of the station box. A tunnel extraction portal would be located within the tail tracks for both Alternative 1 terminus station options.

From LAUS, the alignment would continue underground crossing under the US-101 freeway and the existing Metro L (Gold) Line aerial structure and continue south beneath Alameda Street to the optional Little Tokyo Station between 1st Street and 2nd Street (note: under Design Option 2, Little Tokyo Station would be constructed). From the optional Little Tokyo Station, the alignment would continue underground beneath Alameda Street to the proposed Arts/Industrial District Station under Alameda Street between 6th Street and Industrial Street. (Note, Alternative 2 would have the same alignment as Alternative 1 from this point south. Refer to Section 2.3.3 for additional information on Alternative 2.)

The underground alignment would continue south under Alameda Street to 8th Street, where the alignment would curve to the west and transition to an aerial alignment south of Olympic Boulevard. The alignment would cross over the I-10 freeway in an aerial viaduct structure and continue south, parallel to the existing Metro A (Blue) Line at Washington Boulevard. The alignment would continue in an aerial configuration along the eastern half of Long Beach Avenue within the UPRR-owned Wilmington Branch ROW, east of the existing Metro A (Blue) Line and continue south to the proposed Slauson/A Line Station. The aerial alignment would pass over the existing pedestrian bridge at E. 53th Street. The Slauson/A Line Station would serve as a transfer point to the Metro A (Blue) Line via a pedestrian bridge. The vertical circulation would be connected at street level on the north side of the station via stairs, escalators, and elevators. (The Slauson/A Line Station would serve as the northern terminus for Alternative 3; refer to Section 2.3.4 for additional information on Alternative 3.)

South of the Slauson/A Line Station, the alignment would turn east along the existing La Habra Branch ROW (also owned by UPRR) in the median of Randolph Street. The alignment would be on the north side of the La Habra Branch ROW and would require the relocation of existing freight tracks to the southern portion of the ROW. The alignment would transition to an at-grade configuration at Alameda Street and would proceed east along the Randolph Street median. Wilmington Avenue, Regent Street, Albany Street, and Rugby Avenue would be closed to traffic crossing the ROW, altering the intersection design to a right-in, right-out configuration. The proposed Pacific/Randolph Station would be located just east of Pacific Boulevard.

From the Pacific/Randolph Station, the alignment would continue east at-grade. Rita Avenue would be closed to traffic crossing the ROW, altering the intersection design to a right-in, right-out configuration. At the San Pedro Subdivision ROW, the alignment would transition to an aerial configuration and turn south to cross over Randolph Street and the freight tracks, returning to an at-grade configuration north of Gage Avenue. The alignment would be located on the east side of the existing San Pedro Subdivision ROW freight tracks, and the existing tracks would be relocated to the west side of the ROW. The alignment would continue at-grade within the San Pedro Subdivision ROW to the proposed at-grade Florence/Salt Lake Station south of the Salt Lake Avenue/Florence Avenue intersection.

South of Florence Avenue, the alignment would extend from the proposed Florence/Salt Lake Station in the City of Huntington Park to the proposed Pioneer Station in the City of Artesia, as shown in Figure 2-4. The alignment would continue southeast from the proposed at-grade Florence/Salt Lake Station within the San Pedro Subdivision ROW, crossing Otis Avenue, Santa Ana Street, and Ardine Street at-grade. The alignment would be located on the east side of the existing San Pedro Subdivision freight tracks and the existing tracks would be relocated to the west side of the ROW. South of Ardine Street, the alignment would transition to an aerial structure to cross over the existing UPRR tracks and Atlantic Avenue. The proposed Firestone Station would be located on an aerial structure between Atlantic Avenue and Firestone Boulevard.

The alignment would then cross over Firestone Boulevard and transition back to an at-grade configuration prior to crossing Rayo Avenue at-grade. The alignment would continue south along the San Pedro Subdivision ROW, crossing Southern Avenue at-grade and continuing at-grade until it transitions to an aerial configuration to cross over the LA River. The proposed LRT bridge would be constructed next to the existing freight bridge. South of the LA River, the alignment would transition to an at-grade configuration crossing Frontage Road at-grade, then passing under the I-710 freeway through the existing box tunnel structure and then crossing Miller Way. The alignment would then return to an aerial structure to cross the Rio Hondo Channel. South of the Rio Hondo Channel, the alignment would briefly transition back to an at-grade configuration and then return to an aerial structure to cross over Imperial Highway and Garfield Avenue. South of Garfield Avenue, the alignment would transition to an at-grade configuration and serve the proposed Gardendale Station north of Gardendale Street.

From the Gardendale Station, the alignment would continue south in an at-grade configuration, crossing Gardendale Street and Main Street to connect to the proposed I-105/C Line Station, which would be located at-grade north of Century Boulevard. This station would be connected to the new infill C (Green) Line Station in the middle of the freeway via a pedestrian walkway on the new LRT bridge. The alignment would continue at-grade, crossing Century Boulevard and then over the I-105 freeway in an aerial configuration within the existing San Pedro Subdivision ROW bridge footprint. A new Metro C (Green) Line Station would be constructed in the median of the I-105 freeway. Vertical pedestrian access would be provided from the LRT bridge to the proposed I-105/C Line Station platform via stairs and elevators. To accommodate the construction of the new station platform, the existing Metro C (Green) Line tracks would be widened and, as part of the I-105 Express Lanes Project, the I-105 lanes would be reconfigured. (The I-105/C Line Station would serve as the northern terminus for Alternative 4; refer to Section 2.3.5 for additional information on this alternative.)

South of the I-105 freeway, the alignment would continue at-grade within the San Pedro Subdivision ROW. In order to maintain freight operations and allow for freight train crossings, the alignment would transition to an aerial configuration as it turns southeast and enter the PEROW. The existing freight track would cross beneath the aerial alignment and align on the north side of the PEROW east of the San Pedro Subdivision ROW. The proposed Paramount/Rosecrans Station would be located in an aerial configuration west of Paramount Boulevard and north of Rosecrans Avenue. The existing freight track would be relocated to the east side of the alignment beneath the station viaduct.

The alignment would continue southeast in an aerial configuration over the Paramount Boulevard/Rosecrans Avenue intersection and descend to an at-grade configuration. The alignment would return to an aerial configuration to cross over Downey Avenue descending back to an at-grade configuration north of Somerset Boulevard. One of the adjacent freight storage tracks at Paramount Refinery Yard would be relocated to accommodate the new LRT tracks and maintain storage capacity. There are no active freight tracks south of the World Energy facility.

The alignment would cross Somerset Boulevard at-grade. South of Somerset Boulevard, the at-grade alignment would parallel the existing Bellflower Bike Trail that is currently aligned on the south side of the PEROW. The alignment would continue at-grade crossing Lakewood Boulevard, Clark Avenue, and Alondra Boulevard. The proposed at-grade Bellflower Station would be located west of Bellflower Boulevard.

East of Bellflower Boulevard, the Bellflower Bike Trail would be realigned to the north side of the PEROW to accommodate an existing historic building located near the southeast corner of Bellflower Boulevard and the PEROW. It would then cross back over the LRT tracks at-grade to the south side of the ROW. The LRT alignment would continue southeast within the PEROW and transition to an aerial configuration at Cornuta Avenue, crossing over Flower Street and Woodruff Avenue. The alignment would return to an at-grade configuration at Walnut Street. South of Woodruff Avenue, the Bellflower Bike Trail would be relocated to the north side of the PEROW. Continuing southeast, the LRT alignment would cross under the SR-91 freeway in an existing underpass. The alignment would cross over the San Gabriel River on a new bridge, replacing the existing abandoned freight bridge. South of the San Gabriel River, the alignment would transition back to an at-grade configuration before crossing Artesia Boulevard at-grade.

East of Artesia Boulevard the alignment would cross beneath the I-605 freeway in an existing underpass. Southeast of the underpass, the alignment would continue at-grade, crossing Studebaker Road. North of Gridley Road, the alignment would transition to an aerial configuration to cross over 183rd Street and Gridley Road. The alignment would return to an at-grade configuration at 185th Street, crossing 186th Street and 187th Street at-grade. The alignment would then pass through the proposed Pioneer Station on the north side of Pioneer Boulevard at-grade. Tail tracks accommodating layover storage for a three-car train would extend approximately 1,000 feet south from the station, crossing Pioneer Boulevard and terminating west of South Street.

2.3.3 Alternative 2: 7th Street/Metro Center to Pioneer Station

The total alignment length of Alternative 2 would be approximately 19.3 miles, consisting of approximately 2.3 miles of underground, 12.3 miles of at-grade, and 4.7 miles of aerial alignment. Alternative 2 would include 12 new LRT stations, 3 of which would be underground, 6 would be at-grade, and 3 would be aerial. Five of the stations would include parking facilities, providing a total of approximately 2,780 new parking spaces. The alignment would include 31 at-grade crossings, 3 freeway undercrossings, 2 aerial freeway crossings, 1 underground freeway crossing, 3 river crossings, 25 aerial road crossings, and 10 freight crossings.

In the north, Alternative 2 would begin at the proposed WSAB 7th Street/Metro Center Station, which would be located underground beneath 8th Street between Figueroa Street and Flower Street. A pedestrian tunnel would provide connection to the existing 7th Street/Metro Center Station. Tail tracks, including a double crossover, would extend approximately 900 feet beyond the station, ending east of the I-110 freeway. From the 7th Street/Metro Center Station, the underground alignment would proceed southeast beneath 8th Street to the South Park/Fashion District Station, which would be located west of Main Street beneath 8th Street.

From the South Park/Fashion District Station, the underground alignment would continue under 8th Street to San Pedro Street, where the alignment would turn east toward 7th Street, crossing under privately owned properties. The tunnel alignment would cross under 7th Street and then turn south at Alameda Street. The alignment would continue south beneath Alameda Street to the Arts/Industrial District Station located under Alameda Street between 7th Street and Center Street. A double crossover would be located south of the station box, south of Center Street. From this point, the alignment of Alternative 2 would follow the same alignment as Alternative 1, which is described further in Section 2.3.2.

2.3.4 Alternative 3: Slauson/A (Blue) Line to Pioneer Station

The total alignment length of Alternative 3 would be approximately 14.8 miles, consisting of approximately 12.2 miles of at-grade, and 2.6 miles of aerial alignment. Alternative 3 would include 9 new LRT stations, 6 would be at-grade and 3 would be aerial. Five of the stations would include parking facilities, providing a total of approximately 2,780 new parking spaces. The alignment would include 31 at-grade crossings, 3 freeway undercrossings, 1 aerial freeway crossing, 3 river crossings, 15 aerial road crossings, and 9 freight crossings. In the north, Alternative 3 would begin at the Slauson/A Line Station and follow the same alignment as Alternatives 1 and 2, described in Section 2.3.2.

2.3.5 Alternative 4: I-105/C (Green) Line to Pioneer Station

The total alignment length of Alternative 4 would be approximately 6.6 miles, consisting of approximately 5.6 miles of at-grade and 1.0 mile of aerial alignment. Alternative 3 would include 4 new LRT stations, 3 would be at-grade, and 1 would be aerial. Four of the stations would include parking facilities, providing a total of approximately 2,180 new parking spaces. The alignment would include 11 at-grade crossings, 2 freeway undercrossings, 1 aerial freeway crossing, 1 river crossing, 7 aerial road crossings, and 2 freight crossings. In the north, Alternative 4 would begin at the I-105/C Line Station and follow the same alignment as Alternatives 1, 2, and 3, described in Section 2.3.2.

2.3.6 Design Options

Alternative 1 includes two design options:

- **Design Option 1:** LAUS at the Metropolitan Water District (MWD) – The LAUS station box would be located east of LAUS and the MWD building, below the baggage area parking facility instead of beneath the LAUS Forecourt. Crossovers would be located on the north and south ends of the station box with tail tracks extending approximately 1,200 feet north of the station box. From LAUS, the underground alignment would cross under the US-101 freeway and the existing Metro L (Gold) Line aerial structure and continue south beneath Alameda Street to the optional Little Tokyo Station between Traction Avenue and 1st Street. The underground alignment between LAUS and the Little Tokyo Station would be located to the east of the base alignment.
- **Design Option 2:** Add the Little Tokyo Station – Under this design option, the Little Tokyo Station would be constructed as an underground station and there would be a direct connection to the Regional Connector Station in the Little Tokyo community. The alignment would proceed underground directly from LAUS to the Arts/Industrial District Station primarily beneath Alameda Street.

2.3.7 Maintenance and Storage Facility

MSFs accommodate daily servicing and cleaning, inspection and repairs, and storage of light rail vehicles (LRV). Activities may take place in the MSF throughout the day and night depending upon train schedules, workload, and the maintenance requirements.

Two MSF options are evaluated; however, only one MSF would be constructed as part of the Project. The MSF would have storage tracks, each with sufficient length to store three-car train sets and a maintenance-of-way vehicle storage. The facility would include a main shop building with administrative offices, a cleaning platform, a traction power substation (TPSS), employee parking, a vehicle wash facility, a paint and body shop, and other facilities as needed. The east and west yard leads (i.e., the tracks leading from the mainline to the facility) would have sufficient length for a three-car train set. In total, the MSF would need to accommodate approximately 80 LRVs to serve the Project’s operations plan.

Two potential locations for the MSF have been identified—one in the City of Bellflower and one in the City of Paramount. These options are described further in the following sections.

2.3.8 Bellflower MSF Option

The Bellflower MSF site option is bounded by industrial facilities to the west, Somerset Boulevard and apartment complexes to the north, residential homes to the east, and the PEROW and Bellflower Bike Trail to the south. The site is approximately 21 acres in area and can accommodate up to 80 vehicles (Figure 2-7).

2.3.9 Paramount MSF Option

The Paramount MSF site option is bounded by the San Pedro Subdivision ROW on the west, Somerset Boulevard to the south, industrial and commercial uses on the east, and All American City Way to the north. The site is 22 acres and could accommodate up to 80 vehicles (Figure 2-7).

Figure 2-7. Maintenance and Storage Facility Options

Source: WSP, 2020

3 REGULATORY FRAMEWORK

3.1 Federal

3.1.1 Transit Noise and Construction Noise

FTA standards and criteria for assessing noise impacts related to transit projects are based on community reactions to noise. The criteria reflect changes in noise exposure using a sliding scale where the higher the level of existing noise, the smaller increase in total noise exposure is allowed. Some land use activities are more sensitive to noise than others, such as parks, churches and residences, as compared to industrial and commercial uses. FTA Noise Impact Criteria groups sensitive land uses into the three categories described in Table 3.1. Most commercial or industrial uses are not considered noise-sensitive because activities within these buildings are generally compatible with higher noise levels. Business can be considered noise-sensitive if low noise levels are an important part of operations, such as sound and motion picture recording studios. Most parks used primarily for active recreation such as sports complexes and bike or running paths are not considered noise-sensitive. However, some parks (even some in dense urban areas) are primarily used for passive recreation such as reading, conversation, or meditation. These places, which may be valued as havens from the noise and rapid pace of everyday city life, are treated as noise-sensitive, and are included in land use Category 3. Non-sensitive uses do not require noise impact assessment.

Table 3.1. Land Use Categories and Metrics for Transit Noise Impact Criteria

Land Use Category	Land Use Type	Noise Metric, dBA	Description of Land Use Category
1	High Sensitivity	Outdoor L_{eq} (1hr)[1]	Land where quiet is an essential element of its intended purpose. Example land uses include preserved land for serenity and quiet, outdoor amphitheaters and concert pavilions, and national historic landmarks with considerable outdoor use. Recording studios and concert halls are also included in this category.
2	Residential	Outdoor L_{dn}	This category is applicable all residential land use and buildings where people normally sleep, such as hotels and hospitals.
3	Institutional	Outdoor L_{eq} (1hr)[1]	This category is applicable to institutional land uses with primarily daytime and evening use. Example land uses include schools, libraries, theaters, and churches where it is important to avoid interference with such activities as speech, meditation, and concentration on reading material. Places for meditation or study associated with cemeteries, monuments, museums, campgrounds, and recreational facilities are also included in this category.

Source: FTA, 2018
Note: [1] L_{eq} (1hr) for the loudest hour of project related activity during hours of noise sensitivity.

The FTA has also identified special cases for certain land use categories.

Severe: Noise mitigation will be specified for severe impact areas unless there is no practical method of mitigating the noise.

Moderate: In this range, other project-specific factors must be considered to determine the magnitude of the impact and the need for mitigation. These other factors may include the predicted increase over existing noise levels, the type and number of noise-sensitive land uses affected, existing outdoor-indoor sound insulation and the cost effectiveness of mitigating noise to more acceptable levels.

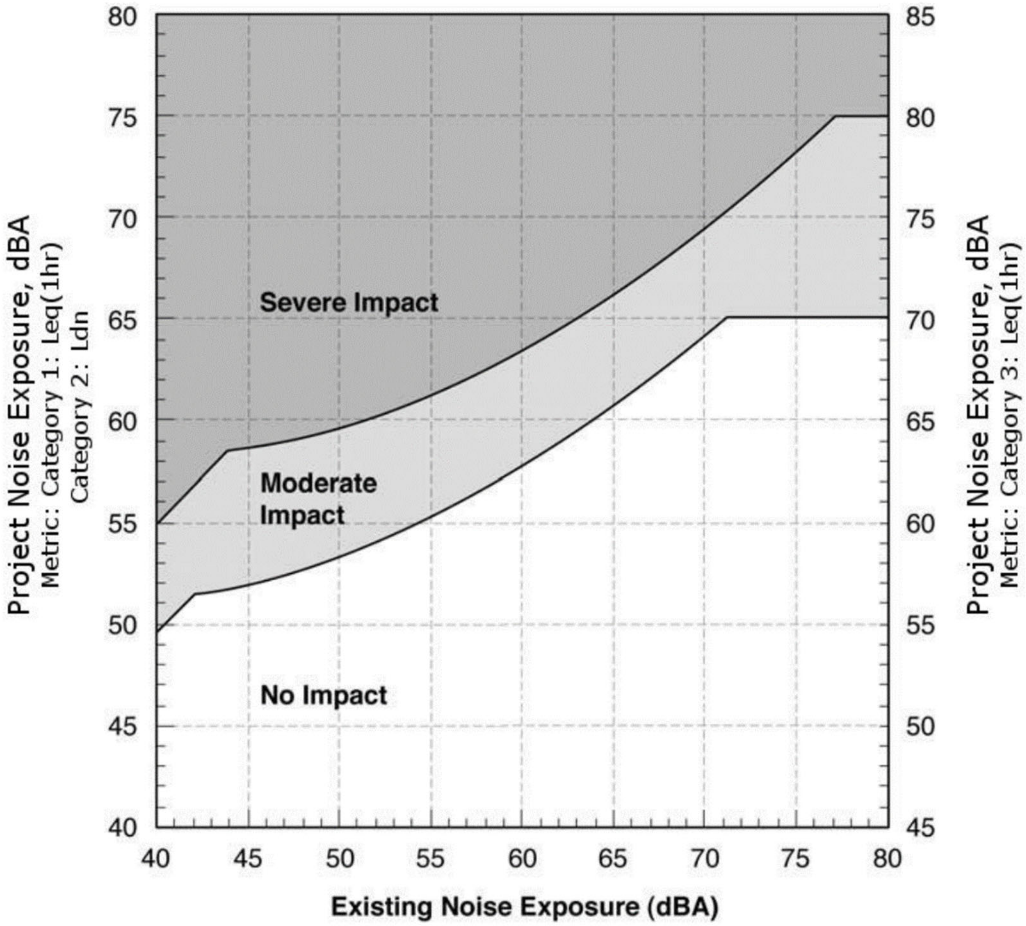
The FTA has defined three levels of impacts for sensitive uses affected by transit projects: no impact, moderate impact, or severe impact. A description of each impact level is shown in Table 3.2. The following three impact levels are also illustrated in Figure 3-1:

Table 3.2. Levels of Impact

Level of Impact	Description
No Impact	Project-generated noise is not likely to cause community annoyance. Noise projections in this range are considered acceptable by FTA and mitigation is not required.
Moderate Impact	Project-generated noise in this range is considered to cause impact at the threshold of measurable annoyance. Moderate impacts serve as an alert to project planners for potential adverse impacts and complaints from the community. Mitigation should be considered at this level of impact based on project specifics and details concerning the affected properties.
Severe Impact	Project-generated noise in this range is likely to cause a high level of community annoyance. The project sponsor should first evaluate alternative locations/alignments to determine whether it is feasible to avoid severe impacts altogether. In densely populated urban areas, evaluation of alternative locations may reveal a trade-off of affected groups, particularly for surface rail alignments. Projects that are characterized as point sources rather than line sources often present greater opportunity for selecting alternative sites. This guidance manual and FTA's environmental impact regulations both encourage project sites which are compatible with surrounding development when possible. If it is not practical to avoid severe impacts by changing the location of the project, mitigation measures must be considered.

Source: FTA, 2018

Figure 3-1. Noise Impact Criteria for Transit Projects



Source: FTA, 2018

The noise impact criteria for transit operations are summarized in Table 3.3. The first column shows the existing noise exposure and the remaining columns show the additional noise exposure caused by a transit project that would result in the two impact levels. As the existing noise exposure increases, the amount of allowable increase in noise exposure from the Build Alternatives decreases. For the purposes of this analysis the FTA impact criteria was calculated for each cluster based upon existing noise exposure using equations found within Table C-1 of FTA *Transit Noise and Vibration Impact Assessment* guidance. The future noise exposure would be the combination of the existing noise exposure and the additional noise exposure caused by a transit project.

Table 3.3. Noise Impact Criteria for Transit Operations

Existing Noise Exposure L_{eq} or L_{dn} (dBA)	Project Noise Impact Exposure, L_{eq} (h) or L_{dn} (dBA)					
	Category 1 or 2 Sites			Category 3 Sites		
	No Impact	Moderate Impact	Severe Impact	No Impact	Moderate Impact	Severe Impact
<43	< Ambient + 10	Ambient + 10 to 15	>Ambient + 15	< Ambient + 15	Ambient + 15 to 20	>Ambient + 20
43	<52	52-58	>58	<57	57-63	63
44	<52	52-58	>58	<57	57-63	63
45	<52	52-58	>58	<57	57-63	63
46	<53	53-59	>59	<58	58-64	64
47	<53	53-59	>59	<58	58-64	64
48	<53	53-59	>59	<58	58-64	64
49	<54	54-59	>59	<59	59-64	64
50	<54	54-59	>59	<59	59-64	64
51	<54	55-60	>60	<59	59-65	65
52	<55	55-60	>60	<60	60-65	6
53	<55	55-60	>60	<60	60-65	65
54	<55	55-61	>61	<60	60-66	66
55	<56	55-61	>61	<61	61-66	66
56	<56	56-62	>62	<61	61-67	67
57	<57	57-62	>62	<62	62-67	67
58	<57	57-62	>62	<62	62-67	67
59	<58	58-63	>63	<63	63-68	68
60	<58	58-63	>63	<63	63-68	68
61	<59	59-64	>64	<64	64-69	69
62	<59	59-64	>64	<64	64-69	69
63	<60	60-65	>65	<65	65-70	70
64	<61	61-65	>65	<66	66-70	70
65	<61	61-66	>66	<66	66-71	71
66	<62	62-67	>67	<67	67-72	72
67	<63	63-67	>67	<68	68-72	72
68	<63	63-68	>68	<68	68-73	73
69	<64	64-69	>69	<69	69-74	74
70	<65	65-69	>69	<70	70-74	74

Existing Noise Exposure L_{eq} or L_{dn} (dBA)	Project Noise Impact Exposure, L_{eq} (h) or L_{dn} (dBA)					
	Category 1 or 2 Sites			Category 3 Sites		
	No Impact	Moderate Impact	Severe Impact	No Impact	Moderate Impact	Severe Impact
71	<66	66-70	>70	<71	71-75	75
72	<66	66-71	>71	<71	71-76	76
73	<66	66-71	>71	<71	71-76	76
74	<66	66-72	>72	<71	71-77	77
75	<66	66-73	>73	<71	71-78	78
76	<66	66-74	>74	<71	71-79	79
77	<66	66-74	>74	<71	71-79	79
>77	<66	66-75	>75	<71	71-80	80

Source: FTA, 2018
Note: dBA = A-weighted decibels; Leg(h) = hourly equivalent noise level; L_{dn} = day-night noise level

Construction noise is assessed using guidance provided in the FTA Guidance Manual. FTA construction noise criteria are shown in Table 3.4. Local ordinances are shown in Section 3.4.

Table 3.4. FTA Construction Noise Impact Criteria

Land Use	1-hour L_{eq} (dBA)	
	Day	Night
Residential	90	80
Commercial	100	100
Industrial	100	100

Source: FTA, 2018

3.1.2 Transit Vibration and Construction Vibration

FTA has developed impact criteria for acceptable levels of groundborne noise (GBN) and GBV. These criteria, as summarized in Table 3.5 and are presented in terms of acceptable indoor ground-borne vibration and noise levels. Impacts will occur if these levels are exceeded. Criteria for ground-borne vibration are expressed in terms of rms velocity levels in VdB, and criteria for ground-borne noise are expressed in terms of A-weighted sound pressure levels in dBA. The criteria for special buildings such as concert halls, television and recording studios, auditoriums, and theaters, which are also sensitive to vibration but do not fit into the three FTA sensitive land use categories previously described, are presented in Table 3.6. Since the Project would have more than 70 train pass-bys per day, the FTA criteria for frequent events is used to assess potential impact.

Table 3.5. GBV and GBN Impact Criteria for General Assessment

Land Use Category	GBV Impact Levels (VdB, 1 micro-inch / sec)			GBN Impact Levels (dBA, 20 micro Pascals)		
	Frequent Events[1]	Occasional Events[2]	Infrequent Events[3]	Frequent Events[1]	Occasional Events[2]	Infrequent Events[3]
Category 1: Buildings where vibration would interfere with interior operations.[4]	65	65	65	N/A	N/A	N/A
Category 2: Residences and buildings where people normally sleep.	72	75	80	35	38	43
Category 3: Institutional land uses with primarily daytime use.	75	78	83	40	43	48

Source: FTA, 2018
Notes: [1] "Frequent Events" is defined as more than 70 vibration events of the same source per day. Most rapid transit projects fall into this category.
[2] "Occasional Events" is defined as between 30 and 70 vibration events of the same source per day. Most commuter trunk lines have this many operation.
[3] "Infrequent Events" is defined as fewer than 30 vibration events of the same kind per day. This category includes commuter rail branch lines.
[4] This criterion limit is based on levels that are acceptable for most moderately sensitive equipment such as optical microscopes.

Table 3.6. GBV and GBN Impact Criteria for Special Buildings

Type of Building or Room	GBV Impact Levels (VdB, 1 micro-inch / sec)		GBN Impact Levels (dBA, 20 micro Pascals)	
	Frequent Events[1]	Occasional or Infrequent Events[2,3]	Frequent Events[1]	Occasional or Infrequent Events[2,3]
Concert Halls	65	65	25	25
TV Studios	65	65	25	25
Recording Studios	65	65	25	25
Auditoriums	72	80	30	38
Theaters	72	80	35	43

Source: FTA, 2018
Notes: [1] "Frequent Events" is defined as more than 70 vibration events of the same source per day. Most rapid transit projects fall into this category.
[2] "Occasional Events" is defined as between 30 and 70 vibration events of the same source per day. Most commuter trunk lines have this many operation.
[3] "Infrequent Events" is defined as fewer than 30 vibration events of the same kind per day. This category includes commuter rail branch lines.

When the Project does not cause vibration more than 5 VdB greater than the existing source of freight train operations, the existing source can be ignored. Table 3.5 includes the consideration of frequency of vibration events. If the combined frequency of existing and Project vibration events would change the Vibration Category, for example from occasional to frequent, the impact criteria for the higher-frequency of events is applicable.

For at-grade or aerial transit systems, the GBN is not considered since the airborne noise from the train pass-by would result in higher noise levels at the interior of the receiver buildings. GBN is a potential impact from underground transit operations where there is no wayside noise.

To evaluate potential annoyance or interference with vibration-sensitive activities caused by construction vibration, the criteria for general assessment shown in Table 3.5 can be applied; however, short-term annoyance during construction is not a NEPA-significant impact. In most cases, the primary concern regarding construction vibration relates to potential damage effects. Vibration damage criteria are provided in Table 3.7 for various structural categories.

Table 3.7. Construction Vibration Damage Risk Criteria

Building Category	PPV (inches / second)
I. Reinforced-concrete, steel or timber (no plaster)	0.5
II. Engineered concrete and masonry (no plaster)	0.3
III. Historic buildings that have average sensitivity to vibration damage and non-engineered timber and masonry buildings	0.2
IV. Buildings extremely susceptible to vibration damage	0.12

Source: FTA, 2018
Note: PPV = peak particle velocity

The limit of 0.12 in/sec for fragile historic structures is among the most restrictive limits used for vibration damage risk to buildings. A damage risk criterion of 0.2 in/sec (PPV) is protective of all but the most fragile buildings.

3.2 State

3.2.1 Noise

There are no state regulations relevant to the Project.

3.2.2 Vibration

There are no state regulations relevant to the Project.

3.3 Regional

3.3.1 Noise

There are no regional regulations relevant to the Project.

3.3.2 Vibration

There are no regional regulations relevant to the Project.

3.4 Local

The regulations of local jurisdictions do not apply transit noise, which is most appropriately assessed using guidance provided by the FTA. However, the regulations of local jurisdictions are relevant with regard to Project construction.

3.4.1 City of Los Angeles

The City of Los Angeles has established policies and regulations concerning the generation and control of noise that could adversely affect its citizens and noise sensitive land uses. The *City of Los Angeles Municipal Code* and the *City of Los Angeles General Plan Noise Element* are the two documents designed to regulate noise within the City. Codes, goals, objectives, and policies designed to regulate noise are shown in Table 3.8.

Table 3.8. City of Los Angeles – Relevant Noise and Vibration Codes, Goals, Objectives, and Policies

Code/Goal/Objective/Policy	Description
City of Los Angeles Municipal Code	
Section 41.40	Engaging in construction, repair, or excavation work with any construction type device or job-site delivering of construction materials without a Police Commission approved variance would constitute a violation: ▪ Between the hours of 9:00 p.m. and 7:00 a.m. of the following day. ▪ In any residential zone, or within 500 feet of land so occupied, before 8:00 a.m. or after 6:00 p.m. on any Saturday, or at any time on any Sunday. In a manner as to disturb the peace and quiet of neighboring residents or any reasonable person of normal sensitiveness residing in the area.
Section 41.40(j)	States that the noise standards do not apply to major public works construction by the City of Los Angeles and its proprietary Departments, including all structures and operations necessary to regulate or direct traffic due to construction activities. It also states that the Board of Police Commissioners will grant a variance for this work and construction activities will be subject to all conditions of the variance as granted. Concurrent with the request for a variance, the City Department that will conduct the construction work will notify each affected Council district office and established Neighborhood Council of projects where proposed Sunday and/or Holiday work will occur.
Section 91.1207.14.2	Interior noise levels attributable to exterior sources shall not exceed 45 dB. in any habitable room. The noise metric shall be either the day-night average sound level (L_{dn}) or the community noise equivalent level (CNEL), consistent with the noise element of the local general plan.
Section 112.05	Specifies the maximum noise level of powered equipment or powered hand tools. Any powered equipment or hand tool that produces a maximum noise level exceeding 75 dBA at a distance of 50 feet when operated within 500 feet of a residential zone is prohibited. However, this noise limitation does not apply where compliance is technically infeasible. Technically infeasible means the above noise limitation cannot be met despite the use of mufflers, shields, sound barriers and/or any other noise reduction device or techniques during the operation of equipment.

Code/Goal/Objective/Policy	Description
City of Los Angeles General Plan Noise Element	
P11	For a proposed development project that is deemed to have a potentially significant noise impact on noise sensitive uses, as defined by this chapter, require mitigation measures, as appropriate, in accordance with California Environmental Quality Act and city procedures.
P12	When issuing discretionary permits for a proposed noise- sensitive use (as defined by this chapter) or a subdivision of four or more detached single-family units and which use is determined to be potentially significantly impacted by existing or proposed noise sources, require mitigation measures, as appropriate, in accordance with procedures set forth in the California Environmental Quality Act so as to achieve an interior noise level of a CNEL of 45 dB, or less, in any habitable room, as required by Los Angeles Municipal Code Section 91.

Source: City of Los Angeles, *Municipal Code*, March 2017; City of Los Angeles, *General Plan, Noise Element*, November 1998

3.4.2 City of Vernon

The City of Vernon has established noise standards to control unnecessary, excessive, and annoying noise. The City standards are codified in *Article IV, Zones, Permitted Uses, Development Standards, and Site Planning Standards* in Section 26.4.1-7 (b) (2) of the Comprehensive Zoning Ordinance. The City of Vernon has also established community noise standards to help guide land use decisions and protect sensitive uses from excessive noise levels. These standards are defined in the *City of Vernon General Plan Noise Element*. Codes, goals, objectives, and policies designed to regulate noise are shown in Table 3.9.

Table 3.9. City of Vernon – Relevant Noise and Vibration Codes, Goals, Objectives, and Policies

Code/Goal/Objective/Policy	Description
City of Vernon Municipal Code	
Section 26.4.1-7 (b) (2)	The standards state that, unless otherwise specifically indicated, the noise restrictions below shall apply to all lots within designated noise zones, measured cumulatively with existing noise from all business on the lot. ▪ Lots located within one tenth of mile of any residence or school located in Vernon or abutting communities shall have an allowable exterior noise level of 60 dBA from 10:00 p.m. to 7:00 a.m. and 65 dBA from 7:00 a.m. to 10:00 p.m. ▪ All other lots shall have an allowable exterior noise level of 75 dBA at any time
City of Vernon General Plan Noise Element	
Goal N-1	Reduce impacts from transportation noise sources to the extent they may affect industrial businesses.
Policy N-1.1	Encourage the effective enforcement of local, state, and federal noise levels by all appropriate City divisions.
Policy N-1.2	Review noise impacts when rail corridors are consolidated, and review ways to reduce impacts on adjacent businesses.

Source: City of Vernon, *Municipal Code*; City of Vernon, *General Plan Noise Element*, 2015

3.4.3 City of Huntington Park

The City of Huntington Park has established policies and regulations concerning the generation and control of noise that could adversely affect its citizens and noise sensitive land uses. The *City of Huntington Park Municipal Code* and the *City of Huntington Park General Plan Noise Element* are the two documents designed to regulate noise within the City. Codes, goals, objectives, and policies designed to regulate noise are shown in Table 3.10.

Table 3.10. City of Huntington Park – Relevant Noise and Vibration Codes, Goals, Objectives, and Policies

Code/Goal/Objective/Policy	Description
City of Huntington Park Municipal Code	
Section 9-3.506 (5)	Noise sources associated with construction, repair, remodeling or grading of any real property, provided the activities do not take place between the hours of 7:00 p.m. and 7:00 a.m. on weekdays, including Saturdays, or at any time on Sundays or Federal holidays.
Section 9-3.507 (2)	Loading and Unloading. No person shall cause the loading, unloading, opening, closing or other handling of boxes, crates, containers, building materials, garbage cans or similar objects between the hours of 8:00 p.m. and 7:00 a.m. in a manner which would cause a noise disturbance to a residential area.
City of Huntington Park General Plan Noise Element	
Table N-1	Contains guidelines for noise compatible land uses to determine the appropriate land use and mitigation measures.
Goal 1.0	Reduce noise impacts from transportation noise sources.
Policy 1.1	Require construction of barriers to shield noise-sensitive uses from noise.
Policy 1.3	Reduce transportation noise through proper design and coordination of new or remodeled transportation and circulation facilities.

Source: City of Huntington Park, *Municipal Code*; City of Huntington Park, *General Plan Noise Element*, February 1992

3.4.4 County of Los Angeles

The *Los Angeles County General Plan 2035,* adopted in October 2015, provides the policy framework and establishes the long-range vision for how and where the unincorporated areas of the county will grow. The Noise Element sets the goals and policy direction for the management of noise in the unincorporated areas. The *County's Noise Control Ordinance* establishes standards to regulate intrusive noise in the county. Codes, goals, objectives, and policies designed to regulate noise are shown in Table 3.11.

Table 3.11. County of Los Angeles – Relevant Noise and Vibration Codes, Goals, Objectives, and Policies

Code/Goal/Objective/Policy	Description
County of Los Angeles Noise Control Ordinance	
Section 12.08.390	Exterior noise standards: ▪ Noise Zone I, Noise Sensitive Area: 45 dB at any time of the day ▪ Noise zone II, Residential Properties: 45 dB from 10:00 p.m. to 7:00 a.m. (nighttime) and 50 dB from 7:00 a.m. to 10:00 p.m. (daytime) ▪ Noise Zone III, Commercial Properties: 55 dB from 10:00 p.m. to 7:00 a.m. (nighttime) and 70 dB from 7:00 a.m. to 10:00 p.m. ▪ Noise Zone IV, Industrial Properties: 70 dB at any time of the day Standard No. 1 shall be the exterior noise level which may not be exceeded for a cumulative period of more than 30 minutes in any hour. Standard No. 1 shall be the applicable noise level from subsection A of this section; or, if the ambient L50 exceeds the foregoing level, then the ambient L50 becomes the exterior noise level for Standard No. 1. Standard No. 2 shall be the exterior noise level which may not be exceeded for a cumulative period of more than 15 minutes in any hour. Standard No. 2 shall be the applicable noise level from subsection A of this section plus 5dB; or, if the ambient L25 exceeds the foregoing level, then the ambient L25 becomes the exterior noise level for Standard No. 2. Standard No. 3 shall be the exterior noise level which may not be exceeded for a cumulative period of more than five minutes in any hour. Standard No. 3 shall be the applicable noise level from subsection A of this section plus 20dB; or, if the ambient L8.3 exceeds the foregoing level, then the ambient L8.3 becomes exterior noise level for Standard No. 3. Standard No. 4 shall be the exterior noise level which may not be exceeded for a cumulative period of more than one minute in any hour. Standard No. 4 shall be the applicable noise level from subsection A of this section plus 15dB; or, if the ambient L1.7 exceeds the foregoing level, then the ambient L1.7 becomes the exterior noise level for Standard No. 4. Standard No. 5 shall be the exterior noise level which may not be exceeded for any period of time. Standard No. 5 shall be the applicable noise level from subsection A of this section plus 20dB; or, if the ambient L0 exceeds the foregoing level then the ambient L0 becomes the exterior noise level for Standard No. 5.

Code/Goal/Objective/Policy	Description
Section 12.08.400	No person shall operate or cause to be operated with a dwelling unit, any source of sound, or allow the creation of any noise, which causes the noise level when measured inside a neighboring receiving dwelling unit to exceed the following standards. Standard No. 1 The applicable interior noise level for cumulative period of more than five minutes in any hour; or Standard No. 2 The applicable interior noise level plus 5dB for a cumulative period of more than one minute in any hour; or Standard No. 3 The applicable interior noise level plus 10dB or the maximum measured ambient noise level for any period of time. Interior noise standards ▪ Multi-family: 40 dB from 10:00 p.m. to 7:00 a.m. ▪ Residential 45 dB from 7:00 a.m. to 10:00 p.m. If the measured ambient noise level reflected by the L50 exceeds that permissible within any of the interior noise standards in subsection A of Section 12.08.390, the allowable interior noise level shall be increased in 5dB increments in each standard as appropriate to reflect said ambient noise level (L50).
Section 12.08.440 (a)	▪ Operating or causing the operation of any tools or equipment used in construction, drilling, repair, alteration or demolition work between weekday hours of 7:00 p.m. and 7:00 a.m., or at any time on Sundays or holidays, such that the sound therefrom creates a noise disturbance across a residential or commercial real-property line, except for emergency work of public service utilities or by variance issued by the health officer is prohibited.

Code/Goal/Objective/Policy	Description
Section 12.08.440 (b)	Noise restrictions at affected structure. The contractor shall conduct construction activities in such a manner that the maximum noise levels at the affected buildings will not exceed those listed in the following schedule: Maximum noise levels for short term operation of mobile equipment (less than 10 days) ▪ 7:00 a.m. to 8:00 p.m. daily and all day Sundays and holidays. – Single-family residential 75 dBA – Multi-family residential 80 dBA – Semi-residential/commercial 85 dBA ▪ 8:00 p.m. to 7:00 a.m. daily and all day Sundays and holidays. – Single-family residential 60 dBA – Multi-family residential 64 dBA – Semi-residential/commercial 70 dBA Maximum noise levels for short term operation of stationary equipment (more than 10 days) ▪ 7:00 a.m. to 8:00 p.m. daily and all day Sundays and holidays. – Single-family residential 60 dBA – Multi-family residential 65 dBA – Semi-residential/commercial 70 dBA ▪ 8:00 p.m. to 7:00 a.m. daily and all day Sundays and holidays. – Single-family residential 50 dBA – Multi-family residential 55 dBA – Semi-residential/commercial 60 dBA
Section 12.08.460	Loading, unloading, opening, closing or other handling of boxes, crates, containers, building materials, garbage cans or similar objects between the hours of 10:00 p.m. and 6:00 a.m. in such a manner as to cause noise disturbance is prohibited.
Section 12.08.560	Vibration. Operating or permitting the operation of any device that creates vibration which is above the vibration perception threshold of any individual at or beyond the property boundary of the source if on private property, or at 150 feet (46 meters) from the source if on a public space or public right-of-way is prohibited. The perception threshold shall be a motion velocity of 0.01 in/sec over the range of 1 to 100 Hertz.
County of Los Angeles General Plan Noise Element	
Goal N 1	The reduction of excessive noise impacts.
Policy N 1.1	Utilize land uses to buffer noise-sensitive uses from sources of adverse noise impacts.
Policy N 1.3	Minimize impacts to noise-sensitive land uses by ensuring adequate site design, acoustical construction, and use of barriers, berms, or additional engineering controls through Best Available Technologies (BAT).
Policy N 1.8	Minimize noise impacts to pedestrians and transit-riders in the design of transportation facilities and mobility networks.

Code/Goal/Objective/Policy	Description
Policy N 1.9	Require construction of suitable noise attenuation barriers on noise sensitive uses that would be exposed to exterior noise levels of 65 dBA CNEL and above, when unavoidable impacts are identified.
Policy N 1.12	Decisions on land adjacent to transportation facilities, such as the airports, freeways and other major highways, must consider both existing and future noise levels of these transportation facilities to assure the compatibility of proposed uses.

Source: County of Los Angeles, *Code of Ordinances*, July 5, 2017; County of Los Angeles, *General Plan 2035*, October 2015

3.4.5 City of Bell

The City of Bell has established policies and regulations concerning the generation and control of noise that could adversely affect its citizens and noise sensitive land uses. The *City of Bell Municipal Code* and the *City of Bell 2030 General Plan Health and Safety Element* are the two documents designed to regulate noise within the City. Codes, goals, objectives, and policies designed to regulate noise are shown in Table 3.12.

Table 3.12. City of Bell – Relevant Noise and Vibration Codes, Goals, Objectives, and Policies

Code/Goal/Objective/Policy	Description
City of Bell Municipal Code	
Section 8.28.040 (a)	No person shall play, use, or operate or permit to be played, used or operated any radio, receiving set, TV. set, musical instrument, phonograph, jukebox or other machine or device for producing or reproducing sound in a manner which disturbs the peace and quiet of any residentially zoned neighborhood.
Section 8.28.040 (b)	No person shall play, use, operate or permit to be played, used or operated any radio, receiving set, TV. set, musical instrument, phonograph, jukebox or other machine or device for producing or reproducing sound between the hours of 10:00 p.m. and 7:00 a.m. on property located in any residential zone and when clearly the same is audible at a distance of fifty (50) feet or more from the building, structure, property or vehicle where the sound is produced.
City of Bell General Plan Health and Safety Element	
Policy 22	The City shall implement noise regulations that will lower excessive and intrusive noise to levels that conform to acceptable standards. The City shall ensure Code Enforcement and the Police Department will continue to enforce noise control regulations.
Policy 23	The City of Bell shall cooperate with all public agencies so as to minimize transportation related noise. Applicable City, State, and Federal noise control regulations shall be enforced.

Source: City of Bell, *Municipal Code*, 1998; City of Bell, *2030 General Plan Health and Safety Element*, May 9, 2018.

3.4.6 City of Cudahy

The City of Cudahy has established policies and regulations concerning the generation and control of noise that could adversely affect its citizens and noise sensitive land uses. The *City of Cudahy Municipal Code* and the *City of Cudahy General Plan Noise Element* are the two documents designed to regulate noise within the City. Codes, goals, objectives, and policies designed to regulate noise are shown in Table 3.13.

Table 3.13. City of Cudahy – Relevant Noise and Vibration Codes, Goals, Objectives, and Policies

Code/Goal/Objective/Policy	Description
City of Cudahy Municipal Code	
Section 20.60.070 (c) (1)	Maximum permissible exterior sounds levels by receiving land uses. ▪ Residential (except multifamily) – 45 dBA from 10:00 p.m. to 7:00 a.m. – 65 dBA from 7:00 a.m. to 10:00 p.m. ▪ Multifamily Residential and Mobile Home Parks – 50 dBA from 10:00 p.m. to 7:00 a.m. – 65 dBA from 7:00 a.m. to 10:00 p.m. ▪ Commercial (All "C" Zones) – 60 dBA from 10:00 p.m. to 7:00 a.m. – 65 dBA from 7:00 a.m. to 10:00 p.m. ▪ Light Industrial Zones – 70 dBA from 10:00 p.m. to 7:00 a.m. – 70 dBA from 7:00 a.m. to 10:00 p.m. ▪ Heavy Industrial Zones (All "C" Zones) – 70 dBA from 10:00 p.m. to 7:00 a.m. – 70 dBA from 7:00 a.m. to 10:00 p.m.
Section 20.60.070 (d) (1)	Maximum permissible interior noise levels. ▪ Residential any duration of time – 35 dBA from 10:00 p.m. to 7:00 a.m. – 45 dBA from 7:00 a.m. to 10:00 p.m. ▪ Residential for the duration of one minute within an hour – 40 dBA from 10:00 p.m. to 7:00 a.m. – 50 dBA from 7:00 a.m. to 10:00 p.m. ▪ Residential for the duration of five minutes within an hour – 35 dBA from 10:00 p.m. to 7:00 a.m. – 45 dBA from 7:00 a.m. to 10:00 p.m.

Code/Goal/Objective/Policy	Description
Section 20.60.090	No vibration shall be detectable beyond the property line of the site from which the vibration is emanating. Within industrial districts, vibration shall not exceed the standards below. ▪ Frequency under 10 – Steady state vibration displacement of 0.055 inches – Impact displacement of 0.0010 inches ▪ Frequency 10-19 – Steady state vibration displacement of 0.0044 inches – Impact displacement of 0.0008 inches ▪ Frequency 20-29 – Steady state vibration displacement of 0.0033 inches – Impact displacement of 0.0006 inches ▪ Frequency 30-39 – Steady state vibration displacement of 0.0002 inches – Impact displacement of 0.0004 inches ▪ Frequency 40 plus – Steady state vibration displacement of 0.0001 inches – Impact displacement of 0.0002 inches
City of Cudahy General Plan Noise Element	
Goal 1	Protect noise sensitive uses.
Policy NE 1.2	Require all exterior noise sources (construction operations, air compressors, pumps, fans, and leaf blowers) to use available noise suppression techniques and devices to lower exterior noise to acceptable levels which are compatible with adjacent land uses.
Policy NE 1.4	Consult with responsible federal and state agencies to minimize the impact of transportation-related noise, including noise associated with freeways, major arterials, rail, and public transportation.
Goal 2	Clear and enforced noise regulations
Policy NE 2.6	Implement appropriate standard construction noise controls for all construction projects.

Source: City of Cudahy, *Municipal Code*, December 2018; City of Cudahy, *2040 General Plan Noise Element*, March 2018

3.4.7 City of South Gate

The City of South Gate has established policies and regulations concerning the generation and control of noise that could adversely affect its citizens and noise sensitive land uses. The *City of South Gate Municipal Code* and the *City of South Gate General Plan 2035 Noise Element* are the two documents designed to regulate noise within the City. Codes, goals, objectives, and policies designed to regulate noise are shown in Table 3.14.

Table 3.14. City of South Gate – Relevant Noise and Vibration Codes, Goals, Objectives and Policies

Code/Goal/Objective/Policy	Description
City of South Gate Municipal Code	
Section 11.34.080 (A)	Maximum sound levels by noise zone. ▪ Noise Zone 1, Noise-Sensitive Area: 45 dBA at any time ▪ Noise Zone 2, Residential Properties (in any zone): 40 dBA from 10:00 p.m. to 7:00 a.m. (nighttime) and 50 dBA from 7:00 a.m. to 10:00 p.m. (daytime) ▪ Noise Zone 3, Commercial Properties: 55 dBA any time ▪ Noise Zone 4, Industrial Properties: 65 dBA at any time
Section 11.34.080 (C)	Permitted temporary noise level increase. ▪ +5 dBA 30 minutes per hour ▪ +10 dBA 15 minutes per hour ▪ +12 dBA 10 minutes per hour ▪ +15 dBA 5 minutes per hour ▪ +20 dBA 2 minutes per hour
City of South Gate General Plan Noise Element	
Objective N1.1	Minimize noise levels from construction and maintenance equipment, vehicles, and activities.
P.1	Construction activities will be prohibited between the hours of 7:00 p.m. to 8:00 a.m. Monday through Saturday and on Sundays and Federal holidays.
P.2	Construction noise reduction methods will be employed to the maximum extent feasible. These measures may include, but not limited to, shutting off idling equipment, installing temporary acoustic barriers around stationary construction noise sources, maximizing the distance between construction equipment staging areas and occupied sensitive receptor areas, and use of electric air compressors and similar power tools, rather than diesel equipment.
P.3	Prior to approval of project plans and specifications by the City, project applicants and/or construction contractors will identify construction equipment and noise reducing measures, and the anticipated noise reduction.
P.5	The City may exceed the noise standards on a case-by-case basis for special circumstances including emergency situations, special events and expedited development projects.
Objective N2.1	Ensure noise impacts are considered in land use planning decisions.
P.7	New development projects will provide buffers and/or appropriate mitigation measures to reduce potential noise sources on noise-sensitive land uses.
Objective N4.2	Minimize noise levels created by the Union Pacific, Southern Pacific, and any future rail systems located in close proximity to residential and other noise-sensitive land uses.

Code/Goal/Objective/Policy	Description
P.1	The City will work with rail operators to install and maintain noise mitigation features where operations adversely impact existing or planned residential and other noise-sensitive land uses.
P.2	The City will work with rail operators to ensure noise impacts are considered and mitigated through proper design, siting, and construction.
P.3	Future rail projects under the City's control will be required to analyze noise impacts and to identify and incorporate noise reducing features into the project design.
P.4	The City should encourage the construction of noise barriers for residential uses near active rail corridors.
P.6	The City will require that noise attenuation measures be incorporated into all new development, renovations, and remodels of residential, health care facilities, schools, libraries, senior facilities, and churches in close proximity to existing or known planned rail lines. Sound attenuation measures will reduce interior noise to a maximum of 45 dBA CNEL.

Source: City of South Gate, *Municipal Code*, February 14, 2017; City of South Gate, *General Plan 2035*, December 2009

3.4.8 City of Downey

The City of Downey has established policies and regulations concerning the generation and control of noise that could adversely affect its citizens and noise sensitive land uses. The *City of Downey Municipal Code* and the *City of Downey General Plan 2025 Noise Element* are the two documents designed to regulate noise within the City. Codes, goals, objectives, and policies designed to regulate noise are shown in Table 3.15.

Table 3.15. City of Downey – Relevant Noise and Vibration Codes, Goals, Objectives and Policies

Code/Goal/Objective/Policy	Description
City of Downey Municipal Code	
Section 4606.3 (a)	All activities to which this chapter is applicable shall be conducted in such a manner that any noise produced shall not create a disturbance. The maximum permissible sound pressure level measured at the property boundary of any land use in Subsection (b) of this section from any noise source not operating on a public right-of-way shall constitute prima facie evidence of a public nuisance when such noise level exceeds five (5) dB(A) above the ambient noise level at any period during the course of a twenty-four (24) hour day.

Code/Goal/Objective/Policy	Description
Section 4606.3 (b)	If the alleged noise source is of a continuous nature and cannot reasonably be discontinued for a time period wherein the ambient noise level can be determined, the maximum permissible steady noise level by sound sources across the property boundary of any land use cited below may be less, but not greater than: ▪ Residential – 45 dBA from 10:00 p.m. to 7:00 a.m. – 55 dBA from 7:00 a.m. to 10:00 p.m. ▪ Commercial – 65 dBA from 10:00 p.m. to 7:00 a.m. – 65 dBA from 7:00 a.m. to 10:00 p.m. ▪ Manufacturing – 70 dBA from 10:00 p.m. to 7:00 a.m. – 70 dBA from 7:00 a.m. to 10:00 p.m. In the hours between 7:00 a.m. to 10:00 p.m., the noise levels permitted in Subsection (b) of this section may be adjusted by the inclusion of the following factors when applicable: ▪ Noise source operated 12 minutes per hour or less + 5 db(A) ▪ Noise source operated 3 minutes per hour or less + 10 db(A) ▪ Noise source operated 1 minute per hour or less + 15 db(A) ▪ Impulsive sounds, pure tone, or sounds with a cyclically varying amplitude shall be considered a public nuisance when such noises are at a sound pressure level of five (5) db(A) less than those listed above.
Section 4606.5	Construction, repair or remodeling equipment and devices and other related construction noise sources shall be exempted from the provisions of this chapter provided a valid permit for such construction, repair, or remodeling shall have been obtained from the City. In any circumstance other than emergency work, no repair or remodeling shall take place between the hours of 9:00 p.m. of one day and 7:00 a.m. of the following day, and no repair or remodeling shall exceed eighty-five (85) db(A) across any property boundary at any time during the course of a twenty-four (24) hour day.
Section 5276	To protect the public health, safety and quiet enjoyment of the residents of the noise level for the collection vehicles during the stationary compaction process shall not exceed seventy-five (75) Db (A) at a distance of twenty-five feet (25’) from the collection vehicle and at an elevation of five feet (5’) from the horizontal base place of such vehicles.
Section 9516.06 (e)	Vibration from any machine, operation, or process which causes a displacement of three thousandth’s (0.003) of an inch as measured at the lot lines of the use shall be prohibited. Shock absorbers or similar mountings shall be allowed which will reduce vibration below three-thousandths (0.003) of an inch as measured at the lot lines. See Section 9318 of this chapter.

Code/Goal/Objective/Policy	Description
City of Downey General Plan Noise Element	
Goal 6.1	Protect persons from exposure to excessive noise.
Policy 6.1.1	Minimize noise impacts onto noise-sensitive uses.
Program 6.1.1.1	Enforce noise standards.
Program 6.1.1.2	Ensure that new developments within areas with exterior noise at unacceptable levels are designed to maintain interior noise levels at acceptable levels.
Program 6.1.1.3	Continue to enforce provisions prohibiting construction activities during noise-sensitive hours.
Program 6.1.1.4	Encourage the use of different construction methods, including insulations, for new developments to reduce impacts generated by other land uses and traffic.
Policy 6.2.2	Support measures to reduce noise generated by railroad traffic.
Program 6.2.2.1	Coordinate with railroad companies in developing and implementing noise reduction methods in their operations.
Program 6.2.2.3	Coordinate with railroad companies to maintain rubberized railroad crossings at intersections.
Goal 6.3	Minimize noise impacts on noise-sensitive land uses.
Program 6.3.1.9	Concentrate construction activities producing the most noise during midday hours to minimize impacts onto nearby residents.
Program 6.3.1.10	Encourage the use of noise-suppression equipment.

Source: City of Downey, *Municipal Code*, February 2017; City of Downey, *General Plan 2025, Chapter 6 Noise*, January 25, 2005

3.4.9 City of Paramount

The City of Paramount has established policies and regulations concerning the generation and control of noise that could adversely affect its citizens and noise sensitive land uses. The *City of Paramount Municipal Code* and the *City of Paramount General Plan 2025 Health and Safety Element* are the two documents designed to regulate noise within the City. Codes, goals, objectives, and policies designed to regulate noise are shown in Table 3.16.

Table 3.16. City of Paramount – Relevant Noise and Vibration Codes, Goals, Objectives and Policies

Code/Goal/Objective/Policy	Description
City of Paramount Municipal Code	
Section 45-4	Noise performance standards. ▪ Noise Zones: Industrial and Commercial – 77 dB from 10:00 p.m. to 6:00 a.m. – 82 dB from 6:00 a.m. to 10:00 p.m. ▪ Noise Zones: R1 and R2 – 57 dB from 10:00 p.m. to 7:00 a.m. – 62 dB from 7:00 a.m. to 10:00 p.m. ▪ Noise Zones: R3 and R4 – 62 dB from 10:00 p.m. to 7:00 a.m. – 67 dB from 7:00 a.m. to 10:00 p.m.
Section 45-7 (d) (1)	Construction, repair or remodeling equipment and devices and other related construction noise sources shall be exempted from the provisions of this chapter provided a permit for such construction, repair or remodeling shall have been obtained for such construction, repair or remodeling from the building department of the city and the construction, repair or remodeling does not take place between the hours of 8:00 p.m. and 7:00 a.m.
Section 45-8	Notwithstanding other sections of this chapter, it shall be unlawful for any person to create, maintain or cause to be created or maintained, any noise within the interior of any multiple family dwelling unit which exceeds 55 dBA as measured. In any adjoining dwelling unit between the hours of 10:00 p.m. and 6:00 a.m.
City of Paramount General Plan Health and Safety Element	
Policy 32	The City of Paramount will cooperate with State and Federal agencies so as to minimize transportation related noise.
Policy 34	The City of Paramount will promote the development of a compatible noise environment throughout the City.

Source: City of Paramount, *Municipal Code*, 2017; City of Paramount, *General Plan, Health and Safety Element*, August 2007

3.4.10 City of Bellflower

The City of Bellflower has established policies and regulations concerning the generation and control of noise that could adversely affect its citizens and noise sensitive land uses. The *City of Bellflower Municipal Code* and the *City of Bellflower General Plan Noise Element 1994* are the two documents designed to regulate noise within the City. Codes, goals, objectives, and policies designed to regulate noise are shown in Table 3.17.

Table 3.17. City of Bellflower – Relevant Noise and Vibration Codes, Goals, Objectives and Policies

Code/Goal/Objective/Policy	Description
City of Bellflower Municipal Code	
Section 8.32.010 (b)	Any unreasonable noise level caused by such use or operation which is audible to the human ear at a distance in excess of two hundred (200) feet from the property line of a noise source, which is within any residential area or zone of the City or within five hundred (500) feet of any residential zone, shall be a violation of the provisions of this chapter. “Residential area” as used herein shall mean property zoned or used for residential purposes.
City of Bellflower General Plan Noise Element	
Goal 1	Maintain or reduce noise levels throughout the City.
Policy 1.2	Utilize noise attenuation mechanisms specified in the Uniform Building Code and the State Noise Insulation Standards (California Administrative Code, Title 24). Noise attenuation mechanisms include; double glazing, sound walls, insulation, and proper siting of land uses.
Policy 1.4	Limit construction activities which impact adjacent residential uses to the hours of 7:00 a.m. to 8:00 p.m. during weekdays and Saturdays.
Policy 1.5	Require construction activities to incorporate feasible and practical techniques which minimized noise impacts.
Policy 1.7	Ensure the outdoor noise limits for residential uses do not exceed 60 dB CNEL for single family uses and 65 dB L_{dn} for multiple family uses.
Policy 1.8	Ensure the indoor noise limits for all residential uses do not exceed 45 dB CNEL.
Policy 1.9	Actively pursue sound wall mitigation measures with Cal Trans and the Metropolitan Transit Authority (MTA).
Figure 1	Contains guidelines for noise compatible land uses to determine the appropriate land use and mitigation measures.

Source: City of Bellflower, *Municipal Code*, February 2017; City of Bellflower, *General Plan, Noise Element*, December 1994

3.4.11 City of Artesia

The City of Artesia has established policies and regulations concerning the generation and control of noise that could adversely affect its citizens and noise sensitive land uses. The *City of Artesia Municipal Code* and the *City of Artesia General Plan 2030 Noise Sub-Element* are the two documents designed to regulate noise within the City. Codes, goals, objectives, and policies designed to regulate noise are shown in Table 3.18.

Table 3.18. City of Artesia – Relevant Noise and Vibration Codes, Goals, Objectives and Policies

Code/Goal/Objective/Policy	Description
City of Artesia Municipal Code	
Section 5-2.03 (b)	Except as otherwise allowed in this chapter, no person, from any location within the City, shall create or allow the creation of noise, sound or vibration on any property owned, leased, occupied, or other controlled by such person, which causes the noise level on any residential property to exceed the greater of either the actual measured ambient noise level, or the following ambient noise level for a cumulative period of more than thirty (30) minutes in any hour as measured at any property line: ▪ 55 dBA from 7:00 a.m. to 10:00 p.m. ▪ 50 dBA from 10:00 p.m. to 7:00 a.m. If the alleged offensive noise consists entirely of impact noise, simple tone noise, speech, music, or any combination thereof, the permissible noise level set forth above shall be reduced by five (5) dB(A). Increases in noise levels are permitted in accordance with the following: ▪ 5 dBA for 15 minutes in an hour ▪ 10 dBA for 5 minutes per hour ▪ 15 dBA for 1 minute per hour ▪ 20 dBA for less than one minute
Section 5-2.04	Permissible Interior Sound Limits or Levels at residential properties. ▪ 55 dBA from 7:00 a.m. to 10:00 p.m. ▪ 45 dBA from 10:00 p.m. to 7:00 a.m. If the alleged offensive noise consists entirely of impact noise, simple tone noise, speech, music, or any combination thereof, the permissible noise level set forth above shall be reduced by five (5) dB(A).
Section 5-2.06 (e)	Loading, unloading, opening, closing or other handling of boxes, crates, containers, building materials, garbage cans or similar objects between the hours of 8:00 p.m. and 7:00 a.m. in volume sufficiently loud as to be plainly audible at a distance of fifty (50) feet or more from the property line of the property where the activity is occurring.
Section 5-2.06 (f)	Operating or causing the operation of any tools, equipment, impact devices, derricks or hoists used on construction, drilling, repair, alteration, demolition or earthwork, between the hours of 7:00 p.m. and 7:00 a.m. on weekdays or at any time on Sunday or Federal holiday.

Code/Goal/Objective/Policy	Description
City of Artesia General Plan Noise Sub-Element	
Policy Action N 1.1.2	Require a noise impact evaluation for projects, if determined necessary through the environmental review process. If noise abatement is found necessary, require implementation mitigation measures based on a technical study prepared by a qualified acoustical professional.
Policy Action N 1.1.3	Implement noise mitigation by placing conditions of approval on development projects, and require a clear description of mitigation on subdivision maps, site plans, and building plans for inspection purposes.
Community Policy N 1.2	Consider noise impacts associated with the development of non-residential uses in the vicinity of residential uses.
Policy Action N 1.2.1	Require that any proposed development near existing residential land uses demonstrate compliance with the City's Noise Ordinance prior to the approval of the project.
Community Policy N 3.1	Ensure non-transportation sources of noise have incorporated appropriate mitigation measures, so that standards contained in the Noise Sub-Element or adopted ordinances are met.
Policy Action N 3.1.1	Require that noise mitigation techniques are incorporated into all construction related activities.
Policy Action N 3.1.2	Enforce the Noise Ordinance to ensure that stationary noise and noise emanating from construction activities, private development, and/or special events are minimized.
Community Goal Policy N 4	Noise impacts to noise sensitive receptors are minimized, ensuring that City and State interior and exterior noise levels are not exceeded.
Community Policy N 4.1	Ensure Community Noise Equivalent Levels (CNEL) for noise sensitive land uses meet normally acceptable levels, as defined by State standards.
Policy Action 4.1.1	Require buffers or appropriate mitigation of potential noise sources on noise sensitive areas.

Source: City of Artesia, *Municipal Code*, March 2017; City of Artesia, *General Plan 2030, Noise Sub-Element*

3.4.12 City of Cerritos

The City of Cerritos has established policies and regulations concerning the generation and control of noise that could adversely affect its citizens and noise sensitive land uses. The *City of Cerritos Municipal Code* and the *City of Cerritos General Plan Noise Element* are the two documents designed to regulate noise within the City. Codes, goals, objectives and policies designed to regulate noise are shown in Table 3.19.

Table 3.19. City of Cerritos – Relevant Noise and Vibration Codes, Goals, Objectives and Policies

Code/Goal/Objective/Policy	Description
City of Cerritos Municipal Code	
Section 22.80.460	No vibration (other than from transportation facilities or temporary construction work) shall be permitted which is discernible without instruments at the points of measurement specified in Section 22.80.210.
Section 22.80.480 (1)	Cerritos Noise Standards by use. No noise shall be generated which causes the maximum sound level (noise level) at any point on property lines surrounding the premises on which noise is produced to exceed the background (ambient noise) including traffic noise by 5 dBA measured at the same point, or the following limits, whichever is greater: ▪ Residential or agricultural maximum sound level of 50 dBA ▪ Commercial maximum sound level of 60 dBA ▪ Industrial maximum sound level of 70 dBA
Section 22.80.480 (5)	The provisions for noise limits shall not be applied to occasional use of equipment for maintenance of any lot or buildings or for building construction, for which a valid building permit has been issued, between the hour of 7:00 a.m. and 7:00 p.m. or for any public works activities or civic event which are authorized by the city.
City of Cerritos General Plan Noise Element	
Goal N-1	Reduction in noise impacts from transportation sources.
Policy N-1.1	Mitigate transportation equipment impacts at construction sites.
Policy N-2.2	Strive to resolve existing and potential conflicts between noise generating uses and human activities.
Policy N-2.3	Ensure noise mitigation techniques are incorporated into all construction-related activities.
Policy N-3.1	Enforce noise standards, as contained in the City's Noise Ordinance.
Policy N-3.2	Ensure Community Noise Equivalent Levels (CNEL) levels for noise sensitive land uses meet or exceed normally acceptable levels, as defined by State of California standards.
Policy N-3.4	Consider noise impacts associated with the development of non-residential uses in the vicinity of residential uses.

Source: City of Cerritos, *Municipal Code*, May 2017; City of Cerritos, *General Plan, Noise Element*, 2004

3.4.13 Los Angeles Metro GBV

Metro Specification Section 01 56 19, Construction Noise and Vibration Control, includes limits on the levels of building GBV generated by construction activities. The limits are different for occupant annoyance and for risk of cosmetic damage to buildings. The construction GBV limits inside residences, hotels and motels, and office buildings from construction operations is 80 VdB. This level of GBV is used to assess potential annoyance to building occupants during construction. This limit is substantially lower than the damage risk criteria for the building.

4 AFFECTED ENVIRONMENT/EXISTING CONDITIONS

4.1 Noise

The noise environment in urban areas is dominated by traffic noise. There are several industrial areas along the Project alignment that generate noise from operation of machinery and truck trips associated with the uses. Occasional aircraft flyovers and movement of trains along existing railroads are also contributors to the existing noise environment. Land uses found along the alignment include public facilities, public and commercial office buildings, various types of commercial uses, institutional uses, multi-family residential uses (including adaptive reuse of older non-residential buildings), industrial uses, surface parking facilities, and parking structures.

Noise-sensitive land uses were identified using Geographic Information System (GIS), assessor's parcel maps, aerial photos, and were verified through field work. Noise monitoring locations were carefully selected to best represent existing conditions at sensitive receivers along the transit corridor. Existing noise levels were not monitored for the underground segments of the alignment, as there would not be audible noise sources at the surface level. It is not possible to monitor noise levels at every receiver along the alignment due to time and cost limitations. Monitoring locations were selected to represent conditions that could be applied to multiple receiver locations. Typical situations where representative measurement sites can be used to estimate noise levels at other sites occur when both share proximity to the same major transportation noise sources and similar type of land use density and housing. Table 4.1 identifies short-term noise monitoring locations.

Table 4.1. Short-Term Noise Monitoring Locations

Noise Site	Location	FTA Land Use Category[1]	Representative Land Uses	Noise Level (dBA, L_{eq})
1	1712 E. 23rd St. Los Angeles	2	Residential	58.3
3	5325 Long Beach Ave. Los Angeles	2	Residential	72.5
4	5905 Holmes Ave. Los Angeles	2, 3	Residential, Lillian Street Elementary School	67.4
6	2776 Randolph St. Huntington Park	2, 3	Residential, Huntington Park High School	63.8
7	San Antonio Elementary School (6222 State St. Huntington Park)	2, 3	Residential, San Antonio Elementary School	65.1
8	Huntington Park Community Center (6925 Salt Lake Ave. Bell Gardens)	2, 3	Residential, Huntington Park Community Center	68.8
10	7732 Salt Lake Ave. Cudahy	2	Residential	65.1

Noise Site	Location	FTA Land Use Category[1]	Representative Land Uses	Noise Level (dBA, L_{eq})
11	7915 Salt Lake Ave. Cudahy	2	Residential	63.1
12	8208 Wilcox Ave. Bell Gardens	2	Residential	67.1
13	9637 Salt Lake Ave. South Gate	2	Residential	60.7
15	10315 Karmont Ave. South Gate	2	Residential	57.8
16	5751 Taft Ave. South Gate	2	Residential	58.4
17	Hollydale Community Center (12221 Industrial Ave. South Gate)	2, 3	Residential, Hollydale Community Center, American Indian Bible Church, Trinity Bible Church	56.9
18	12508 Center St. South Gate	2	Residential	58.0
20	14005 Arthur Ave. Paramount	2	Residential	52.3
21	14121 McClure Ave. Paramount	2	Residential	52.8
22	Bianchi Stadium 11 Theatres (7770 Rosecrans Ave. Paramount)	3	Bianchi Stadium 11 Theatres	59.4
23	Paramount Adult School (3419, 14507 Paramount Blvd. Paramount)	3	Paramount Adult School	64.3
24	Paramount Park (14400 Paramount Blvd. Paramount)	2, 3	Residential, Paramount Park, Paramount Park Middle School, Paramount Adult School, Paramount High School – West Campus	59.9
25	Our Lady of the Rosary Parish (14815 Paramount Blvd. Paramount)	2,3	Our Lady of the Rosary Catholic School, Our Lady of the Rosary Catholic School, Our Lady of the Rosary Convent	67.3
27	8429 2nd St. Paramount	2	Residential	53.7
29	9158 Hegel St. Bellflower	2	Residential	54.0

Noise Site	Location	FTA Land Use Category[1]	Representative Land Uses	Noise Level (dBA, L_{eq})
30	Adventist Union School (15548 Santa Ana Ave. Bellflower)	2, 3	Residential, Adventist Union School	53.2
31	9521 Harvard St. Bellflower	2, 3	Residential, Door Christian Fellowship Church	61.5
32	9827 Oak St. Bellflower	2, 3	Residential, Open Door Worship Center	58.0
33	10144 Maple St. Bellflower	2	Residential	71.4
34	17230 Palo Verde Ave. Bellflower	2	Residential	59.7
35	Valley Christian High School (10818 Artesia Blvd. Cerritos)	3	Valley Christian High School	61.4
36	11255 Sharon St. Cerritos	2, 3	Residential, Artesia Cemetery	53.2
37	18615 Alburtis Ave. Artesia	2, 3	Residential, Wan Yuen Temple	50.0
39	20012 Teresa Wy. Cerritos	2	Residential	69.6

Source: TAHA, 2020; WSP, 2020
Note: [1] Category 2: Residences and buildings where people normally sleep. This category includes homes, hospitals and hotels where a nighttime sensitivity to noise is assumed to be of utmost importance.
Category 3: Institutional land uses with primarily daytime and evening use. This category includes schools, libraries, theaters, and churches where it is important to avoid interference with such activities as speech, meditation and concentration on reading material. Places for meditation or study associated with cemeteries, monuments, museums, campgrounds and recreational facilities can also be considered to be in this category. Certain historical sites and parks are also included.

Table 4.2 identifies long-term noise monitoring locations. Noise monitoring locations are shown in Appendices A, C, D, and E.

4.2 Vibration

The Project is located in an urban center. Primary existing sources of GBV include trucks travelling along roadways, construction utilizing heavy equipment, and active freight lines within the corridor. According to FTA guidance, the background vibration levels are expected to range from 50 VdB to 65 VdB. Ambient vibration levels were not measured as part of this study since the FTA vibration impact assessment is not based on the ambient levels but instead is based on FTA Vibration Impact Criteria. These criteria were used to identify vibration-sensitive receivers along the Project alignments where potential impacts may occur, based on existing land use activities. These receivers include residences, hotel/motels, medical facilities, schools, movie theaters, live theaters, and museums. The potential for vibration generated by the underground operation of the trains has been analyzed at these receiver locations.

Table 4.2. Long-Term Noise Monitoring Locations

Location	Jurisdiction	FTA Land Use Category[1]	Representative Land Uses	Noise Level (dBA, L_{dn})
2	4507 Long Beach Ave., Los Angeles	2	Residential, Fred Roberts Recreation Center	66.8
5	Randolph St. and Rugby Ave., Huntington Park	2, 3	Residential, UEI College	68.0
9	6815 California Ave., Huntington Park	2, 3	Residential, Huntington Park Community Center	64.0
14	10001 W. Frontage Rd., South Gate	2	Residential	57.4
19	13820 Facade Ave., Paramount	2	Residential	64.0
26	8327 3rd St., Paramount	2, 3	Residential, Paramount High School	58.0
28	9208 Ives St., Bellflower	2	Residential	48.1
38	11886 Park Ave., Artesia	2	Residential	52.0

Source: TAHA, 2020; WSP, 2020
Note: [1] Category 2: Residences and buildings where people normally sleep. This category includes homes, hospitals and hotels where a nighttime sensitivity to noise is assumed to be of utmost importance.
Category 3: Institutional land uses with primarily daytime and evening use. This category includes schools, libraries, theaters, and churches where it is important to avoid interference with such activities as speech, meditation and concentration on reading material. Places for meditation or study associated with cemeteries, monuments, museums, campgrounds and recreational facilities can also be considered to be in this category. Certain historical sites and parks are also included.

5 ENVIRONMENTAL CONSEQUENCES /ENVIRONMENTAL IMPACTS

5.1 No Build Alternative

The No Build Alternative includes projects identified in the SCAG *2016 RTP/SCS*, Metro's *2009 LRTP*, and Measure M. Under the No Build Alternative, the Build Alternative would not be developed. However, several infrastructure and transportation-related projects located within the Study Area as described in Table 2.1 would be implemented and built. SCAG *2016 RTP/SCS*, Metro's *2009 LRTP*, and Measure M projects identified in the vicinity of the Project alignment include the Metro East-West Line/Regional Connector/Eastside Phase 2, CA HSR, Metro North-South Line/Regional Connector, improvements to the Metro bus system and local municipality bus systems, I-710 South Corridor Project, and I-105 Express Lane. Project-related TODs are not included in the No Built Alternative because the future planning of TODs surrounding the Project station areas cannot occur without implementation of the Project.

The projects included in the No Build Alternative would change the regional transportation system and likely reduce regional vehicle miles traveled. This would result in fewer automobiles on the regional roadway network and less mobile noise. Projects under the No Build Alternative would generate noise and vibration levels typical to urban construction activities and long-term transportation noise. Under the No Build Alternative, no changes related to the Build Alternatives, and no project-related noise or vibration sources would occur. The existing freight tracks within the rail ROWs would remain in place and the rail ROWs would be undisturbed. Existing noise sources such as industrial areas along the Project alignment, occasional aircraft flyovers, traffic noise and the movement of trains along existing railroads would remain the dominant noise sources in the Project Area. Therefore, the No Build Alternative would not cause new adverse effects related to increasing noise or vibration levels at sensitive receivers.

5.2 Alternative 1

5.2.1 LRT Underground

5.2.1.1 Noise

Alternative 1 would be entirely underground from LAUS to just south of Olympic Boulevard. Noise related to underground LRT would not be readily transmitted to surface level receivers. Station entrances would not result in a direct line-of-sight of the LRT vehicles and aboveground receivers. As such, LRT noise would not be audible at station entrances. Therefore, noise associated with the underground segments of Alternative 1 are not considered for further analysis and no adverse effects related to noise would occur.

5.2.1.2 Vibration

Groundborne vibration (GBV) levels and groundborne noise (GBN) were modeled at each cluster along the underground segments of Alternative 1. No Vibration Category 1 land uses (i.e., buildings where vibration would interfere with operations within the buildings) were identified within this section of the alignment. Table 5.1 provides predicted vibration levels for Vibration Category 2 land uses which include all residential uses and buildings where people normally sleep, such as hospitals and hotels. One cluster, Cluster 7, would experience GBV levels that are predicted to exceed the FTA vibration impact threshold of 72 VdB by 7 VdB. This cluster would also experience GBN levels that would exceed the GBN impact criteria by 9 dBA. Clusters and impacts are shown in Appendix B. Therefore, there is a strong chance that actual GBN associated with the underground segments of Alternative 1, with the exception of Cluster 7, will be below the impact threshold and would not result in an adverse effect.

The level of train GBV at historic buildings is not considered in this assessment because these levels are well below the architectural or structural damage risk criteria. The damage risk concern to historic buildings is GBV from underground and at-grade construction, which is included in Construction Impacts (Chapter 7).

Table 5.1. Vibration Category 2 Land Use Light Rail Vibration Assessment – Alternatives 1

Cluster No.[1]	Land Use	Slant Distance Near Track (ft.)	Speed (mph)	Track Type	Predicted GBV (VdB)	GBV Criteria (VdB)	Exceeds?[2]	Amount Exceeds	Predicted GBN (dBA)	GBN Criteria (dBA)	Exceeds?[2]	Amount Exceeds
Design Option 1												
V1	SFR/MFR	98	55	Direct Fixation	56[3]	72	-	-	21	35	-	-
Alternative 1 (Common)												
V2	SFR/MFR	100	55	Direct Fixation	56[3]	72	-	-	21	35	-	-
V3	SFR/MFR	85	55	Direct Fixation	58[3]	72	-	-	23	35	-	-
V4	SFR/MFR	88	55	Direct Fixation	57[3]	72	-	-	22	35	-	-
V5	SFR/MFR	138	55	Direct Fixation	53[3]	72	-	-	18	35	-	-
V6	Hotel	114	55	Direct Fixation	65	72	-	-	30	35	-	-
V7	SFR/MFR	6	35	Direct Fixation	79	72	Y	7	44	35	Y	9

Source: WSP, 2020
Notes: [1] Cluster sites shown in Appendix B.
[2] A vibration level is considered an impact if it exceeds the impact criteria threshold.
[3] Predicted GBV at these locations include a -10 deduction for building coupling loss.
GBV = Groundborne vibration; SFR = Single-Family Residential; MFR = Multi-Family Residential

5.2.2 LRT (At-grade and Aerial)

5.2.2.1 Noise

Noise-sensitive land uses along the Project alignment were categorized using the FTA Land Use Categories of 1, 2, or 3. The sensitive uses were grouped into clusters, each having one representative receiver. Sensitive uses would be exposed to a combination of noise sources including LRT pass-by noise, audible warnings noise, wheel squeal noise, special trackwork noise, and freight noise related to relocated freight tracks. A total of 31 protected at-grade crossings with crossing signals would contribute to LRT noise at sensitive uses. Noise levels at the remaining at-grade crossings were modeled at the nearest clusters to determine the potential for impacts, and noise levels are shown in Table 5.2. Curves with a radius of less than 600 could produce wheel squeal. Three curves along the alignment could produce wheel squeal: the first curve serves as the transition point from the San Pedro Subdivision ROW to Randolph Street; the second curve is the transition from Randolph Street to Long Beach Boulevard; and the third curve serves as the transition point from the Pacific Electric Right-of-Way (PEROW) to the San Pedro Subdivision ROW following Arthur Avenue, just before it crosses the I-105 freeway. A 10-dBA adjustment was added to LRT pass-by noise to account for possible wheel squeal at clusters near these locations.

At the two locations along Randolph Street and along Façade Avenue freight train noise related to the relocated tracks have been added to Clusters.

Noise levels were modeled at each cluster and are shown in the following tables. Clusters and impacts are shown in Appendix A. One Category 1 land use, Kairos Music Group, was identified. Table 5.3 shows noise levels for Category 1 land uses, characterized as buildings where quiet is an essential element of their purpose. Table 5.4 provides noise levels for Category 2 land uses, characterized as residences and buildings where people normally sleep (i.e., hospitals and hotels) and where nighttime sensitivity is assumed to be of utmost importance. Table 5.5 provides noise levels for Category 3 land uses, characterized as institutional land uses with primarily daytime use that depend on quiet as an important part of operations (i.e., schools, libraries and churches).

Under Alternative 1, 76 of 316 Category 2 clusters would experience moderate impacts from LRT noise and 171 would experience severe impacts. Ten Category 3 clusters would experience moderate impacts and two would experience severe impacts. Regarding health effects, it is unlikely for LRT noise to result in noise induced hearing loss, as this is an occupational hazard related to working over long periods of time in high noise environments. The Occupational Safety and Health Administration (OSHA) has established a sound level of 82 dBA as being protective of hearing for a continuous exposure of 24 hours (29 CFR 1910.95). FTA defines moderate impacts as having the potential to result in measurable annoyance in a community and severe impacts to cause a high level of community annoyance. High levels of noise could increase stress and the potential for stress related diseases at affected sensitive uses. This applies for other areas that would result in noise impacts. Calculation details are shown in Appendix J.

Table 5.2. Audible Warnings Noise Assessment – Alternative 1

Grade Crossing	Cluster No.[1]	FTA Land Use Category[2]	Distance (ft.)[3]	Noise Level (Cat 2 dBA, L_{dn}) (Cat 3 dBA, L_{eq})				Impact
				Existing	Project	Impact Threshold		
						Moderate	Severe	
Alameda St.	None	None	None	None	None	None	None	None
Santa Fe Ave.	52	2	230	68.0	51.5	62.9	68.1	No
Santa Fe Ave.	54	2	180	68.0	63.2	62.9	68.1	Moderate
Santa Fe Ave.	55	2	140	68.0	51.4	62.9	68.1	No
Santa Fe Ave.	56	2	60	68.0	63.2	62.9	68.1	Moderate
Santa Fe Ave.	58	2	180	68.0	53.7	62.9	68.1	No
Malabar St.	57	2	200	68.0	52.8	62.9	68.1	No
Malabar St.	60	2	45	68.0	65.7	62.9	68.1	Moderate
Malabar St.	61	2	110	68.0	58.0	62.9	68.1	No
Malabar St	62	3	75	64.2	65.1	65.3	70.7	No
Malabar St.	63	2	220	68.0	51.9	62.9	68.1	No
Malabar St.	64	2	200	68.0	52.8	62.9	68.1	No
Malabar St.	65	2	50	68.0	64.8	62.9	68.1	Moderate
Pacific Blvd.	66	2	300	64.2	53.0	65.3	70.7	No
Pacific Blvd.	67	3	130	68.0	56.5	62.9	68.1	No
Seville Ave.	69	2	210	61.8	52.3	58.8	64.3	No
Seville Ave.	70	2	250	61.8	50.8	58.8	64.3	No
Seville Ave.	71	2	45	61.8	65.7	58.8	64.3	Moderate
Seville Ave.	73	2	45	61.8	65.7	58.8	64.3	Moderate
Miles Ave.	73	2	60	61.8	63.2	58.8	64.3	Moderate
Miles Ave.	78	2	100	61.8	54.3	58.8	64.3	No
Miles Ave.	76	2	50	61.8	64.8	58.8	64.3	Moderate

Grade Crossing	Cluster No.[1]	FTA Land Use Category[2]	Distance (ft.)[3]	Noise Level (Cat 2 dBA, L_{dn}) (Cat 3 dBA, L_{eq})				Impact
				Existing	Project	Impact Threshold		
						Moderate	Severe	
Miles Ave.	82	2	220	61.8	51.9	58.8	64.3	No
Miles Ave.	83	3	90	63.8	63.5	65.1	70.5	No
Miles Ave.	86	2	50	61.8	64.8	58.8	64.3	Moderate
Arbutus Ave.	88	2	70	63.1	61.9	59.6	65.1	Moderate
Arbutus Ave.	92	2	170	63.1	49.7	59.6	65.1	No
Arbutus Ave.	93	2	70	63.1	61.9	59.6	65.1	Moderate
Arbutus Ave.	94	2	90	63.1	59.7	59.6	65.1	Moderate
Arbutus Ave.	95	2	201	63.1	48.2	59.6	65.1	No
Arbutus Ave.	96	2	100	63.1	58.8	59.6	65.1	No
State St.	94	2	150	63.1	55.3	59.6	65.1	No
State St.	98	2	160	63.1	54.7	59.6	65.1	No
State St.	99	2	130	63.1	56.5	59.6	65.1	No
State St.	100	3	160	65.1	58.5	65.9	71.3	No
Gage Ave	106	3	260	68.8	54.3	68.5	73.7	No
Gage Ave.	107	2	100	66.8	58.8	62.0	67.3	No
Gage Ave.	108	2	180	66.8	53.7	62.0	67.3	No
Bell Ave.	112	2	330	66.8	48.4	62.0	67.3	No
Bell Ave.	113	2	25	66.8	70.8	62.0	67.3	Moderate
Bell Ave.	114	2	100	66.8	58.8	62.0	67.3	No
Bell Ave.	115	2	230	66.8	51.5	62.0	67.3	No
Bell Ave.	116	2	25	64.0	70.8	60.2	65.6	Moderate
Florence Ave.	119	2	130	64.0	56.5	60.2	65.6	No
Florence Ave.	120	2	220	64.0	51.9	60.2	65.6	No

Grade Crossing	Cluster No.[1]	FTA Land Use Category[2]	Distance (ft.)[3]	Noise Level (Cat 2 dBA, L_{dn}) (Cat 3 dBA, L_{eq})				Impact
						Impact Threshold		
				Existing	Project	Moderate	Severe	
Florence Ave.	121	2	280	64.0	49.8	60.2	65.6	No
Florence Ave.	122	2	285	63.1	49.7	59.6	65.1	No
Otis Ave.	160	2	130	61.1	56.5	58.4	64.0	No
Otis Ave.	161	2	60	61.1	63.2	58.4	64.0	Moderate
Otis Ave.	163	2	87	61.1	60.0	58.4	64.0	Moderate
Santa Ana St.	162	2	300	61.1	49.2	58.4	64.0	No
Santa Ana St.	163	2	280	61.1	49.8	58.4	64.0	No
Santa Ana St.	165	2	200	61.1	52.8	58.4	64.0	No
Santa Ana St.	166	2	280	61.1	49.8	58.4	64.0	No
Ardine St.	None	None	None	None	None	None	None	None
Rayo Ave.	None	None	None	None	None	None	None	None
Southern Ave.	170	2	250	58.7	50.8	57.1	62.8	No
Miller Wy.	None	None	None	None	None	None	None	None
Gardendale St.	None	None	None	None	None	None	None	None
Main St.	181	3	20	56.9	76.6	61.2	66.9	Severe
Main St.	184	3	20	56.9	76.6	61.2	66.9	Severe
Century Blvd.	188	2	200	56.0	52.8	55.7	61.6	No
Century Blvd.	189	2	140	56.0	55.9	55.7	61.6	Moderate
Century Blvd.	190	2	40	56.0	66.7	55.7	61.6	Severe
Somerset Blvd.	224	2	330	51.7	48.4	53.9	60.0	No
Somerset Blvd.	226	2	125	51.7	56.8	53.9	60.0	Moderate
Somerset Blvd.	227	2	55	51.7	64.0	53.9	60.0	Severe
Lakewood Blvd.	232	2	110	51.7	58.0	53.9	60.0	Moderate

Grade Crossing	Cluster No.[1]	FTA Land Use Category[2]	Distance (ft.)[3]	Noise Level (Cat 2 dBA, L_{dn}) (Cat 3 dBA, L_{eq})				Impact
				Existing	Project	Impact Threshold		
						Moderate	Severe	
Lakewood Blvd.	231	2	85	51.7	60.2	53.9	60.0	Severe
Clark Ave.	247	2	150	51.2	55.3	53.8	59.9	Moderate
Clark Ave.	249	2	165	59.5	54.4	57.5	63.1	No
Clark Ave.	251	2	105	59.5	58.4	57.5	63.1	Moderate
Alondra Blvd.	251	2	140	59.5	55.9	57.5	63.1	No
Alondra Blvd.	252	3	120	61.5	61.0	63.6	69.2	No
Alondra Blvd.	253	2	115	59.5	57.6	57.5	63.1	Moderate
Bellflower Blvd.	261	2	50	59.5	64.8	57.5	63.1	Severe
Bellflower Blvd.	264	2	230	59.5	51.5	57.5	63.1	No
Bellflower Blvd.	266	3	120	58.0	61.0	61.7	67.4	No
Bellflower Blvd.	267	2	280	58.0	49.8	55.7	61.6	No
Artesia Blvd.	302	3	221	61.4	55.7	63.6	69.1	No
Studebaker Rd.	303	3	162	61.4	58.4	63.6	69.1	No
186th St.	326	2	130	48.0	56.5	52.7	59.2	Moderate
186th St.	322	2	230	48.0	51.5	52.7	59.2	No
186th St.	327	2	240	48.0	46.7	52.7	59.2	No
186th St.	328	2	61	48.0	63.1	52.7	59.2	Severe
186th St.	334	2	50	48.0	64.8	52.7	59.2	Severe
Pioneer Blvd.	344	2	85	52.0	60.2	54.1	60.1	Severe

Source: TAHA, 2020

Notes: [1] Cluster sites shown in Appendix A.

[2] Category 2: Residences and buildings where people normally sleep. This category includes homes, hospitals and hotels where a nighttime sensitivity to noise is assumed to be of utmost importance.

Category 3: Institutional land uses with primarily daytime and evening use. This category includes schools, libraries, theaters, and churches where it is important to avoid interference with such activities as speech, meditation and concentration on reading material. Places for meditation or study associated with cemeteries, monuments, museums, campgrounds and recreational facilities can also be considered to be in this category. Certain historical sites and parks are also included.

[3] Distance to the closest area of human use or closest building façade.

Table 5.3. Category 1 Land Use Light Rail Noise Assessment – Alternative 1

Cluster No.[1]	Land Use	Near Distance Track (ft.)[2]	Speed (mph)	Adjustments to LRT Noise[3]	Noise Level (dBA, L_{eq})				Impact
					Existing	Project	Impact Threshold		
							Moderate	Severe	
N1	Kairos Music	350	55	D	66.8	58.3	62.0	67.3	No

Source: TAHA, 2020
Notes: [1] Cluster sites shown in Appendix A.
[2] Distance to the closest area of human use or closest building façade.
[3] Adjustments to LRT noise based on intervening rows of buildings, track type, special trackwork, quacker noise, wheel squeal noise, and audible warning noise.
A = first row of intervening buildings.
B = second row of intervening buildings.
C = embedded track on grade.
D = aerial structure with slab track.
E = jointed track or crossover.
F = quacker noise.
G = wheel squeal noise.
H = audible warning noise

Table 5.4. Category 2 Land Use Light Rail Noise Assessment Alternative 1

Cluster No.[1]	Land Use	Near Distance Track (ft.)[2]	Speed (mph)	Adjustment to LRT Noise[3]	Noise Level (dBA, L_{dn})				Impact
					Existing	Project	Impact Threshold		
							Moderate	Severe	
N2	SFR/MFR	80	55	D	56.3	68.3	55.9	61.7	Severe
N3	SFR/MFR	210	55	D	56.3	64.1	55.9	61.7	Severe
N4	SFR/MFR	45	55	D	56.3	70.8	55.9	61.7	Severe
N5	SFR/MFR	240	55	D	56.3	63.5	55.9	61.7	Severe
N6	SFR/MFR	80	55	D	56.3	68.3	55.9	61.7	Severe
N7	SFR/MFR	240	55	D	56.3	63.5	55.9	61.7	Severe
N10	SFR/MFR	240	55	D	66.8	63.5	62.0	67.3	Moderate
N11	SFR/MFR	185	55	D	66.8	64.7	62.0	67.3	Moderate
N12	SFR/MFR	110	55	D	66.8	66.9	62.0	67.3	Moderate
N13	SFR/MFR	230	55	DE	66.8	68.7	62.0	67.3	Severe
N14	SFR/MFR	110	55	DE	66.8	71.9	62.0	67.3	Severe
N15	SFR/MFR	140	55	DE	66.8	70.9	62.0	67.3	Severe
N16	SFR/MFR	240	55	DE	66.8	68.5	62.0	67.3	Severe
N17	SFR/MFR	15	55	DE	66.8	80.6	62.0	67.3	Severe
N18	SFR/MFR	140	55	D	66.8	65.9	62.0	67.3	Moderate
N19	SFR/MFR	15	55	D	66.8	75.6	62.0	67.3	Severe
N20	SFR/MFR	110	55	DE	66.8	71.9	62.0	67.3	Severe
N21	SFR/MFR	320	55	D	66.8	62.3	62.0	67.3	Moderate
N22	SFR/MFR	320	55	D	66.8	62.3	62.0	67.3	Moderate
N23	SFR/MFR	110	55	D	66.8	66.9	62.0	67.3	Moderate
N24	SFR	30	55	D	66.8	72.6	62.0	67.3	Severe

Cluster No.[1]	Land Use	Near Distance Track (ft.)[2]	Speed (mph)	Adjustment to LRT Noise[3]	Noise Level (dBA, L_{dn})				Impact
					Existing	Project	Impact Threshold		
							Moderate	Severe	
N25	SFR/MFR	80	55	D	66.8	68.3	62.0	67.3	Severe
N27	SFR/MFR	300	55	D	66.8	62.6	62.0	67.3	Moderate
N29	SFR/MFR	110	55	D	66.8	66.9	62.0	67.3	Moderate
N30	SFR/MFR	230	55	D	66.8	63.7	62.0	67.3	Moderate
N31	SFR/MFR	220	50	D	70.5	63.1	64.7	69.8	No
N32	SFR/MFR	90	50	D	70.5	67.0	64.7	69.8	Moderate
N33	MFR	200	55	D	70.5	64.3	64.7	69.8	No
N34	MFR	60	55	D	70.5	69.6	64.7	69.8	Moderate
N35	SFR/MFR	80	55	D	70.5	68.3	64.7	69.8	Moderate
N36	SFR/MFR	210	35	D	70.5	60.2	64.7	69.8	No
N37	MFR	90	45	D	70.5	66.1	64.7	69.8	Moderate
N38	MFR	110	45	D	70.5	65.2	64.7	69.8	Moderate
N39	MFR	200	45	D	70.5	62.6	64.7	69.8	No
N40	SFR	215	45	DE	70.5	67.3	64.7	69.8	Moderate
N42	SFR/MFR	100	45	DE	70.5	70.6	64.7	69.8	Severe
N43	SFR	40	45	DEF	70.5	75.6	64.7	69.8	Severe
N44	SFR	155	45	DEF	70.5	69.7	64.7	69.8	Moderate
N45	SFR	100	25	DEF	70.5	66.5	64.7	69.8	Moderate
N46	SFR	155	20	DF	70.5	57.7	64.7	69.8	No
N47	SFR	40	20	DF	70.5	63.5	64.7	69.8	No
N48	SFR	220	20	DF	70.5	56.1	64.7	69.8	No
N49	SFR	160	20	DF	70.5	57.5	64.7	69.8	No

Cluster No.[1]	Land Use	Near Distance Track (ft.)[2]	Speed (mph)	Adjustment to LRT Noise[3]	Noise Level (dBA, L_{dn})				Impact
					Existing	Project	Impact Threshold		
							Moderate	Severe	
N50	SFR/MFR	90	20	DEG	65.4	74.0	61.1	66.4	Severe
N52	SFR/MFR	230	35	ACH	68.0	56.2	62.9	68.1	No
N53	SFR/MFR	130	35	None	68.0	58.3	62.9	68.1	No
N54	SFR	70	35	CH	68.0	64.4	62.9	68.1	Moderate
N55	SFR	140	35	ACH	68.0	57.6	62.9	68.1	No
N56	SFR	60	35	CH	68.0	67.0	62.9	68.1	Moderate
N57	SFR/MFR	215	35	H	68.0	57.8	62.9	68.1	No
N58	SFR/MFR	70	35	CH	68.0	64.4	62.9	68.1	Moderate
N59	SFR/MFR	230	35	None	68.0	55.8	62.9	68.1	No
N60	SFR/MFR	50	35	CH	68.0	68.6	62.9	68.1	Severe
N61	SFR	70	35	CH	68.0	64.9	62.9	68.1	Moderate
N63	SFR/MFR	235	35	H	68.0	57.2	62.9	68.1	No
N64	SFR/MFR	210	25	CFH	68.0	58.6	62.9	68.1	No
N65	SFR/MFR	70	25	FH	68.0	65.8	62.9	68.1	Moderate
N66	SFR/MFR	70	20	CFH	68.0	61.7	62.9	68.1	No
N69	SFR/MFR	225	20	CFH	61.8	56.9	58.8	64.3	No
N70	SFR/MFR	210	20	CFH	61.8	56.7	58.8	64.3	No
N71	MFR	55	20	CFH	61.8	67.0	58.8	64.3	Severe
N72	SFR/MFR	215	25	F	61.8	54.2	58.8	64.3	No
N73	SFR/MFR	65	35	EH	61.8	68.0	58.8	64.3	Severe
N74	SFR/MFR	130	35	E	61.8	63.3	58.8	64.3	Moderate
N75	MFR	100	35	AE	61.8	59.9	58.8	64.3	Moderate

Cluster No.[1]	Land Use	Near Distance Track (ft.)[2]	Speed (mph)	Adjustment to LRT Noise[3]	Noise Level (dBA, L_{dn})				Impact
					Existing	Project	Impact Threshold		
							Moderate	Severe	
N76	SFR/MFR	55	35	E	61.8	67.0	58.8	64.3	Severe
N77	SFR/MFR	140	35	E	61.8	63.0	58.8	64.3	Moderate
N78	SFR/MFR	110	35	ACEH	61.8	63.1	58.8	64.3	Moderate
N79	SFR/MFR	55	35	CEH	61.8	71.2	58.8	64.3	Severe
N80	SFR/MFR	65	35	CEH	61.8	70.6	58.8	64.3	Severe
N81	SFR	220	35	E	61.8	61.0	58.8	64.3	Moderate
N82	SFR/MFR	230	35	CH	61.8	59.6	58.8	64.3	Moderate
N84	SFR/MFR	120	35	A	61.8	54.1	58.8	64.3	No
N85	SFR/MFR	50	35	None	61.8	62.4	58.8	64.3	Moderate
N86	SFR/MFR	65	35	CH	61.8	67.6	58.8	64.3	Severe
N87	SFR	235	35	None	61.8	55.7	58.8	64.3	No
N88	SFR/MFR	70	35	CH	61.8	66.1	58.8	64.3	Severe
N89	SFR/MFR	45	35	None	63.1	62.9	59.6	65.1	Moderate
N90	SFR	130	35	A	63.1	53.8	59.6	65.1	No
N91	SFR	150	35	A	63.1	53.2	59.6	65.1	No
N92	SFR/MFR	130	35	CH	63.1	61.6	59.6	65.1	Moderate
N93	SFR	50	35	CH	63.1	67.0	59.6	65.1	Severe
N94	SFR/MFR	75	35	CH	63.1	64.3	59.6	65.1	Moderate
N95	SFR/MFR	225	35	H	63.1	56.6	59.6	65.1	No
N96	SFR	90	35	H	63.1	62.4	59.6	65.1	Moderate
N97	SFR/MFR	275	35	None	63.1	55.0	59.6	65.1	No
N98	SFR/MFR	100	35	CH	63.1	63.1	59.6	65.1	Moderate

Cluster No.[1]	Land Use	Near Distance Track (ft.)[2]	Speed (mph)	Adjustment to LRT Noise[3]	Noise Level (dBA, L_{dn})				Impact
					Existing	Project	Impact Threshold		
							Moderate	Severe	
N99	SFR/MFR	220	35	CH	63.1	60.9	59.6	65.1	Moderate
N101	SFR	250	55	None	63.1	59.4	59.6	65.1	No
N102	SFR	120	55	None	63.1	62.6	59.6	65.1	Moderate
N103	SFR	260	55	None	63.1	59.2	59.6	65.1	No
N104	SFR	140	55	None	63.1	61.9	59.6	65.1	Moderate
N105	SFR/MFR	135	55	DG	63.1	76.0	59.6	65.1	Severe
N107	SFR	130	55	CH	66.8	66.1	62.0	67.3	Moderate
N108	SFR	20	55	CEH	66.8	78.4	62.0	67.3	Severe
N109	SFR	145	55	AE	66.8	62.2	62.0	67.3	Moderate
N110	SFR	220	55	E	66.8	64.9	62.0	67.3	Moderate
N111	SFR	120	55	E	66.8	67.6	62.0	67.3	Severe
N112	SFR/MFR	65	55	CH	66.8	68.3	62.0	67.3	Severe
N113	SFR/MFR	35	55	CEH	66.8	77.1	62.0	67.3	Severe
N114	SFR	110	50	CH	66.8	66.0	62.0	67.3	Moderate
N115	SFR/MFR	270	50	CH	66.8	61.7	62.0	67.3	No
N116	SFR/MFR	25	50	CH	64.0	74.2	60.2	65.6	Severe
N117	SFR/MFR	125	50	A	64.0	57.1	60.2	65.6	No
N118	SFR	25	45	None	64.0	67.6	60.2	65.6	Severe
N119	SFR	35	40	CFH	64.0	69.4	60.2	65.6	Severe
N120	SFR	240	35	CFH	64.0	60.3	60.2	65.6	Moderate
N121	MFR	280	35	CFH	64.0	59.5	60.2	65.6	No
N122	SFR	315	20	CFH	63.1	55.1	59.6	65.1	No

Cluster No.[1]	Land Use	Near Distance Track (ft.)[2]	Speed (mph)	Adjustment to LRT Noise[3]	Noise Level (dBA, L_{dn})				Impact
					Existing	Project	Impact Threshold		
							Moderate	Severe	
N123	SFR	100	20	F	63.1	55.6	59.6	65.1	No
N124	SFR	145	20	AF	63.1	49.5	59.6	65.1	No
N125	SFR	210	25	F	63.1	54.3	59.6	65.1	No
N126	SFR	100	25	F	63.1	57.5	59.6	65.1	No
N127	SFR	130	25	AF	63.1	51.9	59.6	65.1	No
N128	SFR/MFR	270	20	F	63.1	51.3	59.6	65.1	No
N129	SFR/MFR	100	20	AF	63.1	51.1	59.6	65.1	No
N130	SFR	55	20	F	63.1	58.2	59.6	65.1	No
N131	SFR	180	25	F	63.1	54.9	59.6	65.1	No
N132	SFR	245	55	None	63.1	59.5	59.6	65.1	No
N133	SFR	110	55	None	63.1	62.9	59.6	65.1	Moderate
N134	SFR	175	55	A	63.1	56.4	59.6	65.1	No
N135	SFR	200	55	None	63.1	60.3	59.6	65.1	Moderate
N136	SFR/MFR	110	55	A	63.1	58.4	59.6	65.1	No
N137	SFR	60	55	None	63.1	65.6	59.6	65.1	Severe
N138	SFR	260	55	None	63.1	59.2	59.6	65.1	No
N139	SFR	250	55	None	63.1	59.4	59.6	65.1	No
N140	MFR	115	55	None	63.1	62.7	59.6	65.1	Moderate
N141	SFR	85	55	None	63.1	64.1	59.6	65.1	Moderate
N142	SFR	160	55	A	63.1	56.8	59.6	65.1	No
N143	SFR	260	55	None	63.1	59.2	59.6	65.1	No
N144	SFR	70	55	None	63.1	64.9	59.6	65.1	Moderate

Cluster No.[1]	Land Use	Near Distance Track (ft.)[2]	Speed (mph)	Adjustment to LRT Noise[3]	Noise Level (dBA, L_{dn})				Impact
					Existing	Project	Impact Threshold		
							Moderate	Severe	
N145	SFR	240	55	None	63.1	59.5	59.6	65.1	No
N146	SFR	100	55	None	63.1	63.4	59.6	65.1	Moderate
N147	SFR	130	55	A	63.1	57.7	59.6	65.1	No
N148	SFR	240	55	None	63.1	59.5	59.6	65.1	No
N149	SFR	100	55	None	63.1	63.4	59.6	65.1	Moderate
N150	SFR	150	55	A	63.1	57.1	59.6	65.1	No
N151	SFR	240	55	None	63.1	59.5	59.6	65.1	No
N152	SFR	120	55	A	63.1	58.1	59.6	65.1	No
N153	SFR	65	55	None	63.1	65.2	59.6	65.1	Severe
N154	SFR	140	55	A	63.1	57.4	59.6	65.1	No
N155	SFR	200	55	None	63.1	60.3	59.6	65.1	Moderate
N156	SFR	90	55	None	63.1	63.8	59.6	65.1	Moderate
N157	SFR	140	55	AD	61.1	61.4	58.4	64.0	Moderate
N158	SFR	90	55	D	61.1	67.8	58.4	64.0	Severe
N159	SFR	205	55	D	61.1	64.2	58.4	64.0	Severe
N160	SFR	140	55	CH	61.1	65.5	58.4	64.0	Severe
N161	SFR	110	55	CH	61.1	67.8	58.4	64.0	Severe
N162	SFR	170	55	CEH	61.1	69.1	58.4	64.0	Severe
N163	SFR/MFR	95	55	CEH	61.1	71.6	58.4	64.0	Severe
N164	SFR/MFR	180	55	E	61.1	65.8	58.4	64.0	Severe
N165	MFR	185	55	CH	61.1	64.0	58.4	64.0	Severe
N166	MFR	60	55	CH	61.1	68.6	58.4	64.0	Severe

Cluster No.[1]	Land Use	Near Distance Track (ft.)[2]	Speed (mph)	Adjustment to LRT Noise[3]	Noise Level (dBA, L_{dn})				Impact
					Existing	Project	Impact Threshold		
							Moderate	Severe	
N167	SFR	140	55	A	61.1	57.4	58.4	64.0	No
N168	Mobile Homes	70	55	None	61.1	64.9	58.4	64.0	Severe
N169	Motel	220	50	D	68.0	63.1	62.9	68.1	Moderate
N170	SFR	305	55	CH	58.7	61.9	57.1	62.8	Moderate
N171	SFR	250	55	None	58.7	59.4	57.1	62.8	Moderate
N172	SFR	130	55	None	58.7	62.2	57.1	62.8	Moderate
N173	SFR	240	55	D	58.7	63.5	57.1	62.8	Severe
N174	SFR	140	55	D	68.0	65.9	62.9	68.1	Moderate
N175	SFR	240	55	D	58.7	63.5	57.1	62.8	Severe
N176	MFR	145	55	D	58.7	65.7	57.1	62.8	Severe
N177	Thunderbird Villa Mobile Home Estates	140	55	D	57.4	65.9	56.4	62.2	Severe
N178	Thunderbird Villa Mobile Home Estates	175	55	DH	57.4	64.9	56.4	62.2	Severe
N179	Thunderbird Villa Mobile Home Estates	90	55	DH	57.4	67.8	56.4	62.2	Severe
N180	Thunderbird Villa Mobile Home Estates	25	55	DH	57.4	73.4	56.4	62.2	Severe
N182	SFR	280	35	None	59.3	55.0	57.4	63.0	No
N185	SFR	210	25	E	59.9	58.3	57.7	63.3	Moderate
N186	SFR	300	25	None	59.3	51.7	57.4	63.0	No
N187	SFR	220	20	E	59.9	56.1	57.7	63.3	No
N188	SFR	220	25	CFH	60.3	58.4	58.0	63.5	Moderate

Cluster No.[1]	Land Use	Near Distance Track (ft.)[2]	Speed (mph)	Adjustment to LRT Noise[3]	Noise Level (dBA, L_{dn})				Impact
					Existing	Project	Impact Threshold		
							Moderate	Severe	
N189	SFR	185	25	CFH	61.2	60.0	58.5	64.0	Moderate
N190	SFR	95	55	CFH	63.7	70.2	60.0	65.4	Severe
N191	SFR	30	55	F	64.0	69.6	60.2	65.6	Severe
N192	SFR	20	55	F	64.0	71.3	60.2	65.6	Severe
N193	SFR	15	55	F	64.0	72.6	60.2	65.6	Severe
N194	SFR	45	55	F	64.0	67.8	60.2	65.6	Severe
N195	SFR	230	55	F	64.0	60.7	60.2	65.6	Moderate
N196	SFR	45	55	F	64.0	67.8	60.2	65.6	Severe
N197	SFR	15	55	F	64.0	72.6	60.2	65.6	Severe
N198	SFR	290	55	None	64.0	58.7	60.2	65.6	No
N199	SFR	285	55	D	57.9	62.8	56.7	62.4	Severe
N200	SFR	15	55	D	66.7	75.6	62.0	67.3	Severe
N201	SFR	65	55	D	66.1	69.2	61.6	66.9	Severe
N202	SFR	240	55	D	58.9	63.5	57.2	62.9	Severe
N203	SFR	190	20	DG	50.3	65.8	53.5	59.7	Severe
N204	SFR	65	20	DG	50.3	70.4	53.5	59.7	Severe
N205	SFR	280	20	DG	59.9	64.1	57.7	63.3	Severe
N206	SFR	15	20	DG	65.1	76.8	60.9	66.3	Severe
N207	SFR	75	20	DG	58.7	69.8	57.1	62.8	Severe
N208	SFR	170	20	DG	64.6	66.3	60.6	66.0	Severe
N209	SFR	290	35	DG	67.5	68.8	62.5	67.8	Severe
N210	SFR	80	35	DG	60.6	74.4	58.1	63.7	Severe

Cluster No.[1]	Land Use	Near Distance Track (ft.)[2]	Speed (mph)	Adjustment to LRT Noise[3]	Noise Level (dBA, L_{dn})				Impact
					Existing	Project	Impact Threshold		
							Moderate	Severe	
N211	SFR	260	20	D	58.6	54.4	57.0	62.7	No
N212	SFR	140	20	D	60.1	57.1	57.8	63.4	No
N213	SFR	55	20	D	65.2	61.2	61.0	66.3	Moderate
N214	MFR	335	45	D	51.7	60.4	53.9	60.0	Severe
N215	SFR	100	55	D	58.0	67.4	56.7	62.4	Severe
N216	SFR	70	55	D	58.0	68.9	56.7	62.4	Severe
N217	SFR	100	55	D	58.0	67.4	56.7	62.4	Severe
N218	SFR	75	55	D	58.0	68.6	56.7	62.4	Severe
N219	SFR	120	65	D	58.0	68.0	56.7	62.4	Severe
N220	SFR	130	65	D	58.0	67.7	56.7	62.4	Severe
N222	SFR	130	65	D	51.7	67.7	53.9	60.0	Severe
N223	SFR	135	65	D	51.7	67.5	53.9	60.0	Severe
N224	SFR	135	65	CH	51.7	66.6	53.9	60.0	Severe
N225	SFR	220	65	None	51.7	61.4	53.9	60.0	Severe
N226	SFR	125	65	CH	51.7	67.2	53.9	60.0	Severe
N227	SFR	20	65	CEH	51.7	79.9	53.9	60.0	Severe
N228	SFR	200	65	E	51.7	66.8	53.9	60.0	Severe
N229	SFR	100	65	E	51.7	69.8	53.9	60.0	Severe
N230	SFR	30	65	E	51.7	75.0	53.9	60.0	Severe
N231	SFR	60	65	CH	51.7	70.4	53.9	60.0	Severe
N232	SFR	115	65	CH	51.7	67.7	53.9	60.0	Severe
N233	SFR/MFR	210	65	None	51.7	61.6	53.9	60.0	Severe

Cluster No.[1]	Land Use	Near Distance Track (ft.)[2]	Speed (mph)	Adjustment to LRT Noise[3]	Noise Level (dBA, L_{dn})				Impact
					Existing	Project	Impact Threshold		
							Moderate	Severe	
N234	Mobile Homes	160	65	A	52.0	58.3	54.1	60.1	Moderate
N235	Mobile Homes	60	65	None	52.0	67.0	54.1	60.1	Severe
N236	SFR	100	65	None	52.0	64.8	54.1	60.1	Severe
N237	SFR	160	65	None	52.0	62.8	54.1	60.1	Severe
N238	SFR	95	65	A	52.0	60.5	54.1	60.1	Severe
N239	SFR	170	65	None	48.1	62.5	52.8	59.2	Severe
N240	SFR	90	65	None	48.1	65.3	52.8	59.2	Severe
N241	SFR	155	65	None	52.0	62.9	54.1	60.1	Severe
N242	SFR	215	65	None	52.0	61.5	54.1	60.1	Severe
N243	SFR	60	65	None	52.0	67.0	54.1	60.1	Severe
N245	MFR	70	65	None	51.2	66.4	53.8	59.9	Severe
N246	MFR	65	65	CH	51.2	70.9	53.8	59.9	Severe
N247	SFR	95	65	CH	51.2	68.2	53.8	59.9	Severe
N248	MFR	170	65	None	51.2	62.5	53.8	59.9	Severe
N249	SFR	165	55	CH	59.5	64.6	57.5	63.1	Severe
N250	SFR	165	55	A	59.5	56.7	57.5	63.1	No
N251	SFR	85	55	CH	59.5	67.4	57.5	63.1	Severe
N253	SFR	100	45	CH	59.5	65.4	57.5	63.1	Severe
N254	SFR	100	45	E	59.5	66.6	57.5	63.1	Severe
N255	Aztec Mobile Home	35	35	E	59.5	69.0	57.5	63.1	Severe
N256	SFR	215	35	None	59.5	56.1	57.5	63.1	No
N258	SFR/MFR	150	35	A	59.5	53.2	57.5	63.1	No

Cluster No.[1]	Land Use	Near Distance Track (ft.)[2]	Speed (mph)	Adjustment to LRT Noise[3]	Noise Level (dBA, L_{dn})				Impact
					Existing	Project	Impact Threshold		
							Moderate	Severe	
N259	SFR	100	35	None	59.5	59.4	57.5	63.1	Moderate
N260	SFR	220	25	F	59.5	54.1	57.5	63.1	No
N261	SFR/MFR	90	20	CFH	59.5	65.8	57.5	63.1	Severe
N262	MFR	305	20	F	59.5	50.7	57.5	63.1	No
N264	MFR	160	20	CFH	59.5	57.7	57.5	63.1	Moderate
N265	MFR	270	20	F	56.0	51.3	55.7	61.6	No
N267	MFR	30	45	CH	56.0	69.9	55.7	61.6	Severe
N268	MFR	50	55	None	56.0	66.4	55.7	61.6	Severe
N270	MFR	140	65	None	56.0	63.3	55.7	61.6	Severe
N271	MFR	130	65	None	56.0	63.7	55.7	61.6	Severe
N274	SFR	125	65	D	56.0	67.8	55.7	61.6	Severe
N275	MFR	295	65	D	56.0	64.1	55.7	61.6	Severe
N276	MFR	220	65	CD	69.4	68.4	63.9	69.1	Moderate
N277	SFR	130	65	ACD	69.4	66.2	63.9	69.1	Moderate
N278	SFR/MFR	60	65	CD	69.4	74.0	63.9	69.1	Severe
N279	SFR	245	65	CD	69.4	67.9	63.9	69.1	Moderate
N280	MFR	320	65	D	69.4	63.8	63.9	69.1	No
N281	MFR	235	65	CD	69.4	68.1	63.9	69.1	Moderate
N282	MFR	205	65	CD	69.4	68.7	63.9	69.1	Moderate
N283	SFR	110	65	CD	57.7	71.4	56.6	62.3	Severe
N284	SFR	175	65	D	57.7	66.4	56.6	62.3	Severe
N285	SFR	185	65	DE	57.7	71.1	56.6	62.3	Severe

Cluster No.[1]	Land Use	Near Distance Track (ft.)[2]	Speed (mph)	Adjustment to LRT Noise[3]	Noise Level (dBA, L_{dn})				Impact
					Existing	Project	Impact Threshold		
							Moderate	Severe	
N286	Bel Tooren Villa Convalescent Hospital	120	65	D	69.4	68.0	63.9	69.1	Moderate
N287	SFR	50	65	D	57.7	71.8	56.6	62.3	Severe
N288	SFR	220	65	D	57.7	65.4	56.6	62.3	Severe
N289	SFR	200	65	DE	57.7	70.8	56.6	62.3	Severe
N290	SFR	45	65	E	57.7	73.3	56.6	62.3	Severe
N291	SFR	100	65	E	57.7	69.8	56.6	62.3	Severe
N292	SFR	160	65	AE	57.7	63.3	56.6	62.3	Severe
N293	SFR	230	65	E	57.7	66.2	56.6	62.3	Severe
N294	SFR	65	65	E	57.7	71.7	56.6	62.3	Severe
N295	SFR	160	65	None	57.7	62.8	56.6	62.3	Severe
N296	SFR	150	65	AE	57.7	63.5	56.6	62.3	Severe
N297	SFR	60	65	E	57.7	72.0	56.6	62.3	Severe
N298	SFR	95	65	None	57.7	65.0	56.6	62.3	Severe
N299	SFR	150	65	None	57.7	63.0	56.6	62.3	Severe
N300	SFR	80	65	None	57.7	65.8	56.6	62.3	Severe
N301	SFR	75	65	None	57.7	66.1	56.6	62.3	Severe
N306	SFR	210	65	D	51.2	65.6	53.8	59.9	Severe
N307	SFR	50	65	D	51.2	71.8	53.8	59.9	Severe
N308	SFR	210	65	D	51.2	65.6	53.8	59.9	Severe
N309	SFR	50	65	D	51.2	71.8	53.8	59.9	Severe
N310	SFR	50	65	D	51.2	71.8	53.8	59.9	Severe

Cluster No.[1]	Land Use	Near Distance Track (ft.)[2]	Speed (mph)	Adjustment to LRT Noise[3]	Noise Level (dBA, L_{dn})				Impact
					Existing	Project	Impact Threshold		
							Moderate	Severe	
N311	SFR	140	65	D	51.2	67.3	53.8	59.9	Severe
N312	SFR	50	65	D	51.2	71.8	53.8	59.9	Severe
N313	SFR	175	65	D	51.2	66.4	53.8	59.9	Severe
N314	SFR	70	65	D	51.2	70.4	53.8	59.9	Severe
N315	SFR	40	65	D	51.2	72.8	53.8	59.9	Severe
N316	SFR	130	65	AD	51.2	63.2	53.8	59.9	Severe
N317	SFR	220	65	D	51.2	65.4	53.8	59.9	Severe
N318	SFR	110	65	D	51.2	68.4	53.8	59.9	Severe
N319	SFR	50	65	D	51.2	71.8	53.8	59.9	Severe
N320	SFR	110	65	AD	51.2	63.9	53.8	59.9	Severe
N321	SFR	210	65	D	48.0	65.6	52.7	59.2	Severe
N322	SFR	40	65	CDH	48.0	75.8	52.7	59.2	Severe
N323	SFR	45	65	D	48.0	72.3	52.7	59.2	Severe
N324	SFR	200	65	D	48.0	65.8	52.7	59.2	Severe
N325	SFR	140	65	D	48.0	67.3	52.7	59.2	Severe
N326	SFR	50	65	CDH	48.0	74.9	52.7	59.2	Severe
N327	MFR	210	65	CH	48.0	64.6	52.7	59.2	Severe
N328	SFR/MFR	45	45	CEH	48.0	73.5	52.7	59.2	Severe
N329	SFR	190	55	None	48.0	60.6	52.7	59.2	Severe
N330	SFR	180	45	AE	48.0	59.6	52.7	59.2	Severe
N331	SFR/MFR	35	35	CE	48.0	72.0	52.7	59.2	Severe
N333	SFR	175	55	AC	48.0	59.4	52.7	59.2	Severe

Cluster No.[1]	Land Use	Near Distance Track (ft.)[2]	Speed (mph)	Adjustment to LRT Noise[3]	Noise Level (dBA, L_{dn})				Impact
					Existing	Project	Impact Threshold		
							Moderate	Severe	
N334	SFR	40	45	CEH	48.0	74.1	52.7	59.2	Severe
N335	SFR/MFR	200	45	None	48.0	58.6	52.7	59.2	Moderate
N336	SFR	180	35	E	48.0	61.9	52.7	59.2	Severe
N338	SFR/MFR	160	35	EF	48.0	63.4	52.7	59.2	Severe
N339	SFR/MFR	90	35	CEF	48.0	68.9	52.7	59.2	Severe
N340	SFR	200	20	EF	48.0	57.6	52.7	59.2	Moderate
N341	SFR	110	20	CEF	48.0	63.2	52.7	59.2	Severe
N342	SFR	80	20	CEF	48.0	64.5	52.7	59.2	Severe
N343	SFR	200	20	EF	48.0	57.6	52.7	59.2	Moderate
N344	SFR	40	15	CE	52.0	64.0	54.1	60.1	Severe
N345	SFR	165	15	AE	52.0	50.4	54.1	60.1	No
N346	SFR	40	15	E	52.0	61.0	54.1	60.1	Severe
N347	SFR	45	15	None	52.0	55.5	54.1	60.1	Moderate

Source: TAHA, 2020
Notes: [1] Cluster sites shown in Appendix A.
[2] Distance to the closest area of human use or closest building façade.
[3] Adjustments to LRT noise based on intervening rows of buildings, track type, special trackwork, quacker noise, wheel squeal noise, and audible warning noise.
A = first row of intervening buildings.
B = second row of intervening buildings.
C = embedded track on grade.
D = aerial structure with slab track.
E = jointed track or crossover.
F = quacker noise.
G = wheel squeal noise.
H = audible warning noise.
SFR = Single-Family Residential; MFR = Multi-Family Residential

Table 5.5. Category 3 Land Use Light Rail Noise Assessment – Alternative 1

Cluster No.[1]	Land Use	Near Track Distance (ft)[2]	Speed (mph)	Adjustment to LRT Noise[3]	Noise Level (dBA, L_{eq})				Impact
							Impact Threshold		
					Existing	Project	Moderate	Severe	
N8	Ánimo Ralph Bunche Charter High School	120	55	None	68.8	63.0	68.5	73.7	No
N9	Ánimo Jefferson Charter Middle School	310	55	None	68.8	58.9	68.5	73.7	No
N26	Greater Olivet Baptist Church	350	55	None	58.3	68.5	73.7	No	58.3
N28	Iglesia Jesus Cristo Libertador	330	55	None	68.8	58.6	68.5	73.7	No
N41	Greater Holy Saint John Baptist Church	260	45	E	72.5	62.9	70.0	76.3	No
N51	Lillian Street Elementary School	140	35	E	67.4	64.6	67.5	72.7	No
N62	Templo Asamblea De Oracion	80	35	CH	64.2	66.2	65.3	70.7	Moderate
N67	UEI College	40	35	FH	64.2	61.5	65.3	70.7	No
N68	Huntington Park Iglesia Pentecostes	220	25	F	63.8	50.6	65.1	70.5	No
N83	Huntington Park High School	50	35	CH	63.8	65.8	65.1	70.5	Moderate
N100	San Antonio Elementary	145	55	CH	65.1	63.1	65.9	71.3	No
N106	Elk's Lodge Community Center	290	55	CH	68.8	59.7	68.5	73.7	No
N181	Trinity Bible Church	20	35	CH	75.3	76.9	70.0	78.4	Moderate
N183	Apostolic Assembly South Gate	280	35	None	66.6	51.4	66.9	72.2	No
N184	American Indian Bible Church	80	35	CH	74.7	76.7	70.0	78.0	Moderate
N221	Paramount High School	85	65	None	53.7	66.0	59.7	65.7	Severe
N244	Adventist Union School	230	65	None	53.2	57.7	59.5	65.5	No
N252	Door Christian Fellowship Church	150	55	CH	61.5	64.0	63.6	69.2	Moderate
N257	Greek Apostolic Church	290	35	None	61.5	51.3	63.6	69.2	No
N263	Kingdom Causes Bellflower	245	20	F	61.5	48.1	63.6	69.2	No
N266	Los Angeles County Fire Museum	110	25	FH	58.0	61.7	61.7	67.4	Moderate

Cluster No.[1]	Land Use	Near Track Distance (ft)[2]	Speed (mph)	Adjustment to LRT Noise[3]	Noise Level (dBA, L_{eq})				Impact
					Existing	Project	Impact Threshold		
							Moderate	Severe	
N269	Open Door Worship Center	200	65	None	58.0	58.3	61.7	67.4	No
N272	Bristol Civic Auditorium	70	65	None	58.0	66.8	61.7	67.4	Moderate
N273	Bellflower Health Center	120	65	None	58.0	64.5	61.7	67.4	Moderate
N302	Valley Christian High School	180	65	CH	61.4	62.7	63.6	69.1	No
N303	Rio Hondo Metal Health Clinic	160	65	CH	61.4	63.7	63.6	69.1	Moderate
N304	Fremont College	200	65	None	53.2	58.3	59.5	65.5	No
N305	Artesia Cemetery	220	65	None	53.2	57.9	59.5	65.5	No
N332	Artesia Historical Museum	45	35	E	50.0	64.4	58.4	64.6	Moderate
N337	Wan Yuen Temple	55	35	CE	50.0	66.5	58.4	64.6	Severe

Source: TAHA, 2020
Notes: [1] Cluster sites shown in Appendix A.
[2] Distance to the closest area of human use or closest building façade.
[3] Adjustments to LRT noise based on intervening rows of buildings, track type, special trackwork, quacker noise, wheel squeal noise, and audible warning noise.
A = first row of intervening buildings.
B = second row of intervening buildings.
C = embedded track on grade.
D = aerial structure with slab track.
E = jointed track or crossover.
F = quacker noise.
G = wheel squeal noise.
H = audible warnings noise.

5.2.2.2 Vibration

Vibration-sensitive land uses along the alignment were categorized using the FTA Vibration Categories of 1, 2, or 3. The sensitive uses were grouped into clusters, each having one representative receiver. Vibration levels were modeled at each cluster and are shown in the following tables. The location of these clusters is shown in Appendix B. No Vibration Category 1 land uses (i.e., buildings where vibration would interfere with interior operations) were identified for Alternative 1. Table 5.6 provides vibration levels for Vibration Category 2 land uses that are within 150 feet of the near track centerline (the screening distance for Vibration Category 2 uses shown in Table 1.3. Vibration Category 2 includes all residential land uses and buildings where people normally sleep, such as hospitals and hotels, where nighttime sensitivity is assumed to be of utmost importance. 101 Vibration Category 2 receivers are predicted to exceed the FTA vibration impact threshold of 72 VdB for frequent events. These predicted GBV levels are in the range of 1 to 20 VdB above the FTA vibration criteria. Thirty-eight clusters are predicted to exceed the impact criteria by more than 5 VdB. Therefore, where the projected GBV is 1 VdB to 5 VdB greater than the impact threshold, there is a strong chance that actual GBV levels will be below the impact threshold and would not result in an adverse effect. Where the projected GBV is 5 VdB greater than the impact threshold, vibration impact is probable.

Table 5.7 provides vibration levels for Vibration Category 3 land uses that are within 100 feet of the nearest track centerline. Vibration Category 3 includes schools, churches, and other institutions, and quiet offices that do not consist of vibration sensitive equipment. None of the Vibration Category 3 receivers are predicted to exceed the FTA vibration impact threshold.

Table 5.6. Vibration Category 2 Land Use Light Rail At-Grade/Aerial Vibration Assessment – Alternative 1

Cluster No.[1]	Land Use	Near Track Distance (ft.)	Speed (mph)	Track Type	Predicted GBV Level, VdB	FTA GBV Level, VdB	Exceeds?[2]	Amount Exceeds, VdB
V28	SFR/MFR	105	55	Aerial	66	72	No	–
V29	SFR/MFR	100	55	Aerial	66	72	No	–
V30	SFR/MFR	100	55	Aerial	66	72	No	–
V31	SFR/MFR	40	55	Aerial	80[3]	72	Yes	8
V32	SFR/MFR	110	55	Aerial	65	72	No	–
V33	SFR/MFR	40	55	Aerial	78[3]	72	Yes	6
V34	SFR/MFR	110	55	Aerial	74[3]	72	Yes	2
V35	SFR/MFR	110	55	Aerial	65	72	No	–
V36	SFR/MFR	100	55	Aerial	66	72	No	–
V37	SFR/MFR	40	55	Aerial	73	72	Yes	1
V39	SFR/MFR	100	50	Aerial	66	72	No	–
V40	SFR/MFR	40	40	Aerial	71	72	No	–
V41	SFR/MFR	120	55	Aerial	64	72	No	–
V43	SFR/MFR	100	45	Aerial	70[3]	72	No	–
V44	SFR/MFR	100	25	Aerial	61	72	No	–
V45	SFR/MFR	75	20	Aerial	69	72	No	–
V47	SFR/MFR	130	35	Ballast & Tie	66	72	No	–
V48	SFR	55	35	Ballast & Tie	73	72	Yes	1
V49	SFR	135	35	Ballast & Tie	65	72	No	–
V50	SFR	65	35	Ballast & Tie	72	72	No	–
V51	SFR/MFR	115	35	Ballast & Tie	67	72	No	–
V52	SFR/MFR	60	35	Ballast & Tie	72	72	No	–

Cluster No.[1]	Land Use	Near Track Distance (ft.)	Speed (mph)	Track Type	Predicted GBV Level, VdB	FTA GBV Level, VdB	Exceeds?[2]	Amount Exceeds, VdB
V53	SFR/MFR	40	35	Ballast & Tie	75	72	Yes	3
V54	SFR	65	35	Ballast & Tie	72	72	No	–
V56	SFR/MFR	55	35	Ballast & Tie	73	72	Yes	1
V58	MFR	55	35	Ballast & Tie	73	72	Yes	1
V59	SFR/MFR	50	35	Ballast & Tie	74	72	Yes	2
V60	SFR/MFR	135	35	Ballast & Tie	65	72	No	–
V61	MFR	90	35	Ballast & Tie	69	72	No	–
V62	SFR/MFR	110	35	Ballast & Tie	74[3]	72	Yes	2
V63	SFR/MFR	50	35	Ballast & Tie	81[3]	72	Yes	9
V65	SFR/MFR	120	35	Ballast & Tie	67	72	No	–
V66	SFR/MFR	40	35	Ballast & Tie	75	72	Yes	3
V67	SFR/MFR	50	35	Ballast & Tie	74	72	Yes	2
V68	SFR/MFR	50	35	Ballast & Tie	74	72	Yes	2
V69	SFR/MFR	45	35	Ballast & Tie	75	72	Yes	3
V70	SFR	110	35	Ballast & Tie	67	72	No	–
V71	SFR	145	35	Ballast & Tie	65	72	No	–
V72	SFR	50	35	Ballast & Tie	74	72	Yes	2
V73	SFR/MFR	75	25	Ballast & Tie	68	72	No	–
V74	SFR	75	35	Ballast & Tie	71	72	No	–
V75	SFR/MFR	85	35	Ballast & Tie	70	72	No	–
V77	SFR	90	55	Aerial	67	72	No	–
V78	SFR	95	55	Aerial	67	72	No	–
V79	SFR/MFR	95	55	Aerial	67	72	No	–

Cluster No.[1]	Land Use	Near Track Distance (ft.)	Speed (mph)	Track Type	Predicted GBV Level, VdB	FTA GBV Level, VdB	Exceeds?[2]	Amount Exceeds, VdB
V80	SFR	135	55	Ballast & Tie	68	72	No	–
V81	SFR	20	55	Ballast & Tie	92[3]	72	Yes	20
V82	SFR	90	55	Ballast & Tie	77	72	Yes	5
V83	SFR/MFR	100	50	Ballast & Tie	71	72	No	–
V84	SFR/MFR	35	50	Ballast & Tie	79	72	Yes	7
V85	SFR	115	50	Ballast & Tie	69	72	No	–
V86	SFR/MFR	25	50	Ballast & Tie	80	72	Yes	8
V87	SFR/MFR	125	50	Ballast & Tie	68	72	No	–
V88	SFR	25	55	Ballast & Tie	81	72	Yes	9
V89	SFR	30	40	Ballast & Tie	78	72	Yes	6
V90	SFR	90	55	Ballast & Tie	72	72	No	–
V91	SFR	135	55	Ballast & Tie	68	72	No	–
V92	SFR	80	45	Ballast & Tie	72	72	No	–
V93	SFR	120	45	Ballast & Tie	68	72	No	–
V94	SFR/MFR	55	45	Ballast & Tie	75	72	Yes	3
V95	SFR	100	45	Ballast & Tie	70	72	No	–
V96	SFR	80	55	Ballast & Tie	73	72	Yes	1
V97	SFR	150	55	Ballast & Tie	67	72	No	–
V98	SFR/MFR	110	55	Ballast & Tie	70	72	No	–
V99	SFR	60	55	Ballast & Tie	75	72	Yes	3
V100	MFR	110	55	Ballast & Tie	70	72	No	–
V101	SFR	80	55	Ballast & Tie	73	72	Yes	1
V102	SFR	50	55	Ballast & Tie	77	72	Yes	5

Cluster No.[1]	Land Use	Near Track Distance (ft.)	Speed (mph)	Track Type	Predicted GBV Level, VdB	FTA GBV Level, VdB	Exceeds?[2]	Amount Exceeds, VdB
V103	SFR	85	55	Ballast & Tie	73	72	Yes	1
V104	SFR	130	55	Ballast & Tie	69	72	No	–
V105	SFR	80	55	Ballast & Tie	73	72	Yes	1
V106	SFR	130	55	Ballast & Tie	69	72	No	–
V107	SFR	120	55	Ballast & Tie	69	72	No	–
V108	SFR	65	55	Ballast & Tie	75	72	Yes	3
V109	SFR	130	55	Ballast & Tie	69	72	No	–
V110	SFR	75	55	Ballast & Tie	74	72	Yes	2
V111	SFR	120	55	Ballast & Tie	69	72	No	–
V112	SFR	70	55	Ballast & Tie	74[3]	72	Yes	2
V113	SFR	80	55	Ballast & Tie	73[3]	72	Yes	1
V114	SFR	75	55	Ballast & Tie	74[3]	72	Yes	2
V115	SFR	140	55	Ballast & Tie	75[3]	72	Yes	3
V116	SFR/MFR	80	55	Ballast & Tie	80[3]	72	Yes	8
V117	MFR	75	55	Ballast & Tie	74	72	Yes	2
V118	SFR	150	55	Ballast & Tie	67	72	No	–
V119	Mobile Homes	85	55	Ballast & Tie	73	72	Yes	1
V120	SFR	95	55	Ballast & Tie	72[3]	72	No	–
V121	SFR	95	55	Aerial DF	67	72	No	–
V122	MFR	95	55	Aerial DF	67	72	No	–
V123	Thunderbird Villa Mobile Home Estates	145	55	Aerial DF	63	72	No	–
V124	Thunderbird Villa Mobile Home Estates	80	55	Aerial DF	68	72	No	–

Cluster No.[1]	Land Use	Near Track Distance (ft.)	Speed (mph)	Track Type	Predicted GBV Level, VdB	FTA GBV Level, VdB	Exceeds?[2]	Amount Exceeds, VdB
V127	SFR	60	55	Ballast & Tie	75	72	Yes	3
V128	SFR	25	55	Ballast & Tie	81	72	Yes	9
V129	SFR	15	55	Ballast & Tie	84	72	Yes	12
V130	SFR	24	55	Ballast & Tie	81	72	Yes	9
V131	SFR	20	55	Ballast & Tie	82	72	Yes	10
V132	SFR	34	55	Ballast & Tie	79	72	Yes	7
V133	SFR	20	55	Ballast & Tie	82	72	Yes	10
V134	SFR	20	55	Ballast & Tie	82	72	Yes	10
V135	SFR	25	55	Ballast & Tie	81	72	Yes	9
V136	SFR	60	20	Ballast & Tie	69	72	No	–
V137	SFR	15	20	Aerial	72	72	No	–
V138	SFR	95	20	Aerial	60	72	No	–
V139	SFR	50	35	Aerial	66	72	No	–
V140	SFR	70	55	Ballast & Tie	74	72	Yes	2
V141	SFR	60	55	Ballast & Tie	75	72	Yes	3
V142	SFR	72	55	Ballast & Tie	74	72	Yes	2
V143	SFR	118	55	Ballast & Tie	70	72	No	–
V144	SFR	66	55	Ballast & Tie	75	72	Yes	3
V145	SFR	130	55	Ballast & Tie	69	72	No	–
V146	SFR	120	55	Ballast & Tie	69	72	No	–
V148	SFR	118	55	Ballast & Tie	70	72	No	–
V149	SFR	125	55	Ballast & Tie	75[3]	72	Yes	3
V150	SFR	117	55	Ballast & Tie	70	72	No	–

Cluster No.[1]	Land Use	Near Track Distance (ft.)	Speed (mph)	Track Type	Predicted GBV Level, VdB	FTA GBV Level, VdB	Exceeds?[2]	Amount Exceeds, VdB
V151	SFR	115	55	Ballast & Tie	70	72	No	–
V152	SFR	20	55	Ballast & Tie	82	72	Yes	10
V153	SFR	33	55	Ballast & Tie	84[3]	72	Yes	12
V154	SFR	31	55	Ballast & Tie	90[3]	72	Yes	18
V155	SFR	50	55	Ballast & Tie	77[3]	72	Yes	5
V156	SFR	136	55	Ballast & Tie	68	72	No	–
V157	Mobile Homes	70	55	Ballast & Tie	74	72	Yes	2
V158	SFR	66	55	Ballast & Tie	75	72	Yes	3
V159	SFR	119	55	Ballast & Tie	70	72	No	–
V160	SFR	70	55	Ballast & Tie	74	72	Yes	2
V161	SFR	100	55	Ballast & Tie	71	72	No	–
V162	SFR	65	55	Ballast & Tie	75	72	Yes	3
V163	SFR	75	55	Ballast & Tie	74	72	Yes	2
V165	MFR	80	55	Ballast & Tie	73	72	Yes	1
V166	MFR	65	55	Ballast & Tie	75	72	Yes	3
V167	SFR	98	55	Ballast & Tie	71	72	No	–
V168	MFR	117	55	Ballast & Tie	70	72	No	–
V169	SFR	150	55	Ballast & Tie	67	72	No	–
V170	SFR	150	55	Ballast & Tie	67	72	No	–
V171	SFR	60	55	Ballast & Tie	75	72	Yes	3
V172	SFR	114	55	Ballast & Tie	70	72	No	–
V173	SFR	117	55	Ballast & Tie	76[3]	72	Yes	4
V174	Aztec Mobile Home	25	55	Ballast & Tie	91[3]	72	Yes	19

Cluster No.[1]	Land Use	Near Track Distance (ft.)	Speed (mph)	Track Type	Predicted GBV Level, VdB	FTA GBV Level, VdB	Exceeds?[2]	Amount Exceeds, VdB
V175	SFR	120	55	Ballast & Tie	76[3]	72	Yes	4
V176	SFR	115	55	Ballast & Tie	70	72	No	–
V177	SFR/MFR	110	55	Ballast & Tie	70	72	No	–
V178	MFR	133	55	Ballast & Tie	61	72	No	–
V180	MFR	25	55	Ballast & Tie	81	72	Yes	9
V181	MFR	60	55	Ballast & Tie	75	72	Yes	3
V182	MFR	122	55	Ballast & Tie	69	72	No	–
V185	SFR	100	55	Ballast & Tie	71	72	No	–
V186	SFR	110	55	Ballast & Tie	70	72	No	–
V187	SFR/MFR	40	55	Ballast & Tie	78	72	Yes	6
V189	SFR	25	55	Ballast & Tie	81[3]	72	Yes	9
V190	SFR	120	55	Ballast & Tie	69	72	No	–
V191	SFR	115	55	Ballast & Tie	70	72	No	–
V192	SFR	60	55	Ballast & Tie	84[3]	72	Yes	12
V193	SFR	50	55	Ballast & Tie	86[3]	72	Yes	14
V194	SFR	30	55	Ballast & Tie	90[3]	72	Yes	18
V195	SFR	45	55	Ballast & Tie	78[3]	72	Yes	6
V196	SFR	95	55	Ballast & Tie	72[3]	72	No	–
V197	SFR	58	55	Ballast & Tie	76[3]	72	Yes	4
V198	SFR	129	55	Ballast & Tie	69	72	No	–
V199	SFR	65	55	Ballast & Tie	75	72	Yes	3
V200	SFR	91	55	Ballast & Tie	72	72	No	–
V201	SFR	140	55	Ballast & Tie	68	72	No	–

Cluster No.[1]	Land Use	Near Track Distance (ft.)	Speed (mph)	Track Type	Predicted GBV Level, VdB	FTA GBV Level, VdB	Exceeds?[2]	Amount Exceeds, VdB
V202	SFR	65	55	Ballast & Tie	75	72	Yes	3
V204	SFR	50	55	Ballast & Tie	77	72	Yes	5
V205	SFR	60	55	Ballast & Tie	75	72	Yes	3
V206	SFR	45	55	Ballast & Tie	77	72	Yes	5
V207	SFR	40	55	Ballast & Tie	78	72	Yes	6
V208	SFR	100	55	Ballast & Tie	71	72	No	–
V209	SFR	160	55	Ballast & Tie	67	72	No	–
V210	SFR	60	55	Ballast & Tie	75	72	Yes	3
V211	SFR	40	55	Ballast & Tie	78	72	Yes	6
V212	SFR	50	55	Ballast & Tie	77	72	Yes	5
V213	SFR	80	55	Ballast & Tie	73	72	Yes	1
V214	SFR	50	55	Ballast & Tie	77	72	Yes	5
V215	SFR	78	55	Ballast & Tie	73	72	Yes	1
V216	SFR	40	55	Ballast & Tie	78[3]	72	Yes	6
V217	SFR	56	55	Ballast & Tie	85[3]	72	Yes	13
V218	SFR	50	55	Ballast & Tie	87[3]	72	Yes	15
V219	SFR	39	55	Ballast & Tie	88[3]	72	Yes	16
V220	SFR	183	55	Ballast & Tie	65	72	No	–
V221	SFR/MFR	64	55	Ballast & Tie	81[3]	72	Yes	9
V222	SFR/MFR	42	55	Ballast & Tie	83[3]	72	Yes	11
V223	SFR	45	45	Ballast & Tie	81[3]	72	Yes	9
V225	SFR/MFR	80	55	Ballast & Tie	73	72	Yes	1
V226	SFR/MFR	58	55	Ballast & Tie	76	72	Yes	4

Cluster No.[1]	Land Use	Near Track Distance (ft.)	Speed (mph)	Track Type	Predicted GBV Level, VdB	FTA GBV Level, VdB	Exceeds?[2]	Amount Exceeds, VdB
V227	SFR	114	15	Ballast & Tie	61	72	No	–
V228	SFR	80	45	Ballast & Tie	79	72	No	7
V229	SFR	63	15	Ballast & Tie	67	72	No	–
V230	SFR	52	45	Ballast & Tie	84[3]	72	Yes	12
V231	SFR	162	45	Ballast & Tie	70	72	No	–
V232	SFR	50	45	Ballast & Tie	85[3]	72	Yes	13
V233	SFR	57	55	Ballast & Tie	76[3]	72	Yes	4

Source: WSP, 2020
Notes: [1] Cluster sites shown in Appendix B.
[2] A vibration level is an impact if it exceeds the impact criteria threshold.
[3] Predicted GBV at these locations include the added vibration from turnouts and crossovers.
GBV = Groundborne vibration; SFR = Single-Family Residential; MFR = Multi-Family Residential

Table 5.7. Vibration Category 3 Land Use Light Rail At-Grade/Aerial Vibration Assessment – Alternative 1

Cluster No.[1]	Land Use	Near Track Distance (ft.)	Speed (mph)	Track Type	Predicted GBV Level, VdB	FTA GBV Level, VdB	Exceeds?[2]	Amount Exceeds, VdB
V38	Roberts Recreation Center	115	55	Aerial	65	75	No	–
V42	Pace Headstart	140	30	Aerial	59	75	No	–
V46	Lillian Street Elementary	70	35	Aerial	64	75	No	–
V55	Templo Asamblea De Oracion	50	35	Ballast & Tie	67	75	No	–
V57	UEI College	35	35	Ballast & Tie	69	75	No	–
V64	Huntington Park High School	50	35	Ballast & Tie	71	75	No	–
V76	San Antonio Elementary	115	55	Ballast & Tie	63	75	No	–
V125	Trinity Bible Church	30	50	Ballast & Tie	72	75	No	–
V126	American Indian Bible Church	80	50	Ballast & Tie	65	75	No	–
V147	Paramount High School	80	55	Ballast & Tie	66	75	No	–
V164	Adventist Union School	149	55	Ballast & Tie	67	75	No	–
V179	Los Angeles County Fire Museum	90	55	Ballast & Tie	65	75	No	–
V183	Bristol Civic Auditorium	75	55	Ballast & Tie	64	75	No	–
V184	Bellflower Health Center	88	55	Ballast & Tie	62	75	No	–
V188	Bel Toreen Villa Convalescent Hospital	65	55	Ballast & Tie	65	72	No	–
V203	Rio Hondo Mental Health Clinic	160	55	Ballast & Tie	60	75	No	–
V224	Wan Yuen Temple	70	55	Ballast & Tie	69	75	No	–

Source: WSP, 2020
Notes: [1] Cluster sites shown in Appendix B.
[2] A vibration level is an impact if it exceeds the impact criteria threshold.
GBV = Groundborne vibration

5.2.3 Ancillary Facilities

Nineteen at-grade TPSS stations would be required. Each underground station would include a TPSS to power the LRT. The TPSS units would be underground and would not be audible to above ground receivers. The underground station entrances would also include ventilation shafts and ventilation equipment. Ventilation shafts and emergency ventilation fans would be designed in accordance with Metro systemwide design criteria noise guidelines (or equivalent policy) for residential areas. The ventilation system would adhere to a noise ceiling of 60 dBA for train pass-by noise and 50 dBA for fan noise at a distance of 50 feet. Compliance with these standards would ensure ventilation noise would be inaudible above the existing noise environment. During emergency situations the ventilation system noise limits would not apply, and ventilation system noise may be audible. However, these situations would not occur during regular operation of the Project. Some of the TPSS stations would have alternatives denoted as site "a", site "b", or site "e", resulting in a multiple possible TPSS locations. Of these locations, 26 would be located near a residence. As shown in Table 5.8, five moderate impacts and two severe impacts would occur. Calculation details are shown in Appendix J. Clusters and impacts are shown in Appendix C.

5.2.4 Parking Facilities

Alternative 1 includes five stations with parking: Firestone Station, I-105/C Line Station, Paramount/Rosecrans Station, Bellflower Station, and Pioneer Station. According to FTA guidance, the appropriate screening distance to identify sensitive receivers for parking facilities is 125 feet. Sensitive receivers would be located within 125 feet of each of the parking facilities, except for the Firestone Station parking facility. As shown in Table 5.9, 13 clusters would be located within 125 feet of the other parking facility sites. No impacts would occur related to parking facility noise. Clusters and impacts are shown in Appendix D.

Table 5.8. TPSS Noise – Alternative 1

TPSS Site	Location	Civil Station	Closet Residence	Distance (ft.)[1]	Existing Nighttime (dBA, L_{dn})	TPSS Noise (dBA, L_{dn})	Noise Impact Criteria		Impact
							Moderate	Severe	
19	North of E 14th St and west of Long Beach Ave within private property	528+00	SFR to the west	200	56.3	44.4	55.9	61.7	No
19(e)	North of E 16th St and west of Long Beach Ave within private property.	538+50	None	None	None	None	None	None	None
19(e)	South of E 16th St and east of Long Beach Ave within private property.	541+00	None	None	None	None	None	None	None
18	South of E Martin Luther King Jr Blvd on the east side of Long Beach Ave and within private property.	589+50	SFR/MFR to the west	130	66.8	48.1	62.0	67.3	No
18(e)	South of E Martin Luther King Jr Blvd on the west side of Long Beach Ave and within private property.	589+00	SFR/MFR to the south, west, and north	15	66.8	66.9	62.0	67.3	Moderate
17	South of E 51st St on the west side of Long Beach Ave within private property.	638+00	SFR/MFR to the west	15	70.5	66.9	64.7	69.8	Moderate
17b	North of E 52nd St on the west side of Long Beach Ave within private property.	640+00	SFR/MFR to the west, north, and south	15	70.5	66.9	64.7	69.8	Moderate
17a	Between E 52nd and 53rd St on the west side of Long Beach Ave within private property.	642+25	SFR/MFR to the west, north, and south	15	70.5	66.9	64.7	69.8	Moderate
17 Slauson	South of Slauson Ave and west of Randolph Ave within Union Pacific Railroad property.	665+25	SFR to the north	250	70.5	42.4	64.7	69.8	No

TPSS Site	Location	Civil Station	Closet Residence	Distance (ft.)[1]	Existing Nighttime (dBA, L_{dn})	TPSS Noise (dBA, L_{dn})	Noise Impact Criteria		Impact
							Moderate	Severe	
16	West of Alameda St and south of Randolph St within private property.	686+50	None	None	None	None	None	None	None
16(e)	West of Regent St and north of Randolph St within private property.	694+25	None	None	None	None	None	None	None
15	North of Randolph St and west of Seville Ave within private property.	729+00	MFR to the southeast	130	61.8	48.1	58.8	64.3	No
15(e)	East of Stafford Ave and north of Randolph St within private property.	737+75	SFR to the west, east, and south	15	61.8	66.9	58.8	64.3	Severe
14	West of State St and north of Randolph St within private property.	761+75	SFR to the east	90	63.1	51.3	59.6	65.1	No
13	North of Randolph Ave and Bissel Pl within Union Pacific Railroad property	787+00	SFR to the west	350	63.1	39.5	59.6	65.1	No
13(e)	North of Randolph Ave and Bissel Pl within Union Pacific Railroad property	832+75	SFR to the south	80	63.1	52.3	59.6	65.1	No
12	North of Walnut St and east of Salt Lake Ave within private property.	834+75	SFR to the south	130	61.1	48.1	59.6	65.1	No
11	North of Walnut St and east of Salt Lake Ave within private property.	887+00	SFR to the north	50	61.1	56.4	58.4	64.0	No
10	South of Firestone Blvd and east of Branyon Ave within private property.	938+75	None	None	None	None	None	None	None

TPSS Site	Location	Civil Station	Closet Residence	Distance (ft.)[1]	Existing Nighttime (dBA, L_{dn})	TPSS Noise (dBA, L_{dn})	Noise Impact Criteria		Impact
							Moderate	Severe	
9	Between Miller Way and the Interstate 710 Freeway and north of the existing tracks within private property.	987+75	None	None	None	None	None	None	None
10(e)	Southeast of the Rio Hondo Channel and north of Meadow Rd within private property.	998+75	None	None	None	None	None	None	None
8	North of Laurel St within a vacant, private-owned property.	1044+75	SFR to the south	450	56.4	37.3	55.9	61.7	No
9(e)	South of Gardendale and adjacent to the west side of Dakota Ave within private property.	1052+25	SFR to the west	165	56.4	46.0	55.9	61.7	No
7	North of Century Blvd and east of Center St within private property within the proposed parking facility.	1080+00	SFR to the south	220	63.7	43.5	60.0	65.4	No
8(e)	Southwest of Arthur Ave/Rose St and north of Rosecrans Ave within public-owned property.	1110+50	SFR to the north	20	58.7	64.4	57.1	62.8	Severe
6	South of Paramount High School's tennis courts and just east of the existing pedestrian bridge within public-owned property	1140+00	SFR to the south	80	58.0	52.3	56.7	62.4	No
6(e)	North of Hegel St and south of the Bellflower Bike Trail within private property.	1195+50	SFR to south, southwest and southeast	70	52.0	53.5	54.1	60.1	No
5	North of Hegel St and the Bellflower Bike Trail within private property.	1196+50	SFR to the south	125	52.0	48.4	54.1	60.1	No

TPSS Site	Location	Civil Station	Closet Residence	Distance (ft.)[1]	Existing Nighttime (dBA, L_{dn})	TPSS Noise (dBA, L_{dn})	Noise Impact Criteria		Impact
							Moderate	Severe	
4	North of Hegel St and south of the Bellflower Bike Trail within private property.	1243+50	SFR to the south	150	59.5	46.9	57.5	63.1	No
3	South of Flora Vista Park and just east of Beach St. within Metro-owned property.	1301+50	SFR to the northwest	100	57.5	50.4	56.6	62.3	No
3 (e)	East of Studebaker Rd within Metro-owned property.	1345+00	None	None	None	None	None	None	None
3 (e)	Southwest of Rosewood Park within Metro-owned property.	1350+75	None	None	None	None	None	None	None
2	Northwest of the crossing at Gridley Rd and 183rd St within Metro-owned property.	1372+50	SFR to the north	40	51.2	58.3	53.8	59.9	Moderate
1	Between Corby Ave and Pioneer Blvd north of 188th St impacting a private property within the proposed parking structure.	1405+00	SFR to the west	100	48.0	50.4	52.7	59.2	No
1 (e)	North of South St and west of Clarkdale Ave impacting a Metro-owned property.	1416+50	SFR to the northeast	70	52.0	53.5	54.1	60.1	No

Source: TAHA, 2020
Notes: [1] Cluster sites shown in Appendix C.
[2] Distance to the closest area of human use or closest building façade.
N/A = Not Applicable; ROW = Right-of-Way; SFR = Single-Family Residential; MFR = Multi-Family Residential

Table 5.9. Parking Facility Noise – Alternative 1

Parking Facility	Cluster No.[1]	Land Use	FTA Land Use Category[2]	Noise Level (Cat 2 dBA, L_{dn}) (Cat 3 dBA, L_{eq})				Impact
				Existing	Parking Facility Noise	Impact Threshold		
						Moderate	Severe	
Firestone Station	None	None	None	None	None	None	None	None
I-105/C Line Station	GS1	SFR	2	56	42	55.7	61.6	No
	GS2	SFR	2	56	39.1	55.7	61.6	No
	GS3	SFR	2	54.9	45.5	55.2	61.1	No
Paramount/Rosecrans Station	PRS1	Bianchi Stadium 11 Theatre	3	59.4	39.7	62.5	68.1	No
Bellflower Station	BS1	SFR/MFR	2	59.5	41.1	57.5	63.1	No
	BS2	SFR/MFR	2	56	39.5	55.7	61.6	No
	BS3	SFR/MFR	2	59.5	38.6	57.5	63.1	No
	BS4	SFR/MFR	2	56	39.5	55.7	61.6	No
Pioneer Station	PS1	SFR/MFR	2	48	41.5	52.7	59.2	No
	PS2	SFR/MFR	2	48.0	47.3	52.7	59.2	No
	PS3	SFR/MFR	2	48.0	43.9	52.7	59.2	No
	PS4	SFR/MFR	2	48.0	46.7	52.7	59.2	No
	PS5	SFR/MFR	2	52.0	45.7	54.1	60.1	No

Source: TAHA, 2020
Notes: [1] Cluster Sites are shown in Appendix D.
[2] Category 2: Residences and buildings where people normally sleep. This category includes homes, hospitals and hotels where a nighttime sensitivity to noise is assumed to be of utmost importance.
Category 3: Institutional land uses with primarily daytime and evening use. This category includes schools, libraries, theaters, and churches where it is important to avoid interference with such activities as speech, meditation and concentration on reading material. Places for meditation or study associated with cemeteries, monuments, museums, campgrounds and recreational facilities can also be considered to be in this category. Certain historical sites and parks are also included.
SFR = Single-Family Residential; MFR = Multi-Family Residential

5.2.5 Freight Track Relocation

5.2.5.1 Noise

Construction of Alternative 1 would require relocation of existing freight tracks. Freight tracks would be relocated to the south of the Project alignment within the La Habra Branch ROW, and to the west of the Project alignment within the San Pedro Subdivision ROW, and to the north of the Project alignment within Metro-owned PEROW to accommodate the Build Alternative alignments and maintain existing operations along the ROW where the proposed LRT tracks would overlap.

Freight train counts were conducted in September of 2019 and it was found that only one train traversed the freight tracks along Randolph Street over a period of nine days. The train event occurred at midnight. One daytime train event occurred near the junction of Randolph Street and Slauson Avenue but did not fully traverse Randolph Street. Due to the infrequency and timing of freight trains along Randolph Street it is unlikely that noise measurements captured freight train noise. Therefore, the FTA impact criteria has been based upon existing freight noise calculated based upon the existing location of freight tracks. Existing noise levels were also adjusted along Façade Avenue to account for existing freight that was not captured during noise measurements.

Relocated freight tracks would generally differ from their current alignments by only a few feet and would remain in the rail ROW. Freight train noise is generally intermittent and only approximately two to three trains pass-by per day. No new noise source would be added, and the frequency of freight trains would not change. However, two locations would bring the freight tracks closer to sensitive receivers. The first location would be an approximately 20-foot shift of the centerline of the freight tracks to the south of the La Habra Branch ROW along Randolph Street. This would bring the freight tracks to approximately 50 feet from inhabited structures along the southern side of Randolph Street. Freight trains are anticipated to travel at a speed of 10 mph along Randolph Street and would be required to sound their warning horns due to grade crossings.

Close to the I-105 freeway, the centerline of the freight tracks would be shifted approximately 15 feet. Residences along Façade Avenue and near Rosecrans Avenue would be affected by the relocated freight tracks. Freight trains are anticipated to travel at a speed of 10 mph along Façade Avenue and would only be required to sound their warning horns near the grade crossing at Century Boulevard. Freight train noise at both of these locations have been added to the LRT noise below.

Under Alternative 1, 30 Category 2 Clusters would experience moderate impacts and 24 would experience severe impacts. Five Category 3 clusters would experience moderate impacts and two would experience severe impacts. Freight train noise at Category 2 Clusters is shown in Table 5.10. Category 3 Clusters are shown in Table 5.11. Category 3 clusters along Randolph Street are unlikely to be regularly experience impacts due to a combination of freight and LRT noise. This is because Category 3 uses are daytime uses and would not typically be open when the freight is traversing Randolph Street at night. Calculation details are shown in Appendix K. Clusters and impacts are shown in Appendix E.

Table 5.10. Category 2 Land Use Freight Track Relocation Noise Assessment – Alternative 1

Cluster No.[1]	Land Use	Freight Track Distance (ft)[2]	Speed (mph)	Noise Level (dBA, L_{dn})						Impact
				Existing	LRT	Freight	Combined	Impact Threshold		
								Moderate	Severe	
Randolph Street										
N50	SFR/MFR	70	10	68.9	74.0	62.5	74.3	63.5	68.7	Severe
N52	SFR/MFR	60	10	71.0	56.2	58.6	60.6	65.1	70.2	No
N53	SFR/MFR	210	10	71.0	58.3	57.7	61.0	65.1	70.2	No
N54	SFR	50	10	71.0	64.4	63.9	67.2	65.1	70.2	Moderate
N55	SFR	110	10	71.0	57.6	56	59.9	65.1	70.2	No
N56	SFR	60	10	71.0	67	63.1	68.5	65.1	70.2	Moderate
N57	SFR/MFR	250	10	71.0	57.8	56.9	60.4	65.1	70.2	No
N58	SFR/MFR	60	10	71.0	64.4	63.1	66.8	65.1	70.2	Moderate
N59	SFR/MFR	220	10	71.0	55.8	57.5	59.7	65.1	70.2	No
N60	SFR/MFR	80	10	71.0	68.6	61.9	69.4	65.1	70.2	Moderate
N61	SFR	60	10	71.0	64.9	63.1	67.1	65.1	70.2	Moderate
N63	SFR/MFR	70	10	71.0	57.2	62.5	63.6	65.1	70.2	No
N64	SFR/MFR	250	10	71.0	58.6	56.9	60.8	65.1	70.2	No
N65	SFR/MFR	50	10	71.0	65.8	63.9	68.0	65.1	70.2	Moderate
N66	MFR	50	10	71.0	61.7	63.9	65.9	65.1	70.2	Moderate
N69	SFR/MFR	210	10	64.8	56.9	57.7	60.3	60.7	66.1	No
N70	SFR/MFR	260	10	64.8	56.7	56.8	59.8	60.7	66.1	No
N71	MFR	40	10	64.8	67.0	64.9	69.1	60.7	66.1	Severe
N72	SFR/MFR	260	10	64.8	54.2	56.8	58.7	60.7	66.1	No
N73	SFR/MFR	90	10	64.8	68.0	61.4	68.9	60.7	66.1	Severe

Cluster No.[1]	Land Use	Freight Track Distance (ft)[2]	Speed (mph)	Noise Level (dBA, L_{dn})						Impact
				Existing	LRT	Freight	Combined	Impact Threshold		
								Moderate	Severe	
N74	SFR/MFR	210	10	64.8	63.3	57.7	64.4	60.7	66.1	Moderate
N75	MFR	100	10	64.8	59.9	56.4	61.5	60.7	66.1	Moderate
N76	SFR/MFR	45	10	64.8	67.0	64.4	68.9	60.7	66.1	Severe
N77	SFR/MFR	130	10	64.8	63.0	59.8	64.7	60.7	66.1	Moderate
N78	SFR/MFR	100	10	64.8	63.1	56.4	63.9	60.7	66.1	Moderate
N79	SFR/MFR	45	10	64.8	71.2	64.4	72.0	60.7	66.1	Severe
N80	SFR/MFR	80	10	64.8	70.6	61.9	71.1	60.7	66.1	Severe
N81	SFR	250	10	64.8	61.0	56.9	62.4	60.7	66.1	Moderate
N82	SFR/MFR	200	10	64.8	59.6	57.9	61.8	60.7	66.1	Moderate
N84	SFR/MFR	160	10	64.8	54.1	58.9	60.1	60.7	66.1	No
N85	SFR/MFR	85	10	64.8	62.4	61.6	65.0	60.7	66.1	Moderate
N86	SFR/MFR	50	10	64.8	67.6	63.9	69.1	60.7	66.1	Severe
N87	SFR	210	10	64.8	55.7	57.7	59.8	60.7	66.1	No
N88	SFR/MFR	50	10	64.8	66.1	63.9	68.1	60.7	66.1	Severe
N89	SFR/MFR	90	10	66.1	62.9	61.4	65.2	61.6	66.9	Moderate
N90	SFR	110	10	66.1	53.8	56.0	58.0	61.6	66.9	No
N91	SFR	190	10	66.1	53.2	53.6	56.4	61.6	66.9	No
N92	SFR/MFR	165	10	66.1	61.6	58.7	63.4	61.6	66.9	Moderate
N93	SFR	80	10	66.1	67.0	61.9	68.2	61.6	66.9	Severe
N94	SFR/MFR	110	10	66.1	64.3	60.5	65.8	61.6	66.9	Moderate
N95	SFR/MFR	210	10	66.1	56.6	57.7	60.2	61.6	66.9	No
N96	SFR	80	10	66.1	62.4	61.9	65.2	61.6	66.9	Moderate

Cluster No.[1]	Land Use	Freight Track Distance (ft)[2]	Speed (mph)	Noise Level (dBA, L_{dn})						Impact
				Existing	LRT	Freight	Combined	Impact Threshold		
								Moderate	Severe	
N97	SFR/MFR	250	10	66.1	55.0	56.9	59.1	61.6	66.9	No
N98	SFR/MFR	80	10	66.1	63.1	61.9	65.6	61.6	66.9	Moderate
N99	SFR/MFR	200	10	66.1	60.9	57.9	62.7	61.6	66.9	Moderate
N101	SFR	190	10	66.1	59.4	58.1	61.8	61.6	66.9	Moderate
N102	SFR	80	10	66.1	62.6	61.9	65.3	61.6	66.9	Moderate
Façade Avenue										
N182	SFR	270	10	58.8	55.0	56.6	58.9	57.1	62.8	Moderate
N185	SFR	240	10	59.3	58.3	57.1	60.8	57.4	63	Moderate
N186	SFR	290	10	58.7	51.7	56.3	57.6	57.1	62.8	Moderate
N187	SFR	250	10	59.2	56.1	56.9	59.5	57.4	63	Moderate
N188	SFR	250	10	59.7	58.4	56.9	60.7	57.6	63.2	Moderate
N189	SFR	160	10	60.6	60.0	58.9	62.5	58.1	63.7	Moderate
N190	SFR	70	10	62.9	70.2	62.5	70.9	59.5	65	Severe
N191	SFR	35	10	64	69.6	65.5	71.0	60.2	65.6	Severe
N192	SFR	60	10	64	71.3	63.1	71.9	60.2	65.6	Severe
N193	SFR	60	10	64	72.6	63.1	73.1	60.2	65.6	Severe
N194	SFR	35	10	64	67.8	65.5	69.8	60.2	65.6	Severe
N195	SFR	240	10	64	60.7	52.6	61.3	60.2	65.6	Moderate
N196	SFR	30	10	64	67.8	66.1	70.0	60.2	65.6	Severe
N197	SFR	45	10	64	72.6	64.4	73.2	60.2	65.6	Severe
N198	SFR	315	10	64	58.7	51.4	59.4	60.2	65.6	No
N199	SFR	315	10	57.1	62.8	51.4	63.1	56.3	62	Severe

Cluster No.[1]	Land Use	Freight Track Distance (ft)[2]	Speed (mph)	Noise Level (dBA, L_{dn})						Impact
				Existing	LRT	Freight	Combined	Impact Threshold		
								Moderate	Severe	
N200	SFR	50	10	65.7	75.6	63.9	75.9	61.3	66.6	Severe
N201	SFR	30	10	65.1	69.2	66.1	70.9	60.9	66.3	Severe
N202	SFR	225	10	58	63.5	52.9	63.9	56.7	62.4	Severe
N205	SFR	320	10	56.9	64.1	51.4	64.3	56.2	61.9	Severe
N209	SFR	280	10	57.3	68.8	51.9	68.9	56.4	62.1	Severe
N210	SFR	30	10	64.7	74.4	66.1	75.0	60.6	66	Severe
N211	SFR	240	10	57.8	54.4	51.1	56.1	56.6	62.3	No
N212	SFR	150	10	59.3	57.1	54.7	59.1	57.4	63	Moderate
N213	SFR	35	10	64.2	61.2	65.5	66.9	60.3	65.7	Severe

Source: TAHA, 2020
Notes: [1] Cluster sites shown in Appendix E.
[2] Distance to the closest area of human use or closest building façade.

Table 5.11. Category 3 Land Use Freight Track Relocation Noise Assessment – Alternative 1

Cluster No.[1]	Land Use	Freight Track Distance (ft)[2]	Speed (mph)	Noise Level (dBA, L_{eq})						Impact
				Existing	LRT	Freight	Combined	Impact Threshold		
								Moderate	Severe	
Randolph Street										
N51	Lillian Street Elementary	60.0	10	73.0	64.6	72.8	73.5	70	76.7	Moderate
N62	Templo Asamblea De Oracion	70.0	10	71.9	66.2	72.2	73.2	70	75.9	Moderate
N67	UEI College	85.0	10	71.3	61.5	71.3	71.8	70	75.4	Moderate
N68	Huntington Park Iglesia Pentecostes	200.0	10	68.8	50.6	67.6	67.7	68.5	73.7	No
N83	Huntington Park High School	120.0	10	71.4	65.8	69.8	71.3	70	75.5	Moderate
N100	San Antonio Elementary	130.0	10	71.1	63.1	69.5	70.4	70	75.3	Moderate
Façade Avenue										
N181	Trinity Bible Church	50.0	10	75.3	76.9	73.6	78.6	70	78.4	Severe
N183	Apostolic Assembly South Gate	275.0	10	66.6	51.4	66.2	66.4	66.9	72.2	No
N184	American Indian Bible Church	50.0	10	74.7	76.9	73.6	78.6	70	78	Severe

Source: TAHA, 2020
Notes: [1] Cluster sites shown in Appendix E.
[2] Distance to the closest area of human use or closest building façade.

5.2.5.1 Vibration

Construction of Alternative 1 would require relocation of existing freight tracks. Freight tracks would be relocated to the south of the Project alignment within the La Habra Branch ROW, and to the west of the Project alignment within the San Pedro Subdivision ROW, and to the north of the Project alignment within Metro-owned PEROW to accommodate the Build Alternative alignments and maintain existing operations along the ROW where the proposed LRT tracks would overlap. Freight trains would be relocated 15 feet closer to the residences along Façade Avenue near Rosecrans Avenue. The vibration level associated with freight trains at the new location operating at 20 mph would be 78 VdB at occupied building structures along Façade Avenue. These levels are based on at-grade ballast and tie track. Freight train vibration would be infrequent as only two to three trains are estimated to travel near this location in any one day. The FTA impact criterion for residential properties exposed to infrequent vibration events is 80 VdB. Projected freight train vibration would not exceed the impact threshold. Clusters and impacts are shown in Appendix E.

5.3 Alternative 2

5.3.1 LRT Underground

5.3.1.1 Noise

Alternative 2 would be entirely underground from the proposed 7th Street/Metro Center Station in the Downtown Transit Core to just south of Olympic Boulevard. Noise related to underground LRT would not be readily transmitted to surface level receivers. Station entrances would not result in a direct line-of-sight of the LRT vehicles and aboveground receivers. As such, LRT noise would not be audible at station entrances. Therefore, noise associated with the underground segments of the Alternative 2 are not considered for further analysis and no adverse effects related to noise would occur.

5.3.1.2 Vibration

GBV and GBN were modeled at each cluster along the underground segment of Alternative 2. No Vibration Category 1 land uses (i.e., buildings where vibration would interfere with operations within the buildings) were identified within this section of the alignment. Clusters and impacts are shown in Appendix B. Table 5.12 provides predicted vibration levels for Vibration Category 2 land uses which include all residential uses and buildings where people normally sleep, such as hospitals and hotels. Table 5.13 provides vibration levels for Vibration Category 3 land uses that are within 100 feet of the nearest track centerline. Vibration Category 3 includes schools, churches, and other institutions, and quiet offices that do not consist of vibration sensitive equipment.

No clusters would experience GBV levels or GBN levels that are predicted to exceed the FTA vibration impact threshold. Clusters and impacts are shown in Appendix B.

Table 5.12. Vibration Category 2 Land Use Light Rail Underground Vibration Assessment – Alternative 2

Cluster No.[1]	Land Use	Slant Distance Near Track (ft.)	Speed (mph)	Track Type	Predicted GBV Level (VdB)	FTA GBV Impact Criteria (VdB)	Exceeds?[2]	Amount Exceeds	Predicted GBN (dBA)	GBN Criteria (dBA)	Exceeds?	Amount Exceeds
V7	SFR/MFR	92	35	Direct Fixation	64	72	No	–	29	35	No	–
V8	Hotel	181	55	Direct Fixation	55[3, 4]	72	No	–	20	35	No	–
V9	Hotel	144	55	Direct Fixation	58[3, 4]	72	No	–	20	35	No	–
V10	Hotel	87	55	Direct Fixation	65[3,]	72	No	–	23	35	No	–
V11	SFR/MFR	86	55	Direct Fixation	57[3]	72	No	–	30	35	No	–
V12	SFR/MFR	86	55	Direct Fixation	57[3]	72	No	–	22	35	No	–
V13	SFR/MFR	187	55	Direct Fixation	50[3]	72	No	–	22	35	No	–
V14	SFR/MFR	131	55	Direct Fixation	54[3]	72	No	–	15	35	No	–
V15	Hotel	79	55	Direct Fixation	58[3]	72	No	–	19	35	No	–
V16	SFR/MFR	77	55	Direct Fixation	58[3]	72	No	–	23	35	No	–
V18	SFR/MFR	77	55	Direct Fixation	58[3]	72	No	–	23	35	No	–
V19	SFR/MFR	80	55	Direct Fixation	58[3]	72	No	–	23	35	No	–
V20	SFR/MFR	75	55	Direct Fixation	59[3]	72	No	–	23	35	No	–
V21	SFR/MFR	77	55	Direct Fixation	58[3]	72	No	–	24	35	No	–
V23	SFR/MFR	71	55	Direct Fixation	59[3]	72	No	–	24	35	No	–
V24	SFR/MFR	67	50	Direct Fixation	69	72	No	–	34	35	No	–
V25	SFR/MFR	180	45	Direct Fixation	49[3]	72	No	–	14	35	No	–
V26	Hotel	67	45	Direct Fixation	58[3]	72	No	–	23	35	No	–
V27	Hotel	50	55	Direct Fixation	58[3]	72	No	–	23	35	No	–

Source: WSP, 2020
Notes: [1] Cluster sites shown in Appendix B.
[2] A vibration level is an impact if it exceeds the impact criteria threshold.
[3] Predicted GBV at these locations include a -10 deduction for building coupling loss.
[4] Predicted GBV at these locations include the added vibration from turnouts and crossovers.
GBV = Groundborne vibration; SFR = Single-Family Residential; MFR = Multi-Family Residential

Table 5.13. Vibration Category 3 Land Use Light Rail Underground Vibration Assessment – Alternative 2

Cluster No.[1]	Land Use	Slant Distance Near Track, ft.	Speed (mph)	Track Type	Predicted GBV Level, VdB	FTA GBV Impact Criteria, VdB	Exceeds?[2]	Amount Exceeds	Predicted GBN (dBA)	GBN Criteria, dBA	Exceeds?	Amount Exceeds
V17	Theater-Movie	78	55	Direct Fixation	58	78	No	–	23	40	No	–

Source: WSP, 2020
Notes: [1] Cluster sites shown in Appendix B.
[2] A vibration level is an impact if it exceeds the impact criteria threshold.
GBV = Groundborne vibration; SFR = Single-Family Residential; MFR = Multi-Family Residential

5.3.2 LRT (At-grade and Aerial)

5.3.2.1 Noise

Alternative 2 would follow the same alignment for at-grade and aerial segments as Alternative 1. LRT pass-by noise impacts related to Alternative 2 would be the largely the same as Alternative 1. However, under Alternative 2 headways would be decreased to 2.5-minute headways during one hour of each weekday peak period between 7th St/Metro Center Station and the Slauson/A Line Station. The change in headways would affect Clusters 2 through 50. Table 5.14 provides noise levels for Category 2 land uses that would be affected by changes under Alternative 2. Table 5.15 provides noise levels for Category 3 land uses that would be affected by changes under Alternative 2. Clusters N12, N23, N29, N34, and N44 would experience severe impacts instead of moderate impacts. Cluster 33 would change from no impact to moderate impact. Alternative 2 would result in 72 moderate impacts and 176 severe impacts at Category 2 clusters. Impacts at Category 3 clusters would remain the same as Alternative 1.

5.3.2.2 Vibration

Alternative 2 would follow the same alignment for at-grade and aerial segments as Alternative 1. LRT pass-by vibration impacts related to Alternative 2 would be the same as Alternative 1 for the at-grade and aerial segments. 101 Vibration Category 2 receivers are predicted to exceed the FTA vibration impact threshold of 72 VdB for frequent events. These predicted GBV levels are in the range of 1 VdB to 20 VdB above the FTA vibration criteria. Thirty-eight clusters are predicted to exceed the impact criteria by more than 5 VdB. Therefore, where the projected GBV is 1 VdB to 5 VdB greater than the impact threshold there is a strong chance that actual GBV levels will be below the impact threshold and would not result in an adverse effect. Where the projected GBV is 5 VdB greater than the impact threshold vibration impact is probable. None of the Vibration Category 3 receivers are predicted to exceed the FTA vibration impact threshold.

5.3.3 Ancillary Facilities

Alternative 2 would utilize the same ancillary facility locations as Alternative 1, with the exception of underground TPSS sites, which would be different. Underground TPSS sites would not produce audible noise at aboveground sensitive receptors. Five moderate impacts and two severe impacts would occur related to TPSS noise under Alternative 2.

5.3.4 Parking Facilities

Alternative 2 would include parking at the same five locations as Alternative 1. No impacts would occur related to parking facility noise.

Table 5.14. Category 2 Land Use Light Rail Noise Assessment – Alternative 2

Cluster No.[1]	Land Use	Near Track Distance (ft)[2]	Speed (mph)	Adjustment to LRT Noise[3]	Noise Level (dBA, L_{dn})				Impact
					Existing	Project	Impact Threshold		
							Moderate	Severe	
N2	SFR/MFR	80	55	D	56.3	68.7	55.9	61.7	Severe
N3	SFR/MFR	210	55	D	56.3	64.6	55.9	61.7	Severe
N4	SFR/MFR	45	55	D	56.3	71.2	55.9	61.7	Severe
N5	SFR/MFR	240	55	D	56.3	64.0	55.9	61.7	Severe
N6	SFR/MFR	80	55	D	56.3	68.7	55.9	61.7	Severe
N7	SFR/MFR	240	55	D	56.3	64.0	55.9	61.7	Severe
N10	SFR/MFR	260	55	D	66.8	63.6	62.0	67.3	Moderate
N11	SFR/MFR	185	55	D	66.8	65.1	62.0	67.3	Moderate
N12	SFR/MFR	110	55	D	66.8	67.4	62.0	67.3	Severe
N13	SFR/MFR	230	55	DE	66.8	69.2	62.0	67.3	Severe
N14	SFR/MFR	110	55	DE	66.8	72.4	62.0	67.3	Severe
N15	SFR/MFR	140	55	DE	66.8	71.3	62.0	67.3	Severe
N16	SFR/MFR	240	55	DE	66.8	69.0	62.0	67.3	Severe
N17	SFR/MFR	15	55	DE	66.8	81.0	62.0	67.3	Severe
N18	SFR/MFR	140	55	D	66.8	66.3	62.0	67.3	Moderate
N19	SFR/MFR	15	55	D	66.8	76.0	62.0	67.3	Severe
N20	SFR/MFR	110	55	DE	66.8	72.4	62.0	67.3	Severe
N21	SFR/MFR	320	55	D	66.8	62.7	62.0	67.3	Moderate
N22	SFR/MFR	320	55	D	66.8	62.7	62.0	67.3	Moderate
N23	SFR/MFR	110	55	D	66.8	67.4	62.0	67.3	Severe
N24	SFR	30	55	D	66.8	73.0	62.0	67.3	Severe

Cluster No.[1]	Land Use	Near Track Distance (ft)[2]	Speed (mph)	Adjustment to LRT Noise[3]	Noise Level (dBA, L_{dn})				Impact
					Existing	Project	Impact Threshold		
							Moderate	Severe	
N25	SFR/MFR	80	55	D	66.8	68.7	62.0	67.3	Severe
N27	SFR/MFR	300	55	D	66.8	63.0	62.0	67.3	Moderate
N29	SFR/MFR	110	55	D	66.8	67.4	62.0	67.3	Severe
N30	SFR/MFR	230	55	D	66.8	64.2	62.0	67.3	Moderate
N31	SFR/MFR	220	50	D	70.5	63.5	64.7	69.8	No
N32	SFR/MFR	90	50	D	70.5	67.4	64.7	69.8	Moderate
N33	MFR	200	55	D	70.5	64.8	64.7	69.8	Moderate
N34	MFR	60	55	D	70.5	70.0	64.7	69.8	Severe
N35	SFR/MFR	80	55	D	70.5	68.7	64.7	69.8	Moderate
N36	SFR/MFR	210	35	D	70.5	60.6	64.7	69.8	No
N37	MFR	90	45	D	70.5	66.5	64.7	69.8	Moderate
N38	MFR	100	45	D	70.5	66.0	64.7	69.8	Moderate
N39	MFR	200	45	D	70.5	63.0	64.7	69.8	No
N40	SFR	215	45	DE	70.5	67.7	64.7	69.8	Moderate
N42	SFR/MFR	100	45	DE	70.5	71.0	64.7	69.8	Severe
N43	SFR	40	45	DEF	70.5	76.0	64.7	69.8	Severe
N44	SFR	155	45	DEF	70.5	70.1	64.7	69.8	Severe
N45	SFR	100	25	DEF	70.5	66.9	64.7	69.8	Moderate
N46	SFR	155	20	DF	70.5	58.1	64.7	69.8	No
N47	SFR	40	20	DF	70.5	64.0	64.7	69.8	No
N48	SFR	220	20	DF	70.5	56.6	64.7	69.8	No

Cluster No.[1]	Land Use	Near Track Distance (ft)[2]	Speed (mph)	Adjustment to LRT Noise[3]	Noise Level (dBA, L_{dn})				Impact
					Existing	Project	Impact Threshold		
							Moderate	Severe	
N49	SFR	160	20	DF	70.5	58.0	64.7	69.8	No
N50	SFR/MFR	90	20	DEG	65.4	74.4	61.1	66.4	Severe

Source: TAHA, 2020
Notes: Only clusters (groups of sensitive uses) that would have different effects from Alternative 1 are shown.
[1] Cluster sites shown in Appendix A.
[2] Distance to the closest area of human use or closest building façade.
[3] Adjustments to LRT noise based on intervening rows of buildings, track type, special trackwork, quacker noise, wheel squeal noise, and audible warning noise.
A = first row of intervening buildings.
B = second row of intervening buildings.
C = embedded track on grade.
D = aerial structure with slab track.
E = jointed track or crossover.
F = quacker noise.
G = wheel squeal noise.
H = audible warnings noise.

Table 5.15. Category 3 Land Use Light Rail Noise Assessment – Alternative 2

Cluster No.[1]	Land Use	Near Track Distance (ft)[2]	Speed (mph)	Adjustment to LRT Noise[3]	Noise Level (dBA, L_{eq})				Impact
					Existing	Project	Impact Threshold		
							Moderate	Severe	
N8	Ánimo Ralph Bunche Charter High School	120	55	FH	68.8	64.8	68.5	73.7	No
N9	Ánimo Jefferson Charter Middle School	310	55	FH	68.8	60.6	68.5	73.7	No
N26	Greater Olivet Baptist Church	350	55	FH	68.8	60.1	68.5	73.7	No
N28	Iglesia Jesus Cristo Libertador	330	55	FH	68.8	60.4	68.5	73.7	No
N41	Greater Holy Saint John Baptist Church	260	45	EFH	72.5	60.0	70.0	76.3	No
N51	Lillian Street Elementary School	100	35	EFH	67.4	61.6	67.5	72.7	No

Source: TAHA, 2020
Notes: Only clusters (groups of sensitive uses) that would have different effects from Alternative 1 are shown.
[1] Cluster sites shown in Appendix A.
[2] Distance to the closest area of human use or closest building façade.
[3] Adjustments to LRT noise based on intervening rows of buildings, track type, special trackwork, quacker noise, wheel squeal noise, and audible warning noise.
A = first row of intervening buildings.
B = second row of intervening buildings.
C = embedded track on grade.
D = aerial structure with slab track.
E = jointed track or crossover.
F = quacker noise.
G = wheel squeal noise.
H = audible warnings noise

5.3.5 Freight Track Relocation

5.3.5.1 Noise

Freight Tracks would be relocated at the same locations as Alternative 1. Noise impacts related to freight track relocation would be the same as Alternative 1.

5.3.5.2 Vibration

Freight Tracks would be relocated at the same locations as Alternative 1. Vibration impacts related to freight track relocation would be the same as Alternative 1.

5.4 Alternative 3

5.4.1 LRT

5.4.1.1 Noise

Noise impacts related to Alternative 3 would largely be the same as Alternative 1 in the portion of the corridor where Alternative 3 would operate. However, noise impacts would be reduced overall due to the shortened length of the alignment. The northern tail tracks would end at civil station 645+50, which would reduce speeds and noise levels at Clusters 33 through 45. Noise levels for the Category 2 clusters are shown in Table 5.16 and noise levels for Category 3 clusters are shown in Table 5.17. Alternative 3 would affect clusters 33 through 347 and would result in moderate impacts at 59 of 289 Category 2 clusters severe impacts at 153 Category 2 clusters. Ten of 26 Category 3 clusters would experience moderate impacts and two would experience severe impacts.

5.4.1.2 Vibration

Vibration impacts related to Alternative 3 would be the same as Alternative 1 in the portion of the corridor where Alternative 3 would operate. No underground portion is proposed and therefore no vibration impacts related to underground LRT-pass-by would occur. Vibration impacts would be reduced overall due to the shortened length of the alignment. Alternative 3 would affect vibration clusters 41 through 233. Under Alternative 3 LRT-pass by vibration would result in 96 impacts exceeding the FTA impact criteria of 72 VdB. Thirty-five clusters are predicted to exceed the impact criteria by more than 5 VdB.

5.4.2 Ancillary Facilities

Seventeen TPSS locations are proposed for Alternative 3. Two severe impacts would occur at TPSS site 15e and TPSS site 8e. One moderate impact would occur at TPSS site 2.

Table 5.16. Category 2 Land Use Light Rail Noise Assessment – Alternative 3

Cluster No.[1]	Land Use	Near Track Distance (ft)[2]	Speed (mph)	Adjustment to LRT Noise[3]	Noise Level (dBA, L_{dn})				Impact
					Existing	Project	Impact Threshold		
							Moderate	Severe	
N33	MFR	270	15	D	70.5	51.8	64.7	69.8	No
N34	MFR	215	15	D	70.5	52.7	64.7	69.8	No
N35	SFR/MFR	220	15	D	70.5	52.6	64.7	69.8	No
N36	SFR/MFR	210	15	D	70.5	52.8	64.7	69.8	No
N37	MFR	230	15	D	70.5	52.4	64.7	69.8	No
N38	MFR	110	15	D	70.5	55.7	64.7	69.8	No
N39	MFR	200	15	D	70.5	53.1	64.7	69.8	No
N40	SFR	215	15	DE	70.5	57.7	64.7	69.8	No
N42	SFR/MFR	100	15	DE	70.5	61.1	64.7	69.8	No
N43	SFR	40	15	DEF	70.5	66.0	64.7	69.8	Moderate
N44	SFR	155	15	DEF	70.5	60.2	64.7	69.8	No
N45	SFR	100	15	DEF	70.5	62.1	64.7	69.8	No

Source: TAHA, 2020
Notes: Only clusters (groups of sensitive uses) that would have different effects from Alternative 1 are shown.
[1] Cluster sites shown in Appendix A.
[2] Distance to the closest area of human use or closest building façade.
[3] Adjustments to LRT noise based on intervening rows of buildings, track type, special trackwork, quacker noise, wheel squeal noise, and audible warning noise.
A = first row of intervening buildings.
B = second row of intervening buildings.
C = embedded track on grade.
D = aerial structure with slab track.
E = jointed track or crossover.
F = quacker noise.
G = wheel squeal noise.
H = audible warnings noise

Table 5.17. Category 3 Land Use Light Rail Noise Assessment – Alternative 3

Cluster No.[1]	Land Use	Near Track Distance (ft)[2]	Speed (mph)	Adjustment to LRT Noise[3]	Noise Level (dBA, L_{eq})				Impact
					Existing	Project	Impact Threshold		
							Moderate	Severe	
N41	Greater Holy Saint John Baptist Church	260	15	EFH	72.5	53.3	70	76.3	No

Source: TAHA, 2020
Notes: Only clusters (groups of sensitive uses) that would have different effects from Alternative 1 are shown.
[1] Cluster sites shown in Appendix A.
[2] Distance to the closest area of human use or closest building façade.
[3] Adjustments to LRT noise based on intervening rows of buildings, track type, special trackwork, quacker noise, wheel squeal noise, and audible warning noise.
A = first row of intervening buildings.
B = second row of intervening buildings.
C = embedded track on grade.
D = aerial structure with slab track.
E = jointed track or crossover.
F = quacker noise.
G = wheel squeal noise.
H = audible warnings noise

5.4.3 Parking Facility

Similar to Alternative 1, no impacts would occur related to parking facility noise.

5.4.4 Freight Track Relocation

5.4.4.1 Noise

Noise

Freight Tracks would be relocated at the same locations as Alternatives 1 and 2. Noise impacts related to freight track relocation would be the same as Alternatives 1 and 2.

5.4.4.2 Vibration

Freight Tracks would be relocated at the same locations as Alternatives 1 and 2. Vibration impacts related to freight track relocation would be the same as Alternatives 1 and 2.

5.5 Alternative 4

5.5.1 LRT

5.5.1.1 Noise

Noise impacts related to Alternative 4 would largely be the same as Alternative 1. However, noise impacts would be reduced overall due to the shortened length of the alignment. The northern tail tracks would end at civil station 1068+50 which would reduce speeds and noise levels at Clusters 181 through 187. Noise levels for the Category 2 clusters are shown in Table 5.18 and noise levels for Category 3 clusters are shown in Table 5.19. Alternative 4 would affect clusters 181 through 347 and would result in moderate impacts at 15 of 149 Category 2 clusters and severe impacts at 117 Category 2 clusters. Six of 18 Category 3 clusters would experience moderate impacts and two would experience severe impacts.

Table 5.18. Category 2 Land Use Light Rail Noise Assessment – Alternative 4

Cluster No.[1]	Land Use	Near Track Distance (ft)[2]	Speed (mph)	Adjustment to LRT Noise[3]	Noise Level (dBA, L_{dn})				Impact
					Existing	Project	Impact Threshold		
							Moderate	Severe	
N182	MFR	350	15	None	59.3	46.6	57.4	63.0	No
N185	MFR	210	15	E	59.9	53.8	57.7	63.3	No
N186	SFR/MFR	300	15	None	59.3	47.3	57.4	63.0	No
N187	SFR/MFR	220	15	None	59.9	53.6	57.7	63.3	No

Source: TAHA, 2020
Notes: Only clusters (groups of sensitive uses) that would have different effects from Alternative 1 are shown.
[1] Cluster sites shown in Appendix A.
[2] Distance to the closest area of human use or closest building façade.
[3] Adjustments to LRT noise based on intervening rows of buildings, track type, special trackwork, quacker noise, wheel squeal noise, and audible warning noise.
A = first row of intervening buildings.
B = second row of intervening buildings.
C = embedded track on grade.
D = aerial structure with slab track.
E = jointed track or crossover.
F = quacker noise.
G = wheel squeal noise.
H = audible warnings noise.

Table 5.19. Category 3 Land Use Light Rail Noise Assessment – Alternative 4

Cluster No.[1]	Land Use	Near Track Distance (ft)[2]	Speed (mph)	Adjustment to LRT Noise[3]	Noise Level (dBA, L_{eq})				Impact
					Existing	Project	Impact Threshold		
							Moderate	Severe	
N181	Trinity Bible Church	200	15	None	75.3	45.5	70.0	78.4	No
N183	Apostolic Assembly South Gate	280	15	None	66.6	44.0	66.9	72.2	No
N184	American Indian Bible Church	100	15	None	74.7	48.5	70.0	78.0	No

Source: TAHA, 2020
Notes: Only clusters (groups of sensitive uses) that would have different effects from Alternative 1 are shown.
[1] Cluster sites shown in Appendix A.
[2] Distance to the closest area of human use or closest building façade.
[3] Adjustments to LRT noise based on intervening rows of buildings, track type, special trackwork, quacker noise, wheel squeal noise, and audible warning noise.
A = first row of intervening buildings.
B = second row of intervening buildings.
C = embedded track on grade.
D = aerial structure with slab track.
E = jointed track or crossover.
F = quacker noise.
G = wheel squeal noise.
H = audible warnings noise.

5.5.1.2 Vibration

Vibration impacts related to Alternative 4 would be the same as Alternative 1 in the portion of the corridor where Alternative 4 would operate. No underground portion is proposed and therefore no vibration impacts related to underground LRT-pass-by would occur. Vibration impacts would be reduced overall due to the shortened length of the alignment. Alternative 4 would affect vibration clusters 125 through 233. Under Alternative 4 LRT-pass by vibration would result in 62 impacts. Twenty-eight clusters are predicted to exceed the impact criteria by more than 5 VdB.

5.5.2 Ancillary Facilities

Eight TPSS locations are proposed for Alternative 4. One severe impact would occur at TPSS site 8e and one moderate impact would occur at TPSS site 2.

5.5.3 Parking Facilities

Similar to Alternative 1, no impacts would occur related to parking facility noise.

5.5.4 Freight Track Relocation

5.5.4.1 Noise

Alternative 4 would not require the relocation of freight tracks north of Civil Station 1068+50, near the Main Street grade crossing. Freight track relocation would therefore only affect clusters 183 to 213. Freight train noise at both of these locations have been added to the LRT noise below. Freight train noise at Category 2 Clusters is shown in Table 5.20. Category 3 Clusters are shown in Table 5.21. Under Alternative 4, six Category 2 Clusters would experience moderate impacts and 15 would experience severe impacts. One Category 3 cluster would experience a moderate impact.

5.5.4.2 Vibration

Alternative 4 would not require the relocation of freight tracks north of Civil Station 1068+50, near the Main Street grade crossing. The FTA impact criterion for residential properties exposed to infrequent vibration events is 80 VdB. Projected freight train vibration would not exceed the impact threshold.

Table 5.20. Category 2 Land Use Freight Track Relocation Noise Assessment – Alternative 4

Cluster No.[1]	Land Use	Freight Track Distance (ft)[2]	Speed (mph)	Noise Level (dBA, L_{dn})						Impact
				Existing	LRT	Freight	Combined	Impact Threshold		
								Moderate	Severe	
Façade Avenue										
N182	SFR	270	10	58.8	46.6	56.6	57.0	57.1	62.8	No
N185	SFR	240	10	59.3	53.8	57.1	58.8	57.4	63.0	Moderate
N186	SFR	290	10	58.7	47.3	56.3	56.8	57.1	62.8	No
N187	SFR	250	10	59.2	53.6	56.9	58.6	57.4	63.0	Moderate

Source: TAHA, 2020
Notes: [1] Cluster sites shown in Appendix E.
[2] Distance to the closest area of human use or closest building façade.

Table 5.21. Category 3 Land Use Freight Track Relocation Noise Assessment – Alternative 4

Cluster No.[1]	Land Use	Freight Track Distance (ft)[2]	Speed (mph)	Noise Level (dBA, L_{dn})						Impact
				Existing	LRT	Freight	Combined	Impact Threshold		
								Moderate	Severe	
Façade Avenue										
N181	Trinity Bible Church	200	10	75.3	48.5	67.6	67.6	70.0	78.4	No
N183	Apostolic Assembly South Gate	275.0	10	66.6	44	51.4	66.3	66.9	72.2	No
N184	American Indian Bible Church	110	10	74.7	45.5	70.2	70.2	70.0	78.0	Moderate

Source: TAHA, 2020
Notes: [1] Cluster sites shown in Appendix E.
[2] Distance to the closest area of human use or closest building façade.

5.6 Design Options

5.6.1 Design Option 1

Noise

Design Option 1 would be entirely underground from LAUS to just south of Olympic Boulevard. Noise related to underground LRT would not be readily transmitted to surface level receivers, similar to those analyzed for Alternative 1. Therefore, noise associated with the underground segments of Design Option 1 are not considered for further analysis and no adverse effect related to noise would occur.

Vibration

Vibration levels and GBN were modeled at each cluster along the underground segment of Design Option 1. Location of the clusters are shown in Appendix B. No Vibration Category 1 land uses (i.e., buildings where vibration would interfere with operations within the buildings) were identified within this section of the alignment. Table 5.22 provides predicted vibration levels for Vibration Category 2 land uses which include all residential uses and buildings where people normally sleep, such as hospitals and hotels. No clusters would experience GBV levels that are predicted to equal or exceed the FTA vibration impact threshold nor would they exceed the GBN impact threshold. Therefore, no adverse effect related to vibration would occur.

5.6.2 Design Option 2

Noise

Under this design option, the Little Tokyo Station would be constructed and there would be a direct connection to the Regional Connector Station in Little Tokyo. Noise related to underground LRT would not be readily transmitted to surface level receivers, similar to those analyzed for Alternative 1. Therefore, no adverse effect related to noise would occur.

Vibration

Predicted vibration levels would not change with the addition of the Little Tokyo Station.

Table 5.22. Vibration Category 2 Land Use Light Rail Vibration Assessment – Design Option 1

Cluster No.[1]	Land Use	Slant Distance Near Track (ft.)	Speed (mph)	Track Type	Predicted GBV Level, VdB	FTA GBV Impact Criteria, VdB	Exceeds?	Amount Exceeds	GBN, dBA	GBN Criteria, dBA	Exceeds?	Amount Exceeds
V2	SFR/MFR	95	55	Direct Fixation	56	72	No	–	21	35	No	–

Source: WSP, 2020
Note: [1] Cluster sites shown in Appendix B.
GBV = Groundborne vibration; SFR = Single-Family Residential; MFR = Multi-Family Residential

5.7 Maintenance and Storage Facility

5.7.1 Paramount MSF Site Option

5.7.1.1 Noise

The Paramount Option is located in the City of Paramount, south of the WSAB alignment. It is a rectangular site bounded by All America City Way to the north, a church, school, swap meet market and industrial property to the east, vacant land to the south, and the Ports of Los Angeles and Long Beach and the San Pedro Subdivision ROW to the west. MSF noise sources include train movements within the MSF and on lead tracks, wheels striking special trackwork, wheel squeal on curves, maintenance shops, the car wash, and associated vehicular traffic from employee trips. Lead tracks to the MSF site within the City of Paramount would enter the site along its western edge approximately 0.3 mile south of the WSAB mainline track. The lead tracks would align to the east of existing freight tracks, partially outside of the ROW, impacting private property. Both lead tracks would be at-grade north of the MSF and would cross Rosecrans Avenue through a new grade crossing and then descend into a trench configuration. Noise levels related to these sources were modeled at the 18 sensitive use clusters near the Paramount MSF site option, and noise levels would not exceed the FTA impact criteria at nearby sensitive uses. Noise levels at the clusters near the Paramount Option site and the lead tracks were modeled and are shown in Table 5.23. No impacts would occur. Calculation details are included in Appendix K. Clusters and impacts are shown in Appendix E.

5.7.1.2 Vibration

The Paramount MSF site option is more 200 feet from any residential land uses. GBV from train movements through crossover trackwork at 10 mph in the yard are predicted not to exceed the FTA impact threshold of 72 VdB FOR Category 2 clusters.

Lead tracks to the MSF site within the City of Paramount would enter the site along its western edge approximately 0.3 mile south of the WSAB mainline track. Movement of the LRT trains on the lead tracks in and out of the facility at 20 mph would result in a GBV level of 70 VdB at the nearest residential property. No vibration impacts would occur from the vehicle movements on the lead tracks.

The lead tracks would require the relocation of the existing freight track 15 feet closer to the residential properties along Façade Street. GBV levels caused by the relocation of the freight line at the clusters near the Paramount Option site and the lead tracks were modeled and are shown in Table 5.24. Freight train operations would be infrequent as only two to three trains are estimated to travel past this location in any one day. The FTA impact criterion for residential properties exposed to infrequent vibration events is 80 VdB. Thus, the GBV is predicted not to exceed the impact criterion and no adverse effects related to vibration is predicted to occur as a result of realignment of the freight tracks.

Table 5.23. Maintenance and Storage Facility Noise Assessment – Paramount Option

Cluster No.[1]	Land Use	FTA Land Use Category[2]	Noise Level (Cat 2 dBA, L_{dn}) (Cat 3 dBA, L_{eq})				Impact
			Existing	Project	Impact Threshold		
					Moderate	Severe	
P1	SFR/MFR	2	64.0	50.9	60.2	65.6	No
P2	SFR/MFR	2	64.0	50.9	60.2	65.6	No
P3	SFR/MFR	2	50.3	45.9	53.5	59.7	No
P4	SFR/MFR	2	50.3	45.9	53.5	59.7	No
P5	SFR/MFR	2	50.3	47.9	53.5	59.7	No
P6	SFR/MFR	2	50.3	30.9	53.5	59.7	No
P7	SFR/MFR	2	50.3	42.8	53.5	59.7	No
P8	SFR/MFR	2	50.3	29.7	53.5	59.7	No
P9	SFR/MFR	2	50.8	32.8	53.6	59.8	No
P10	SFR/MFR	2	50.8	42.7	53.6	59.8	No
P11	SFR/MFR	2	50.8	45.9	53.6	59.8	No
P12	SFR/MFR	2	50.8	51.1	53.6	59.8	No
P13	Bianchi Stadium 11 Theatre	3	59.4	49.6	62.5	68.1	No
P14	Paramount Adult School	3	64.3	46.2	65.4	70.8	No
P15	Our Lady of the Rosary Catholic School	3	67.3	53.0	67.4	72.7	No
P16	Our Lady of the Rosary Parish	3	67.3	45.9	67.4	72.7	No
P17	Our Lady of the Rosary Convent	2	65.3	42.1	61.0	66.4	No
P18	SFR/MFR	2	58.0	49.1	56.7	62.4	No

Source: TAHA, 2020
Notes: [1] Cluster Sites are shown in Appendix F.
[2] Category 2: Residences and buildings where people normally sleep. This category includes homes, hospitals and hotels where a nighttime sensitivity to noise is assumed to be of utmost importance.
Category 3: Institutional land uses with primarily daytime and evening use. This category includes schools, libraries, theaters, and churches where it is important to avoid interference with such activities as speech, meditation and concentration on reading material. Places for meditation or study associated with cemeteries, monuments, museums, campgrounds and recreational facilities can also be considered to be in this category. Certain historical sites and parks are also included.
SFR = Single-Family Residential; MFR = Multi-Family Residential

Table 5.24. Vibration Category 2 Land Use Light Rail Vibration Assessment – Paramount Option - Freight Line Movement

Cluster No.[1]	Land Use	Near Track Distance (ft.)	Speed (mph)[4]	Track Type	Predicted GBV Level, VdB	FTA GBV Impact Criteria[2], dBA	Exceeds?[3]	Amount Exceeds
V155	SFR	70	20	Ballast & Tie	78	80	N	–
V156	SFR	40	20	Ballast & Tie	80	80	N	–
V157	SFR	40	20	Ballast & Tie	80	80	N	–
V158	SFR	50	20	Ballast & Tie	79	80	N	–

Source: WSP, 2020.
Notes: Predicted vibration levels that exceeds 80 VdB are an impact for infrequent events of fewer than 30 per day.
[1] Cluster sites shown in Appendix B.
[2] The FTA GBV Impact Criteria is based on infrequent events fewer than 30 per day.
[3] A vibration level is an impact if it exceeds the impact criteria threshold.
[4] Freight Trains use the FTA 20*Log speed adjustment.
GBV = Groundborne vibration

5.7.2 Bellflower MSF Site Option

5.7.2.1 Noise

The Bellflower Option is located on property owned by the City of Bellflower and leased to the Hollywood Sports Paintball & Airsoft Park, a recreational commercial business. The site is bounded by industrial facilities to the west, Somerset Boulevard and apartment complexes to the north, residential homes to the east and the San Pedro Branch and Bellflower Bike Trail to the south. Noise levels at the clusters near the Bellflower Option were modeled and are shown in Table 5.25. No impacts would occur. Calculation details are included in Appendix K. Clusters and impacts are shown in Appendix E.

Table 5.25. Maintenance and Storage Facility Noise Assessment – Bellflower Option

Cluster No.[1]	Land Use	FTA Land Use Category[2]	Noise Level (Cat 2 dBA, L_{dn}) (Cat 3 dBA, L_{eq})				Impact
			Existing	Project	Impact Threshold		
					Moderate	Severe	
BF1	SFR	2	52.0	45.6	54.1	60.1	No
BF2	SFR	2	52.0	37.3	54.1	60.1	No
BF3	SFR	2	52.0	42.0	54.1	60.1	No
BF4	SFR	2	52.0	37.3	54.1	60.1	No
BF5	SFR	2	52.0	36.1	54.1	60.1	No
BF6	SFR	2	52.0	35.2	54.1	60.1	No
BF7	SFR	2	52.0	35.1	54.1	60.1	No
BF8	SFR	2	52.0	35.6	54.1	60.1	No
BF9	SFR	2	52.0	36.4	54.1	60.1	No
BF10	SFR	2	52.0	33.5	54.1	60.1	No

Cluster No.[1]	Land Use	FTA Land Use Category[2]	Noise Level (Cat 2 dBA, L_{dn}) (Cat 3 dBA, L_{eq})				Impact
			Existing	Project	Impact Threshold		
					Moderate	Severe	
BF11	SFR	2	52.0	34.0	54.1	60.1	No
BF12	SFR	2	52.0	34.0	54.1	60.1	No
BF13	SFR	2	52.0	25.8	54.1	60.1	No
BF14	SFR	2	52.0	40.8	54.1	60.1	No
BF15	SFR	2	52.0	45.1	54.1	60.1	No
BF16	SFR	2	52.0	44.2	54.1	60.1	No
BF17	SFR	2	52.0	32.6	54.1	60.1	No
BF18	SFR	2	52.0	27.4	54.1	60.1	No
BF19	SFR	2	48.1	51.8	52.8	59.2	No
BF20	SFR	2	48.1	51.8	52.8	59.2	No
BF21	SFR	2	48.1	40.3	52.8	59.2	No
BF22	SFR	2	48.1	38.2	52.8	59.2	No
BF23	SFR	2	48.1	37.1	52.8	59.2	No
BF24	SFR	2	48.1	41.8	52.8	59.2	No
BF25	SFR	2	48.1	45.1	52.8	59.2	No
BF26	SFR	2	48.1	41.2	52.8	59.2	No
BF27	SFR	2	48.1	39.8	52.8	59.2	No
BF28	SFR	2	48.1	50.7	52.8	59.2	No
BF29	MFR	2	48.1	44.8	52.8	59.2	No
BF30	MFR	2	48.1	38.1	52.8	59.2	No
BF31	MFR	2	48.1	36.5	52.8	59.2	No
BF32	MFR	2	48.1	35.5	52.8	59.2	No
BF33	SFR	2	48.1	39.6	52.8	59.2	No
BF34	SFR	2	48.1	36.7	52.8	59.2	No
BF35	SFR	2	48.1	35.9	52.8	59.2	No
BF36	SFR	2	48.1	36.2	52.8	59.2	No
BF37	SFR	2	48.1	35.2	52.8	59.2	No
BF38	SFR	2	48.1	35.9	52.8	59.2	No
BF39	SFR	2	48.1	41.8	52.8	59.2	No
BF40	SFR	2	48.1	35.8	52.8	59.2	No
BF41	SFR	2	48.1	35.2	52.8	59.2	No
BF42	SFR	2	48.1	24.4	52.8	59.2	No

Cluster No.[1]	Land Use	FTA Land Use Category[2]	Noise Level (Cat 2 dBA, L_{dn}) (Cat 3 dBA, L_{eq})				Impact
			Existing	Project	Impact Threshold: Moderate	Impact Threshold: Severe	
BF43	SFR	2	48.1	43.2	52.8	59.2	No
BF44	SFR	2	48.1	37.5	52.8	59.2	No
BF45	SFR	2	48.1	36.2	52.8	59.2	No
BF46	SFR	2	48.1	26.0	52.8	59.2	No
BF47	SFR	2	48.1	41.3	52.8	59.2	No
BF48	SFR	2	48.1	35.8	52.8	59.2	No
BF49	Albert Baxter Elementary School	3	48.7	27.1	57.9	64.3	No
BF50	MFR	2	48.1	33.1	52.8	59.2	No
BF51	MFR	2	48.1	26.7	52.8	59.2	No
BF52	Mobile Homes	2	48.1	25.2	52.8	59.2	No
BF53	Mobile Homes	2	48.1	44.5	52.8	59.2	No
BF54	SFR	2	52.0	22.7	54.1	60.1	No
BF55	SFR	2	52.0	26.5	54.1	60.1	No
BF56	Mobile Homes	2	52.0	44.1	54.1	60.1	No
BF57	Mobile Homes	2	52.0	37.3	54.1	60.1	No

Source: TAHA, 2020

Notes: [1] Cluster Sites are shown in Appendix F.

[2] Category 2: Residences and buildings where people normally sleep. This category includes homes, hospitals and hotels where a nighttime sensitivity to noise is assumed to be of utmost importance.
Category 3: Institutional land uses with primarily daytime and evening use. This category includes schools, libraries, theaters, and churches where it is important to avoid interference with such activities as speech, meditation and concentration on reading material. Places for meditation or study associated with cemeteries, monuments, museums, campgrounds and recreational facilities can also be considered to be in this category. Certain historical sites and parks are also included.

SFR = Single-Family Residential; MFR = Multi-Family Residential

5.7.2.2 Vibration

The Bellflower MSF site option is approximately 75 feet from the nearest residential land uses along Virginia Avenue. Train movements through crossover trackwork at 10 mph are predicted to result in a GBV level at these residential land uses of 71 VdB which would not exceed the FTA impact threshold of 72 VdB for residential Category 2 clusters.

6 CEQA DETERMINATION

To satisfy CEQA requirements, noise and vibrations impacts would also be analyzed in accordance with Appendix G of the *CEQA Guidelines*.

6.1 Would the Project result in the generation of a substantial temporary or permanent increase in ambient noise levels in the vicinity of the project in excess of standards established by FTA or in the local general plan or noise ordinances?

6.1.1 No Project Alternative

Under the No Project Alternative, the Project alignment would not be developed, properties would not be acquired for the Project, no structures along the Project alignment would be demolished, and no new structures would be constructed along the rail and street ROWs. The existing freight tracks within the rail ROWs would remain in place and the rail ROWs would be undisturbed. Existing noise sources such as industrial areas along the Project alignment, occasional aircraft flyovers and the movement of trains along existing railroads would remain the dominant noise sources in the Project Area. No project related operational noise impacts would occur. Therefore, impacts would be less than significant, and no mitigation measures are required.

Mitigation Measures

No mitigation measures are required.

Impacts Remaining After Mitigation

Less than significant impact.

6.1.2 Alternative 1

6.1.2.1 LRT

The subterranean portion of Alternative 1 would not generate pass-by noise audible to surface receptors. Ventilation shaft and station noise is assessed below in the Ancillary Facilities subsection. Noise sources associated with at-grade and aerial LRT includes steel wheels rolling on steel rails (wheel/rail noise), propulsion motors, air conditioning, and other auxiliary equipment on the vehicles. Sensitive uses would be exposed to a combination of noise sources, including LRT pass-by noise, audible warnings noise, wheel squeal noise, special trackwork noise. Throughout the project area, Category 2 clusters would experience 76 moderate impacts and 171 severe impacts. Ten Category 3 clusters would experience moderate impacts and two would experience severe impacts. For the purposes of this analysis, moderate and severe impacts under FTA's noise criteria are considered significant impacts under CEQA. Therefore, without mitigation, impacts related to LRT noise would be significant.

Regarding health effects of noise, it is unlikely for LRT noise to result in noise-induced hearing loss, as this is an occupational hazard related to working over long periods of time in high noise environments. FTA defines moderate impacts as having the potential to result in measurable annoyance in a community and severe impacts to cause a high level of community annoyance. LRT noise could increase stress and the potential for stress-related diseases at affected sensitive uses. This applies for other areas that would result in noise impacts.

6.1.2.2 Ancillary Facilities

Five moderate and two severe impacts would occur as a result of ancillary facility noise. For the purposes of this analysis, moderate and severe impacts under FTA's noise criteria are considered significant impacts under CEQA. Therefore, without mitigation, impacts related to ancillary facility noise would be potentially significant.

6.1.2.3 Parking Facilities

No impacts would occur related to parking facility noise. Therefore, without mitigation, impacts related to parking facility noise would be less than significant.

6.1.2.4 Freight Track Relocation

Construction of the Alternative 1 would require relocation of existing freight tracks. Freight tracks would be relocated to the south of the Project alignment within the La Habra Branch ROW, and to the west of the Project alignment within the San Pedro Subdivision ROW, and to the north of the Project alignment within Metro-owned PEROW to accommodate the Build Alternative alignments and maintain existing operations along the ROW where the proposed LRT tracks would overlap.

Relocated freight tracks would generally differ from their current alignments by only a few feet and would remain in the rail ROW. Freight train noise is generally intermittent and only approximately two to three trains pass-by per day. No new noise source would be added, and the frequency of freight trains would not change. However, two locations would bring the freight tracks closer to sensitive receivers. The first location would be an approximately 20-foot shift of the centerline of the freight tracks to the south of the La Habra Branch ROW along Randolph Street. Close to the I-105 freeway, the centerline of the freight tracks would be shifted approximately 15 feet. Residences along Façade Avenue and near Rosecrans Avenue would be affected by the relocated freight tracks.

Freight train noise at both of these locations have been added to the LRT noise. Under Alternative 1, 30 Category 2 Clusters would experience moderate impacts and 24 would experience severe impacts. Five Category 3 clusters would experience moderate impacts and two would experience severe impacts. Category 3 clusters along Randolph Street are unlikely to be regularly experience impacts due to a combination of freight and LRT noise. This is because Category 3 uses are daytime uses and would not typically be open when the freight is traversing Randolph Street at night. Therefore, without mitigation, impacts related to relocated freight track noise would be potentially significant.

Mitigation Measures

Mitigation Measures NOI-1 (Soundwalls) through NOI-7 (Freight Track Relocation Soundwalls).

Impacts Remaining After Mitigation

Mitigation Measures NOI-1 (Soundwalls), NOI-2 (Low Impact Frogs), and NOI-3 (Wheel Squeal Noise Monitoring) would reduce the number and severity of operational noise impacts. Mitigation Measure NOI-4 (Crossing Signal Bells) and NOI-5 (Gate-Down-Bell-Stop

Variance) may result in additional reductions in impacts but would require CPUC approval before implementation. After implementation of mitigation measures related to LRT noise, 103 moderate impacts and 60 severe impacts would remain at Category 2 clusters. Seven moderate impacts would remain at Category 3 clusters. Regarding relocated freight track noise, 33 moderate impacts and 9 severe impacts would remain at Category 2 clusters after implementation of Mitigation Measures NOI-1 (Soundwalls), NOI-2 (Low Impact Frogs), NOI-3 (Wheel Squeal Noise Monitoring) and NOI-7 (Freight Track Relocation Soundwalls). Four moderate impacts and two severe impacts would remain at Category 3 clusters. Regarding ancillary facility noise, implementation of Mitigation Measure NOI-6 (TPSS Noise Reduction) would reduce TPSS noise levels. However, at this stage in design, various TPSS noise reduction methods may or may not be completely effective due to design constraints for individual TPSS locations, which will be determined as part of final design. Therefore, five moderate and two severe ancillary facility impacts could remain. Impacts related to Alternative 1 would remain significant and unavoidable with mitigation.

6.1.3 Alternative 2

6.1.3.1 LRT

The subterranean portion of Alternative 2 would not generate pass-by noise audible to surface receptors. Ventilation shaft and station noise is assessed below in the Ancillary Equipment subsection. Alternative 2 would follow the same alignment for at-grade and aerial segments. LRT pass-by noise impacts related to Alternative 2 would be the largely the same as Alternative 1. However, under Alternative 2 headways would be decreased to 2.5-minute headways during one hour of each weekday peak period between 7th St/Metro Center Station and the Slauson/A Line Station. Alternative 2 would result in 72 moderate impacts and 176 severe impacts at Category 2 clusters. Impacts at Category 3 clusters would remain the same as Alternative 1. For the purposes of this analysis, moderate and severe impacts under FTA's noise criteria are considered significant impacts under CEQA. Therefore, without mitigation, impacts related to LRT noise would be significant.

6.1.3.2 Ancillary Facilities

Five moderate impacts and two severe impacts would occur as a result of ancillary facility noise. For the purposes of this analysis, moderate and severe impacts under FTA's noise criteria are considered significant impacts under CEQA. Therefore, without mitigation, impacts related to ancillary facility noise would be potentially significant.

6.1.3.3 Parking Facilities

No impacts would occur related to parking facility noise. Therefore, without mitigation, impacts related to parking facility noise would be less than significant.

6.1.3.4 Freight Track Relocation

Alternative 2 would follow the same alignment for at-grade and aerial segments. Freight track relocation noise impacts related to Alternative 2 would be the same as Alternative 1. Therefore, without mitigation, impacts related to relocated freight track noise would be potentially significant.

Mitigation Measures

Mitigation Measures NOI-1 (Soundwalls) through NOI-7 (Freight Track Relocation Soundwalls).

Impacts Remaining After Mitigation

Alternative 2 would have the same impacts after mitigation as Alternative 1. Impacts related to Alternative 2 would remain significant and unavoidable with mitigation.

6.1.4 Alternative 3

6.1.4.1 LRT

Alternative 3 would not include a subterranean portion, but would follow the same alignment for at-grade and aerial segments. However, noise impacts would be reduced overall due to the shortened length of the alignment. The northern tail tracks would end at civil station 645+50 which would reduce speeds and noise levels at Clusters 33 through 45. Alternative 3 would affect clusters 33 through 347 and would result in moderate impacts at 59 of 289 Category 2 clusters and severe impacts at 153 Category 2 clusters. Ten of 26 Category 3 clusters would experience moderate impacts and two would experience severe impacts. For the purposes of this analysis, moderate and severe impacts under FTA's noise criteria are considered significant impacts under CEQA. Therefore, without mitigation, impacts related to LRT noise would be significant.

6.1.4.2 Ancillary Facilities

One moderate impact and two severe impacts would occur as a result of ancillary facility noise. For the purposes of this analysis, moderate and severe impacts under FTA's noise criteria are considered significant impacts under CEQA. Therefore, without mitigation, impacts related to ancillary facility noise would be potentially significant.

6.1.4.3 Parking Facilities

No impacts would occur related to parking facility noise. Therefore, without mitigation, impacts related to parking facility noise would be less than significant.

6.1.4.4 Freight Track Relocation

Freight Tracks would be relocated at the same locations as Alternatives 1 and 2. Noise impacts related to freight track relocation would be the same as Alternatives 1 and 2. Therefore, without mitigation, impacts related to relocated freight track noise would be potentially significant.

Mitigation Measures

Mitigation Measures NOI-1 (Soundwalls) through NOI-7 (Freight Track Relocation Soundwalls).

Impacts Remaining After Mitigation

Mitigation Measures NOI-1 (Soundwalls), NOI-2 (Low Impact Frogs), and NOI-3 (Wheel Squeal Noise Monitoring) would reduce the number and severity of operational noise impacts. Mitigation Measure NOI-4 (Crossing Signal Bells) and NOI-5 (Gate-Down-Bell-Stop Variance) may result in additional reductions in impacts but would require CPUC approval before implementation. Under Alternative 3, 94 moderate impacts and 59 severe impacts would remain at Category 2 clusters after implementation of mitigation measures. Seven moderate impacts would remain at Category 3 clusters. Impacts related to relocated freight track noise would be the same as those identified for Alternatives 1 and 2 after implementation of Mitigation Measures NOI-1 (Soundwalls), NOI-2 (Low Impact Frogs), NOI-3 (Wheel Squeal Noise Monitoring) and NOI-7 (Freight Track Relocation Soundwalls). Regarding ancillary facility noise, implementation of Mitigation Measure NOI-6 (TPSS Noise Reduction) would reduce TPSS noise levels. However, at this stage in design, various TPSS noise reduction methods may or may not be completely effective due to design constraints for individual TPSS locations which will be determined as part of final design. Therefore, one moderate and two severe ancillary facility impacts could remain. Impacts related to Alternative 3 would remain significant and unavoidable with mitigation.

6.1.5 Alternative 4

6.1.5.1 LRT

Alternative 4 would not include a subterranean portion, but would follow the same alignment for at-grade and aerial segments starting near the I-105/C Line Station. However, noise impacts would be reduced overall due to the shortened length of the alignment. The northern tail tracks would end at civil station 1068+50, which would reduce speeds and noise levels at clusters 181 through 187. Alternative 4 would affect clusters 181 through 347 and would result in moderate impacts at 15 of 149 Category 2 clusters and severe impacts at 117 Category 2 clusters. Six of 18 Category 3 clusters would experience moderate impacts and two would experience severe impacts. Therefore, without mitigation, impacts related to LRT noise would be significant.

6.1.5.2 Ancillary Facilities

One moderate and one severe impact would occur as a result of ancillary facility noise. For the purposes of this analysis, moderate and severe impacts under FTA's noise criteria are considered significant impacts under CEQA. Therefore, without mitigation, impacts related to ancillary facility noise would be potentially significant.

6.1.5.3 Parking Facilities

No impacts would occur related to parking facility noise. Therefore, without mitigation, impacts related to parking facility noise would be less than significant.

6.1.5.4 Freight Track Relocation

Alternative 4 would not require the relocation of freight tracks north of Civil Station 1068+50, near the Main Street Grade crossing. Freight track relocation would therefore only affect clusters 183 to 213. Freight train noise at both of these locations have been added to the LRT noise. Under Alternative 4, six Category 2 Clusters would experience moderate impacts and 15 would experience severe impacts. One Category 3 cluster would experience a moderate impact. Therefore, without mitigation, impacts related to relocated freight track noise would be potentially significant.

Mitigation Measures

Mitigation Measures NOI-1 (Soundwalls) through NOI-7 (Freight Track Relocation Soundwalls).

Impacts Remaining After Mitigation

Mitigation Measures NOI-1 (Soundwalls), NOI-2 (Low Impact Frogs), and NOI-3 (Wheel Squeal Noise Monitoring) would reduce the number and severity of operational noise impacts. Mitigation Measure NOI-4 (Crossing Signal Bells) and NOI-5 (Gate-Down-Bell-Stop Variance) may result in additional reductions in impacts but would require CPUC approval before implementation. Under Alternative 4, 56 moderate impacts and 44 severe impacts would remain at Category 2 clusters after implementation of mitigation measures. Three moderate impacts would remain at Category 3 clusters. Regarding relocated freight track noise, 13 moderate impacts and 1 severe impact would remain at Category 2 clusters after implementation of Mitigation Measures NOI-1 (Soundwalls), NOI-2 (Low Impact Frogs), NOI-3 (Wheel Squeal Noise Monitoring), and NOI-7 (Freight Track Relocation Soundwalls). One moderate impact would remain at Category 3 clusters. Regarding ancillary facility noise, implementation of Mitigation Measure NOI-6 (TPSS Noise Reduction) would reduce TPSS noise levels. However, at this stage in design, various TPSS noise reduction methods may or may not be completely effective due to design constraints for individual TPSS locations which will be determined as part of final design. Therefore, one moderate and one severe ancillary facility impacts could remain. Impacts related to Alternative 4 would remain significant and unavoidable with mitigation.

6.1.6 Design Options

6.1.6.1 Design Option 1

Design Option 1 would be entirely underground from LAUS to just south of Olympic Boulevard. Noise related to underground LRT would not be readily transmitted to surface-level receivers. Design Option 1 would not result in additional operational noise impacts beyond those described in Section 5.6 for Alternative 1. Therefore, operational noise impacts related to Design Option 1 would be less than significant.

6.1.6.2 Design Option 2

Design Option 2 would add the optional Little Tokyo Station to Alternative 1. Noise related to underground LRT would not be readily transmitted to surface-level receivers. Design Option 2 would not result in additional operational noise impacts beyond those described in Section 5.6 for Alternative 1. Therefore, operational noise impacts related to Design Option 2 would be less than significant.

Mitigation Measures

No mitigation measures required.

Impacts Remaining After Mitigation

Less than significant impact.

6.1.7 Maintenance and Storage Facilities

6.1.7.1 Bellflower MSF Site Option.

Noise levels related to MSF noise sources was modeled at the 57 sensitive use clusters near the Bellflower MSF site option and the modeling results indicated noise levels would not exceed the FTA noise impact criteria at nearby sensitive uses. The Bellflower MSF site option would not result in impacts. For the purposes of this analysis, moderate and severe impacts under

FTA's noise criteria are considered significant impacts under CEQA. Therefore, impacts related to noise at the Bellflower MSF site option would be less than significant.

6.1.7.2 Paramount MSF Site Option.

Noise levels related to MSF noise sources was modeled at the 18 sensitive use clusters near the Paramount MSF site option and the modeling results indicated noise levels would not exceed the FTA noise impact criteria at nearby sensitive uses. The Paramount MSF site option would not result in impacts. For the purposes of this analysis, moderate and severe impacts under FTA's noise criteria are considered significant impacts under CEQA. Therefore, impacts related to noise at the Paramount MSF site option would be less than significant.

Mitigation Measures

No mitigation measures required.

Impacts Remaining After Mitigation

Less than significant impact.

6.2 Would the Project result in generation of excessive groundborne vibration or groundborne noise levels?

6.2.1 No Project Alternative

Under the No Project Alternative, the Project alignment would not be developed, properties would not be acquired for the Project, no structures along the Project alignment would be demolished, and no new structures would be constructed along the rail and street ROWs. The existing freight tracks within the rail ROWs would remain in place and the rail ROWs would be undisturbed. Existing sources of GBV including trucks travelling along roadways, construction utilizing heavy equipment, and active freight lines within the corridor would remain the dominant GBV and GBN sources in the Project Area. No project related operational vibration impacts would occur. Therefore, impacts would be less than significant and no mitigation measures are required.

Mitigation Measures

No mitigation measures are required.

Impacts Remaining After Mitigation

Less than significant impact.

6.2.2 Alternative 1

6.2.2.1 LRT

As described in Section 5.2.1, 5.2.1 and 5.3.1, one Vibration Category 2 cluster would experience GBV and GBN impacts from underground LRT pass-by vibration. 101 vibration Category 2 clusters would experience impacts from at-grade and aerial LRT pass-by vibration. These predicted GBV levels are in the range of 1 to 20 VdB above the FTA vibration criteria. Thirty-eight clusters are predicted to exceed the impact criteria by more than 5 VdB. Therefore, where the projected GBV is 1 VdB to 5 VdB greater than the impact threshold there is a strong chance that actual GBV levels will be below the impact threshold and would not result in an adverse effect. Where the projected GBV is 5 VdB greater than the impact threshold vibration impact is probable. None of the Category 3 clusters would experience impacts. Therefore, without mitigation, impacts related to LRT pass-by vibration would be potentially significant.

6.2.2.2 Freight Track Relocation

Alternative 1 would not require significant changes to the freight track alignment that would result in impacts at sensitive land uses. No new sources of train vibration would be added to the existing freight tracks. In the Southern Section, realignment of the freight tracks along Façade Avenue would move freight tracks closer to residences. The vibration level associated with freight trains at the new location would be 77 VdB at occupied building structures along Façade Avenue. The FTA impact criterion for residential properties exposed to infrequent vibration events is 80 VdB. Projected freight train vibration would not exceed the impact threshold. Therefore, impacts related to freight track relocation vibration would be less than significant, and no mitigation measures are required.

Mitigation Measures

Mitigation Measures VIB-1 (Ballast Mat or Resilient Rail Fasteners) and VIB-2 (Low Impact Frogs).

Impacts Remaining After Mitigation

Mitigation Measures VIB-1 (Ballast Mat or Resilient Rail Fasteners) and VIB-2 (Low Impact Frogs) would reduce LRT pass-by vibration impacts. However, 14 impacts would remain along the alignment after mitigation in the range of 1 VdB to 5 VdB. In accordance with FTA guidance, there is a strong chance that actual GBV levels at these 14 locations would be below the impact threshold with mitigation. A FTA Detail Vibration Assessment would be conducted during final design to determine if vibration impacts would not occur, and control measures would not be needed. Based on currently available information, impacts would be significant even after implementation of mitigation. Therefore, impacts related to LRT pass-by vibration may be significant and unavoidable.

6.2.3 Alternative 2

6.2.3.1 LRT

As described in Section 5.3.2.1, no vibration Category 2 clusters would experience GBV and GBN impacts from underground LRT pass-by vibration. Alternative 2 would follow the same alignment for at-grade and aerial segments as Alternative 1. At-grade and aerial LRT pass-by vibration impacts related to Alternative 2 would be the same as Alternative 1. 101 Vibration Category 2 receivers are predicted to exceed the FTA vibration impact threshold of 72 VdB for frequent events. These predicted GBV levels are in the range of 1 VdB to 20 VdB above the FTA vibration criteria. Thirty-eight clusters are predicted to exceed the impact criteria by more than 5 VdB. Therefore, where the projected GBV is 1 VdB to 5 VdB greater than the impact threshold there is a strong chance that actual GBV levels will be below the impact threshold and would not result in an adverse effect. Where the projected GBV is 5 VdB greater than the impact threshold vibration impact is probable. None of the Vibration Category 3 receivers are predicted to exceed the FTA vibration impact threshold. Therefore, without mitigation, impacts related to LRT pass-by vibration would be potentially significant.

6.2.3.2 Freight Track Relocation

As described in Section 5.3.1.2, the vibration level associated with freight trains at the newly relocated tracks would be 77 VdB at occupied building structures along Facade Avenue. These levels are based on at-grade with ballast and tie. Freight train vibration would be infrequent as only two to three trains are estimated to travel near this location in any one day. The FTA impact criterion for residential properties exposed to infrequent vibration events is 80 VdB. Projected freight train vibration would not exceed the impact threshold. Therefore, impacts related to freight track relocation vibration would be less than significant, and no mitigation measures are required.

Mitigation Measures

Mitigation Measures VIB-1 (Ballast Mat or Resilient Rail Fasteners) and VIB-2 (Low Impact Frogs).

Impacts Remaining After Mitigation

Mitigation Measures VIB-1 (Ballast Mat or Resilient Rail Fasteners) and VIB-2 (Low Impact Frogs) would reduce LRT pass-by vibration impacts. Similar to Alternative 1, 14 impacts in the range of 1 VdB to 5 VdB would remain along the alignment after mitigation. In accordance with FTA guidance, there is a strong chance that actual GBV levels at these 14 locations would be below the impact threshold with mitigation. A FTA Detail Vibration Assessment would be conducted during final design to determine if vibration impacts would not occur, and control measures would not be needed. Based on currently available information, impacts would be significant even after implementation of mitigation. Therefore, impacts related to LRT pass-by vibration may be significant and unavoidable.

6.2.4 Alternative 3

6.2.4.1 LRT

As described in Section 5.4.1.2, vibration impacts related to Alternative 3 would largely be the same as Alternative 1. No underground portion is proposed and therefore no vibration impacts related to underground LRT-pass-by would occur. Vibration impacts would be reduced overall due to the shortened length of the alignment. Alternative 3 would affect vibration clusters 41 through 233. Under Alternative 3 LRT-pass by vibration would result in 96 clusters exceeding the FTA impact criteria of 72 VdB. Thirty-five clusters are predicted to exceed the impact criteria by more than 5 VdB. Therefore, without mitigation, impacts related to LRT pass-by vibration would be potentially significant.

6.2.4.2 Freight Track Relocation

As described in Section 5.4.4.2, the vibration level associated with freight trains at the newly relocated tracks would be 77 VdB at occupied building structures along Facade Avenue. These levels are based on at-grade with ballast and tie. Freight train vibration would be infrequent as only two to three trains are estimated to travel near this location in any one day. The FTA impact criterion for residential properties exposed to infrequent vibration events is 80 VdB. Projected freight train vibration would not exceed the impact threshold. Therefore, impacts related to freight track relocation vibration would be less than significant, and no mitigation measures are required.

Mitigation Measures

Mitigation Measures VIB-1 (Ballast Mat or Resilient Rail Fasteners) and VIB-2 (Low Impact Frogs).

Impacts Remaining After Mitigation

Mitigation Measures VIB-1 (Ballast Mat or Resilient Rail Fasteners) and VIB-2 (Low Impact Frogs) would reduce LRT pass-by vibration impacts. Similar to Alternatives 1 and 2, 13 impacts in the range of 1 VdB to 5 VdB would remain along the alignment after mitigation. In accordance with FTA guidance, there is a strong chance that actual GBV levels at these locations would be below the impact threshold with mitigation. A FTA Detail Vibration Assessment would be conducted during final design to determine if vibration impacts would not occur, and control measures would not be needed. Based on currently available information, impacts would be significant even after implementation of mitigation. Therefore, impacts related to LRT pass-by vibration may be significant and unavoidable.

6.2.5 Alternative 4

6.2.5.1 LRT

As described in Section 5.5.1.2, vibration impacts related to Alternative 4 would largely be the same as Alternative 1. No underground portion is proposed and therefore no vibration impacts related to underground LRT-pass-by would occur. Vibration impacts would be reduced overall due to the shortened length of the alignment. Alternative 4 would affect vibration clusters 125 through 233. Under Alternative 4 LRT-pass by vibration would result in 62 clusters exceeding impact criteria. Twenty-eight clusters are predicted to exceed the impact criteria by more than 5 VdB. Therefore, without mitigation, impacts related to LRT pass-by vibration would be potentially significant.

6.2.5.2 Freight Track Relocation

As described in Section 5.5.4.2, the vibration level associated with freight trains at the newly relocated tracks would be 77 VdB at occupied building structures along Facade Avenue. These levels are based on at-grade with ballast and tie. Freight train vibration would be infrequent as only two to three trains are estimated to travel near this location in any one day. The FTA impact criterion for residential properties exposed to infrequent vibration events is 80 VdB. Projected freight train vibration would not exceed the impact threshold. Therefore, impacts related to freight track relocation vibration would be less than significant, and no mitigation measures are required.

Mitigation Measures

Mitigation Measures VIB-1 (Ballast Mat or Resilient Rail Fasteners) and VIB-2 (Low Impact Frogs).

Impacts Remaining After Mitigation

Mitigation Measures VIB-1 (Ballast Mat or Resilient Rail Fasteners) and VIB-2 (Low Impact Frogs) would reduce LRT pass-by vibration impacts. However, 11 impacts in the range of 1 VdB to 5 VdB would remain along the alignment after mitigation. In accordance with FTA guidance, there is a strong chance that actual GBV levels at these locations would be below the impact threshold with mitigation. A FTA Detail Vibration Assessment would be conducted during final design to determine if vibration impacts would not occur, and control measures would not be needed. Based on currently available information, impacts would be significant even after implementation of mitigation. Therefore, impacts related to LRT pass-by vibration may be significant and unavoidable.

6.2.6 Design Options

6.2.6.1 Design Option 1

GBV and GBN levels were modeled at each cluster along the underground segment for Design Option 1. No clusters would experience levels that are predicted to equal or exceed the FTA impact criteria. Design Option 1 would not include additional impacts beyond those described in Section 5.6 for Alternative 1. Therefore, operational vibration impacts related to Design Option 1 would be less than significant.

6.2.6.2 Design Option 2

Predicted vibration levels would not change with the addition of the Little Tokyo Station. Design Option 2 would not include additional impacts beyond those disclosed above for Alternative 1. Therefore, operational vibration impacts related to Design Option 2 would be less than significant.

Mitigation Measures

No mitigation measures required.

Impacts Remaining After Mitigation

Less than significant impact.

6.2.7 Maintenance and Storage Facilities

6.2.7.1 Bellflower MSF Site Option.

As described in Section 5.7.2, no impacts would occur related to vibration at the Bellflower MSF site options.

6.2.7.2 Paramount MSF Site Option.

As described in Section 5.7.1, no impacts would occur related to vibration at the Paramount MSF site options.

Mitigation Measures

No mitigation measures required.

Impacts Remaining After Mitigation

Less than significant impact.

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

6.3.1 No Project Alternative

There are no public airports or private airstrips located within two miles of the project area. Therefore, no impacts related to airport noise would occur.

6.3.2 Build Alternatives

There are no public airports or private airstrips located within two miles of the Project area. Therefore, no impacts related to airport noise would occur.

6.3.2.1 Mitigation Measure

No mitigation required.

6.3.2.2 Impacts Remaining After Mitigation

No impacts were identified.

7 CONSTRUCTION IMPACTS

7.1 Construction Activities

Construction activities associated with the West Santa Ana Branch Project are detailed in the *West Santa Ana Branch Transit Corridor Project Construction Methods Report* (Metro 2021a).

7.2 Construction Methodology

To satisfy National Environmental Policy Act (NEPA) requirements the analysis utilizes FTA Transit Noise and Vibration Impact Assessment guidance for the general assessment construction noise criteria associated with transit projects. The criteria are based upon an 1-hour L_{eq}. There may be adverse community reaction if the following 1-hour L_{eq} noise levels are exceeded:

- Residential: 90 dBA during the day and 80 dBA at night
- Commercial: 100 dBA during the day and 100 dBA at night
- Industrial: 100 dBA during the day and 100 dBA at night

As shown in Table 7.1, several jurisdictions have not established quantitative thresholds for construction noise, but instead rely on allowable hours of construction to limit construction noise. The City of Los Angeles, County of Los Angeles and the City of Downey have established quantitative standards for construction noise. For the purposes of this analysis, the FTA general assessment construction noise limit criteria 1-hour L_{eq} have been applied.

Table 7.1. Construction Standards by Jurisdiction

Jurisdiction	Permissible Construction Time	Quantitative Construction Noise Standard
City of Artesia	7:00 a.m. to 7:00 p.m. Monday through Saturday	No
City of Bell	Not Established	No
City of Bellflower	7:00 a.m. to 6:00 p.m. Monday through Friday 8:00 a.m. to 6:00 p.m. Saturdays	No
City of Cerritos	7:00 a.m. to 7:00 p.m.	No
City of Cudahy	Daytime (not defined)	No
City of Huntington Park	7:00 a.m. to 7:00 p.m. Monday through Saturday	No
City of Paramount	7:00 a.m. to 8:00 p.m. Monday through Saturday	No
City of South Gate	8:00 a.m. to 7:00 p.m. Monday through Saturday	No
City of Vernon	Not Established	No
City of Downey	7:00 a.m. to 9:00 p.m.	85 dBA at the property line

Jurisdiction	Permissible Construction Time	Quantitative Construction Noise Standard
City of Los Angeles	7:00 a.m. to 9:00 p.m. Monday through Friday 8:00 a.m. to 6:00 p.m. Saturdays:	75 dBA at 50 feet within 500 feet of a residential zone
County of Los Angeles	7:00 a.m. to 7:00 p.m. Monday through Saturday	75 dBA at single-family residence 80 dBA at multi-family residence

Source: City of Artesia, *Municipal Code*, March 2017; City of Bellflower, *Municipal Code*, February 2017; City of Cerritos, *Municipal Code*, May 25, 2017; City of Cudahy, *2010 General Plan Noise Element*, September 15, 2010; City of Huntington Park, *Municipal Code*; City of Paramount, *Municipal Code*, 2017; City of South Gate, *Municipal Code*, February 14, 2017

Short-term annoyance from vibration during construction is not a NEPA-significant impact. In most cases, the primary concern regarding construction vibration relates to potential damage effects. To satisfy NEPA requirements the potential for damage to structures associated with construction vibration has been assessed using FTA vibration damage criteria shown in Table 7.2.

Table 7.2. Construction Vibration Damage Risk Criteria

Building Category	PPV (inches / second)
I. Reinforced-concrete, steel or timber (no plaster)	0.5
II. Engineered concrete and masonry (no plaster)	0.3
III. Historic buildings that have average sensitivity to vibration damage and non-engineered timber and masonry buildings	0.2
IV. Buildings extremely susceptible to vibration damage	0.12

Source: FTA, 2018
Note: PPV = peak particle velocity

The limit of 0.12 in/sec for fragile historic structures is among the most restrictive limits used for vibration damage risk to buildings. A damage risk criteria of 0.2 in/sec (PPV) is protective of all but the most fragile buildings.

To satisfy California Environmental Quality Act (CEQA) requirements, noise and vibration impacts are analyzed in accordance with Appendix G of the *CEQA Guidelines* and considered significant if the Project has the potential to:

- Result in the generation of a substantial temporary or permanent increase in ambient noise levels in the vicinity of the project in excess of standards established by FTA or in the local general plan or noise ordinances;
- Result in generation of excessive GBV or GBN levels; and/or
- 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.

7.2.1 Noise Model

Construction noise was modeled using noise levels from the FTA Guidance Manual and the Federal Highway Administration (FHWA) Roadway Construction Noise Model (RCNM) version 1.1. The FTA Guidance Manual includes noise levels for common pieces of construction equipment. For equipment noise levels not listed in FTA Guidance Manual noise levels from the RCNM were used. Construction noise levels were assessed as they would typically occur on the alignment. The two loudest pieces of construction equipment were combined and this noise level was used to assess construction noise against the FTA construction 1-hour L_{eq} noise criteria.

7.2.2 Vibration Model

The FTA analytical/empirical construction vibration prediction model was used to estimate vibration level propagation from construction equipment to vibration-sensitive locations. The vibration model is based on a combination of previous works, including measured equipment vibration emission data from several reference sources and projects, including the FTA's Guidance Manual, the Central Artery/Tunnel Project in Boston, and ground transmissibility relationships found in Charles Dowding's reference textbook. The fundamental equation used in the model is based on propagation relationships of vibration through average soil conditions and distance, as follows:

$$PPV_{receiver} = PPV_{ref} \times (25/Dist_{receiver})^n$$

where:

$PPV_{receiver}$ = predicted PPV at the receiver

PPV_{ref} = reference PPV of equipment at 25 feet

$Dist_{receiver}$ = distance from the receiver to the equipment in feet

n = 1.5 (the vibration attenuation rate through the soil)

The suggested value for "n" in the FTA Guidance Manual is 1.5. The value for "n" can lie between 1.0 and 2.0, and a value of 1.5 is commonly used in general vibration prediction models for distances less than 100 feet.

Equipment vibration emission levels used for the predictions are shown in Table 7.3. As additional guidance for the contractor, the distance beyond which the damage risk criteria would not be exceeded is presented in Table 7.4 building categories I and III.

Table 7.3. Equipment Vibration Emission Levels

Equipment		Vibration Level at 25 feet (in/sec PPV)
Pile Driver (impact)	Upper range	1.518
	Typical	0.644
Large Bulldozer		0.089
Caisson Drilling		0.089
Small Bulldozer		0.003
Jack Hammer		0.035
Hoe Ram		0.089
Loaded Truck		0.076
Vibratory Roller		0.210

Source: FTA, 2018

Table 7.4 Construction Vibration Emission Levels and Distance to Impact Threshold

Equipment	PPV Ref Level at 25 ft (in/sec)	Distance to FTA Building Impact Category I of 0.20 in/sec (PPV)[1], feet	Distance to FTA Building Impact Category I of 0.50 in/sec (PPV)[2], feet
Auger Drill Rig	0.089	15	8
Backhoe	0.028	7	4
Bulldozer (small)	0.03	7	4
Bulldozer (large)	0.089	15	8
Caisson Drill	0.089	15	8
Compactor/Ballast Tamper	0.4254	41	23
Concrete Mixer	0.076	13	8
Concrete Pump	0.076	13	8
Crane	0.0006	1	1
Dump Truck	0.02	6	3
Excavator	0.175	23	13
Flat Bed Truck	0.02	20	3
Front End Loader	0.0866	15	8
Gradall	0.0866	15	8
Grader	0.0866	15	8
Hydra Break Ram	0.089	15	8
Insitu Soil Sampling Rig	0.089	15	8
Jackhammer	0.035	8	5

Equipment	PPV Ref Level at 25 ft (in/sec)	Distance to FTA Building Impact Category I of 0.20 in/sec (PPV) [1], feet	Distance to FTA Building Impact Category I of 0.50 in/sec (PPV)[2], feet
Loaded Trucks	0.076	13	8
Mounted Hammer hoe ram	0.325	35	20
Paver	0.076	13	8
Soil Mix Drill Rig	0.089	15	8
Tractor	0.076	14	8
Tunnel Boring Machine (rock)	0.1181	18	10
Tunnel Boring Machine (soil)	0.0236	7	4
Vibratory Pile Driver	0.734	60	33
Vibratory Roller (large)	0.21	26	15
Vibratory Roller (small)	0.126	19	10
Clam Shovel Drop	0.202	26	14

Notes: [1] Damage risk criteria for well-constructed historic buildings.
[2] Damage risk criteria for well-constructed historic non-building structures.

7.3 Construction Impacts

7.3.1 No Build Alternative

The No Build Alternative includes projects identified in the SCAG *2016 RTP/SCS* (SCAG 2016a), Metro's *2009 LRTP* (Metro 2009a), and Measure M. Under the No Build Alternative, the Build Alternative would not be developed. However, several infrastructure and transportation-related projects would be implemented and built in the vicinity of the project alignment, including the Metro East-West Line/Regional Connector/Eastside Phase 2, California High-Speed Rail, Metro North-South Line/Regional Connector, improvements to the Metro bus system and local municipality bus systems, I-710 South Corridor Project, and I-105 Express Lane. The projects in the No Build Alternative would have their own environmental evaluations with mitigation measures, if necessary. Under the No Build Alternative, the Build Alternatives would not be constructed. Therefore, the No Build Alternative would not result in an adverse effect related to increasing noise levels or vibration levels at sensitive receivers.

Table 7.5: Predicted Construction Vibration at Listed and Eligible Historic Properties

Eligible	APE Map No.	Property Location	Land Use	Year Built	Track Type	Horizontal Distance from Track Centerline to Building	Damage Risk Criteria - in/sec (PPV)	Predicted Maximum Construction Vibration Level – in/sec (PPV)	Exceed Damage Risk Criteria (Y/N)
Listed	1-006	900 N Alameda St, Los Angeles	Commercial	1938	Underground	0	0.20	<0.025	N
Listed	1-007	750 N Alameda St, Los Angeles	Commercial	N/A	Underground	0	0.20	<0.025	N
Yes	2-003	216 S Alameda St, Los Angeles	Industrial	1924	Underground	0	0.20	<0.025	N
Yes	2-004	701 E 3rd St, Los Angeles	Commercial	1924	Underground	0	0.20	<0.025	N
Yes	2-005	312 S Alameda St, Los Angeles	Commercial	1901	Underground	0	0.50	<0.025	N
Yes	2-006	400 S Alameda St, Los Angeles	Industrial	1908	Underground	0	0.20	<0.025	N
Yes	2-008	426 S Alameda St, Los Angeles	Industrial	N/A	Underground	0	0.20	<0.025	N
Yes	2-009	436 S Alameda St, Los Angeles	Industrial	1921	Underground	0	0.20	<0.025	N
Yes	2-010	440 S Alameda St, Los Angeles	Industrial	1921	Underground	0	0.20	<0.025	N
Yes	2-011	500 S Alameda St, Los Angeles	Commercial	1949	Underground	0	0.20	<0.025	N
Yes	2-013	542 S Alameda St, Los Angeles	Industrial	1930	Underground	0	0.20	<0.025	N
Yes	2-015	Air Raid Siren No. 65_WIlde St	Commercial	N/A	Underground	0	0.50	<0.025	N
Yes	3-002	757 S Flower St, Los Angeles	Commercial	1948	Underground	0	0.20	<0.025	N
Yes	3-004	801 S Flower St, Los Angeles	Commercial	1931	Underground	0	0.20	<0.025	N
Yes	3-006	Air Raid Siren No. 5_8th & Hope	Commercial	N/A	Underground	0	0.50	<0.025	N
Yes	3-007	South Hope Street Lights (1925)	Commercial	N/A	Underground	0	0.20	<0.025	N
Yes	3-008	423 W 8th St, Los Angeles	Commercial	1906	Underground	0	0.20	<0.025	N
Yes	3-010	416 W 8th St, Los Angeles	Commercial	1924	Underground	0	0.20	<0.025	N
Yes	3-013	313 W 8th St, Los Angeles	Commercial	1917	Underground	0	0.20	<0.025	N

Eligible	APE Map No.	Property Location	Land Use	Year Built	Track Type	Horizontal Distance from Track Centerline to Building	Damage Risk Criteria - in/sec (PPV)	Predicted Maximum Construction Vibration Level – in/sec (PPV)	Exceed Damage Risk Criteria (Y/N)
Yes	3-014	801 S Spring St, Los Angeles	Commercial	1922	Underground	0	0.20	<0.025	N
Listed	3-015	756 S Spring St, Los Angeles	Residential	N/A	Underground	0	0.50	<0.025	N
Listed	3-017	810 S Spring St, Los Angeles	Residential	1924	Underground	0	0.20	<0.025	N
Listed	3-019	812 S Spring St, No. 5, Los Angeles	Residential	1914	Underground	0	0.20	<0.025	N
Yes	3-022	809 S Los Angeles St, Los Angeles	Industrial	1919	Underground	0	0.20	<0.025	N
Listed	3-023	760 S Hill St, No 204, Los Angeles	Residential	1928	Underground	0	0.20	<0.025	N
Listed	3-024	403 E 8th St, Los Angeles	Commercial	1929	Underground	0	0.20	<0.025	N
Listed	3-025	301 W 8th St, Los Angeles	Commercial	1915	Underground	0	0.20	<0.025	N
Listed	3-026	756 S Broadway, No. CU-2, Los Angeles	Commercial	1913	Underground	0	0.20	<0.025	N
Listed	3-027	800 S Broadway, Los Angeles	Recreational	1927	Underground	0	0.20	<0.025	N
Listed	3-028	801 S Broadway, Los Angeles	Commercial	1918	Underground	0	0.20	<0.025	N
Listed	3-029	810 S Flower St, Los Angeles	Residential	N/A	Underground	20	0.20	<0.025	N
Listed	3-030	800 W 7th St, Los Angeles	Commercial	N/A	Underground	0	0.20	<0.025	N
Yes	4-001	Air Raid Siren No. 10_Los Angeles & 8th	Miscellaneous	N/A	Underground	0	0.50	<0.025	N
Yes	4-007	508 E 8th St, Los Angeles	Industrial	1924	Underground	0	0.20	<0.025	N
Listed	4-037	315 E 8th St, Los Angeles	Residential	1925	Underground	0	0.20	<0.025	N
Listed	4-038	217 E 8th St, Los Angeles	Commercial	1922	Underground	0	0.50	<0.025	N
Yes	4-039	840 South Santee, Los Angeles	Industrial	N/A	Underground	255	0.50	<0.010	N

Eligible	APE Map No.	Property Location	Land Use	Year Built	Track Type	Horizontal Distance from Track Centerline to Building	Damage Risk Criteria - in/sec (PPV)	Predicted Maximum Construction Vibration Level – in/sec (PPV)	Exceed Damage Risk Criteria (Y/N)
Yes	5-003	Air Raid Siren No. 189_8th & McGarry	Miscellaneous	N/A	Underground	0	0.50	<0.025	N
Yes	5-004	1753 E Olympic Blvd, Los Angeles	Industrial	1912	Underground	0	0.20	<0.025	N
Yes	5-009	1250 Long Beach Ave, Los Angeles	Residential	1906	Underground	0	0.20	<0.025	N
Yes	5-010	1312 E 7th St, Los Angeles	Industrial	N/A	Underground	0	0.20	<0.025	N
Yes	6-004	1608 15th St, Los Angeles	Industrial	N/A	Aerial	16	0.20	0.17	N
Yes	6-006	1600 Compton Ave, Los Angeles	Industrial	1923	Aerial	12	0.50	0.28	N
Yes	6-014	2001 S Alameda St,	Industrial	1925	Aerial	74	0.20	0.02	N
Yes	6-020	Air Raid Siren No. 70_24th & Long Beach	Miscellaneous	N/A	Aerial	85	0.50	0.01	N
Yes	8-013	PDR	Miscellaneous	N/A	Aerial	54	0.50	0.03	N
Yes	9-015	1978 Belgrave Ave, Huntington Park	Industrial	N/A	At-Grade	53	0.20	0.03	N
Yes	10-012	6101 Santa Fe Ave, Huntington Park	Commercial	N/A	At-Grade	67	0.20	0.02	N
Yes	10-017	2860 Randolph St, Huntington Park	Residential	1926	At-Grade	66	0.20	0.02	N
Yes	11-016	3350 Randolph St, Huntington Park	Miscellaneous	N/A	Aerial	100	0.50	0.01	N
Yes	11-018	6300 State St, Huntington Park	Commercial	1929	Aerial	617	0.50	0.00	N

Eligible	APE Map No.	Property Location	Land Use	Year Built	Track Type	Horizontal Distance from Track Centerline to Building	Damage Risk Criteria - in/sec (PPV)	Predicted Maximum Construction Vibration Level – in/sec (PPV)	Exceed Damage Risk Criteria (Y/N)
Listed	17-005	LADWP Boulder Dam-Los Angeles 287.5 kV Transmission Line (1936)	Linear Non-Parcel Resource – No Building	N/A	At-Grade	10	0.50	0.35	N
Yes	17-006	Union Pacific Los Angeles River Rail Bridge	Miscellaneous	N/A	Aerial	10	0.50	0.35	N
Yes	18-016	Southern California Edison, Long Beach to Laguna Bell Transmission Line	Miscellaneous	N/A	Aerial	39	0.50	0.05	N
Yes	19-013	7601 E Imperial Hwy, Downey	Miscellaneous	N/A	At-Grade	41	0.50	0.04	N
Yes	21-027	105 Freeway	Freeway (No Building)	N/A			N/A		N
Yes	24-001	14819 Paramount Blvd, Paramount	Institutional	N/A	At-Grade	1446	0.20	0.00	N
Yes	28-008	Bellflower Pacific Electric Railway Depot	Institutional	N/A	At-Grade	23	0.50	0.10	N
Yes	28-009	10040 Flora Vista St, Bellflower	Residential	1931	At-Grade	43	0.20	0.04	N

Notes: Underground trackwork alignments assume the maximum construction vibration levels would occur from TBM operations.
At-grade trackwork alignments assume the maximum construction vibration levels would occur from compacting of the track beds and ballast tamping.
Aerial trackwork assume the maximum construction vibration levels would occur from caisson drilling for the column structures.
N/A: information not available

7.3.2 Alternative 1

7.3.2.1 Noise

Environmental impacts and consequences were analyzed for the Project as a whole and not broken down by geographic section as the urban nature of the Affected Area is generally consistent across geographic sections for this resource. Alternative 1 would be located in a fully built-out urban environment and construction activities would occur in close proximity to sensitive land uses, including residences, parks, religious uses, and schools, throughout the corridor and may occur during daytime or nighttime hours. Unless variances, such as variances for nighttime or weekend construction, are obtained, the Project would be required to comply with the construction time limits of the Cities of Los Angeles, Huntington Park, Cudahy, South Gate, Downey, Paramount, Bellflower, Artesia, and Cerritos, and the County of Los Angeles.

Construction of the Build Alternatives would take place over the course of approximately six years. It is anticipated that several construction phases would occur simultaneously along the Project alignment, accommodating activities requiring lengthy construction times such as utility relocation, tunnels, below ground stations, and aerial segments. Simultaneous construction may also reduce the overall construction duration. Working hours of construction would vary to meet the type of work being performed and to meet local ordinance restrictions. Nighttime and weekend construction may be required to mitigate potential impacts to commute-period, traffic congestion, and to accommodate construction scheduling for specific work activities.

Project construction would be minimized during weekday AM and PM peak hours and would typically occur between the hours of 8:00 a.m. and 7:00 p.m., in accordance with the most conservative of the local ordinance restrictions among all involved cities. Metro would obtain a variance to conduct construction hours of the local ordinance. Nighttime construction may be required at times to avoid congested freeways and surface streets or due to the nature of certain construction processes. The contractor would develop an excavation plan that defines haul routes, dust control, sweeping, and disposal sites.

The four phases of construction that would occur are at-grade construction, tunnel construction, cut-and-cover construction, and elevated guideway construction. Construction of the above-ground elements of the LRT guideways and MSF would use equipment similar to heavy-earth moving equipment, generators, cranes, pneumatic tools and other similar pieces of equipment. Construction activity at station areas would be dependent on the profile of the station (at-grade, aerial, underground – cut and cover). Construction activity at staging areas would be most similar to noise levels generated by at-grade construction and would primarily involve the movement of equipment to and from the project site.

Construction activity for Alternative 1 would include the use of a tunnel boring machine (TBM) or cut and cover for construction of the underground segments. The TBM would be launched from a portal located on a property adjacent to Long Beach Avenue between E 14th Street and Newton Street. Land uses immediately adjacent to the TNM launch site are primarily non-noise sensitive industrial and commercial uses. The nearest sensitive receivers would be located approximately 400 feet to the west of the launch site with several rows of intervening buildings in the line-of-sight to the construction area. Entrances for TBM operations (tunnel launch sites) would follow similar construction methods as the station excavations (cut and cover). However, the TBM launch site area may require a higher number of haul trucks than other construction areas due to the need to export materials from tunneling. During tunnel construction activities the TBM would not be audible at aboveground sensitive receivers. The tunnel construction activities would also require the use of ventilation fans.

The FTA has provided guidance for assessing construction noise associated with transit projects. The criteria are based upon a 1-hour L_{eq}, as shown in Table 7.6. For residential uses the threshold is 90 dBA for daytime construction and 80 dBA for nighttime construction. Commercial and industrial uses are held to a 100-dBA daytime and nighttime noise construction threshold. The Project would be located in multiple jurisdictions with competing noise standards.. For the purposes of this analysis, the FTA general assessment construction noise limit criteria 1-hour L_{eq} have been applied. Typical construction equipment used during each phase of construction are listed in Table 7.6.

Table 7.6. Construction Noise by Phase

Equipment	1-hour L_{eq} (dBA)
At-Grade Construction	
Backhoe	80.0
Compressor (air)	80.0
Crane	83.0
Dump Truck	76.5
Flat Bed Truck	74.3
Generator	82.0
Grader	85.0
Rail Saw	90.0
Paver	85.0
Pneumatic Tools	85.0
Welder/Torch	74.0
Combined At-Grade Construction 1-hour L_{eq}[1]	91.2
Tunnel Construction	
Backhoe	80.0
Crane	83.0
Dump Truck	76.5
Generator	82.0
Pneumatic Tools	85.0
TBM	0.0
Ventilation Fan	85.0
Combined Tunnel Construction 1-hour L_{eq}[1]	88.0

Equipment	1-hour L_{eq} (dBA)
Cut-and-Cover	
Backhoe	80.0
Compressor (air)	80.0
Concrete Saw	89.6
Crane	83.0
Dump Truck	76.5
Excavator	80.7
Flat Bed Truck	74.3
Generator	82.0
Pneumatic Tools	85.0
Welder/Torch	74.0
Combined Cut-and-Cover Construction 1-hour L_{eq}[1]	90.9
Elevated Guideway	
Concrete Mixer Truck	85.0
Concrete Pump Truck	82.0
Concrete Saw	89.6
Crane	83.0
Dump Truck	76.5
Flat Bed Truck	74.3
Generator	82.0
Pneumatic Tools	85.0
Welder/Torch	74.0
Combined Elevated Guideway Construction 1-hour L_{eq}[1]	90.9

Source: FHWA, 2008; FTA, 2018
Notes: [1] Logarithmic sum of two loudest pieces of equipment.
dBA = A-weighted decibel; Leq = equivalent sound level; TBM = tunnel boring machine

At-Grade construction would be the loudest phases with a 1-hour L_{eq} of 91.2 dBA at 50 feet. The 1-hour L_{eq} would exceed the 1-hour L_{eq} FTA standards of 90 dBA during the day and 80 dBA at night for residential uses during the at-grade cut-and-cover, and elevated guideway phases. Tunnel construction would exceed the nighttime 1-hour L_{eq} FTA standard, but could also potentially exceed the daytime standards. Therefore, without mitigation, construction activity is expected to result in a potentially adverse noise impact.

7.3.2.2 Vibration

Construction vibration varies greatly depending on the construction process, type of equipment used, and distance to the closest receivers. Many of these factors are traditionally left to the contractor's discretion, which makes it difficult to accurately estimate levels of construction vibration. Overall, construction vibration levels are governed primarily by the equipment being used.

Construction vibration estimates are approximate because of the lack of specific information available at the time of the environmental assessment. Project designers usually try to minimize constraints on how the construction would be performed and what equipment would be used so that contractors can perform construction in the most cost-effective manner. Environmental impacts and consequences were analyzed for the Build Alternatives as a whole and not broken down by geographic section as the urban nature of the Affected Area is generally consistent across geographic sections for this resource. Construction activity would be similar along the alignment as well as the MSF site options. Construction activity in the underground portions of the alignment would include the use of a TBM. Activities would occur in close proximity to sensitive land uses throughout the corridor.

Construction of the LRT guideways, MSF, and freight track relocation would use equipment similar to heavy-earth moving equipment, cranes, and other similar pieces of equipment. Equipment used for underground construction, such as the TBM and mine trains, could generate vibration levels that could result in audible ground-borne noise levels in buildings at the surface, depending on the depth of the tunnel and soil conditions. The FTA has provided guidance for assessing construction vibration associated with transit projects. The vibration criteria are based on potential damage risk to buildings (Table 3.7) and potential annoyance to building occupants (see Section 3.1.2). The FTA standards are used in this analysis to ensure that the potential for construction vibration impacts is assessed equally throughout the corridor.

Typical construction equipment to be used during construction are listed in Table 7.5 along with the predicted vibration levels at 25 feet. Vibration generating activities could result in noticeable levels of vibration but would largely occur within the ROW and are unlikely to result in building damage. Most buildings within the project corridor are constructed of engineered concrete and masonry (no plaster) or non-engineered timber masonry which are held to vibration damage thresholds of 0.3 PPV and 0.2 PPV, respectively. The use of vibration intensive equipment, such as a compactor/ballast tamper or an impact pile driver could exceed the 0.2 PPV threshold within 45 feet of a structure. Equipment such as a vibratory roller could result in an exceedance of the 0.2 PPV threshold within 25 feet of a structure. Equipment such as large bulldozers, caisson drills, and hoe rams could result in an exceedance of the 0.2 PPV threshold within 15 feet of a structure. Additionally, fifty-nine historic structures have been identified along the proposed alignment. Historic structures are held to a vibration damage threshold of 0.20 PPV. An impact pile driver would exceed this threshold within 35 feet of a historic structure. A vibratory roller would exceed this threshold within 26 feet of a historic structure and equipment such as a large bulldozer would exceed the threshold within 20 feet of a historic structure. Vibration could also exceed the FTA vibration annoyance criteria outlined in Table 3.5 and Table 3.6 when vibration intensive equipment would be operated within 25 feet of sensitive uses. Therefore, without mitigation, construction activity is expected to result in a potentially adverse vibration impact.

Construction Vibration Effects on Historic Resources

The predicted construction vibration from the equipment and activities associated with this Project are presented in Table 7.6 at each of the eligible historic resources. The location of these historic resources is shown in the APE Maps (Metro 2020a). The highest ground vibration at those historic resources near the underground trackwork alignments would be generated by the TBM operations. Compacting of the track beds and ballast tamping would generate the highest levels at at-grade trackwork alignments, and caisson drilling for columns structures at the aerial trackwork alignments. There are no historic properties where vibration levels would exceed the damage risk criteria.

7.3.3 Alternative 2

7.3.3.1 Noise

Construction methods and equipment would be similar to Alternative 1. Under Alternative 2, the 1-hour L_{eq} of 91.2 dBA would exceed the FTA standards for residential uses. Therefore, without mitigation, construction activity is expected to result in a potentially adverse noise impact.

7.3.3.2 Vibration

Construction methods and equipment would be similar to Alternative 1. Under Alternative 2, construction vibration levels could potentially exceed the FTA vibration damage criteria and the FTA vibration annoyance criteria. Therefore, without mitigation, construction activity is expected to result in a potentially adverse vibration impact.

Construction Vibration Effects on Historic Resources

The predicted construction vibration from the equipment and activities associated with this Project are presented in Table 7.6 at each of the eligible historic resources. The location of these historic resources is shown in the APE Maps (Metro 2020a). The highest ground vibration at those historic resources near the underground trackwork alignments would be generated by the TBM operations. Compacting of the track beds and ballast tamping would generate the highest levels at at-grade trackwork alignments, and caisson drilling for columns structures at the aerial trackwork alignments. There are no historic properties where vibration levels would exceed the damage risk criteria.

7.3.4 Alternative 3

7.3.4.1 Noise

Construction methods and equipment would be similar to Alternative 1. However, under Alternative 3 there would be no underground construction that would necessitate the use of the TBM or cut-and-cover construction. In addition, due to the shortened length of Alternative 3, the extent of construction noise impacts would be reduced. Nonetheless, under Alternative 3, the 1-hour L_{eq} of 91.2 dBA would exceed the FTA standards for residential uses. Therefore, without mitigation, construction activity is expected to result in a potentially adverse noise impact.

7.3.4.2 Vibration

Construction methods and equipment would be similar to Alternative 1. However, under Alternative 3 there would be no underground construction that would necessitate the use of the TBM or cut-and-cover construction. In addition, due to the shortened length of Alternative 3, the extent of construction vibration impacts would be reduced. Nonetheless, under Alternative 3, construction vibration levels could potentially exceed the FTA vibration damage criteria and the FTA vibration annoyance criteria. Therefore, without mitigation, construction activity is expected to result in a potentially adverse vibration impact.

Construction Vibration Effects on Historic Resources

The predicted construction vibration from the equipment and activities associated with this Project are presented in Table 7.6 at each of the eligible historic resources. The location of these historic resources is shown in the APE Maps (Metro 2020a). Compacting of the track beds and ballast tamping would generate the highest levels at at-grade trackwork alignments, and caisson drilling for columns structures at the aerial trackwork alignments. There are no historic properties where vibration levels would exceed the damage risk criteria.

7.3.5 Alternative 4

7.3.5.1 Noise

Construction methods and equipment would be similar to Alternative 1. However, under Alternative 4 there would be no underground construction that would necessitate the use of the TBM or cut-and-cover construction. Alternative 4 would be the shortest Build Alternative and would therefore have the greatest reduction in the extent of construction noise impacts. Nonetheless, under Alternative 4, the 1-hour L_{eq} of 91.2 dBA would exceed the FTA standards for residential uses. Therefore, without mitigation, construction activity is expected to result in a potentially adverse noise impact.

7.3.5.2 Vibration

Construction methods and equipment would be similar to Alternative 1. However, under Alternative 4 there would be no underground construction that would necessitate the use of the TBM or cut-and-cover construction. Alternative 4 would be the shortest Build Alternative and would therefore have the greatest reduction in the extent of construction vibration impacts. Nonetheless, under Alternative 4, construction vibration levels could potentially exceed the FTA vibration damage criteria and the FTA vibration annoyance criteria. Therefore, without mitigation, construction activity is expected to result in a potentially adverse vibration impact.

Construction Vibration Effects on Historic Resources

The predicted construction vibration from the equipment and activities associated with this Project are presented in Table 7.6 at each of the eligible historic resources. The location of these historic resources is shown in the APE Maps (Metro 2020a). Compacting of the track beds and ballast tamping would generate the highest levels at at-grade trackwork alignments, and caisson drilling for columns structures at the aerial trackwork alignments. There are no historic properties where vibration levels would exceed the damage risk criteria.

7.3.6 Design Options

7.3.6.1 Design Option 1

Construction activities and requirements for design options would be similar to the rest of the alignment. Design Option 1 would move the northern terminus of Alternative 1 to the east side of LAUS. Construction methods and equipment would be similar to those utilized for the Alternative 1 northern terminus. However, construction noise and vibration would be moved to the east side of LAUS. Similar to the alignment, it is anticipated that, without mitigation, impacts related to construction noise and vibration would be potentially adverse.

7.3.6.2 Design Option 2

Construction activities and requirements for design options would be similar to the rest of the alignment. The addition of the Little Tokyo Station would result in additional construction noise and vibration impacts around the station area due to additional construction. Construction methods and equipment would be similar to those utilized for the construction of other underground stations. Similar to the alignment, it is anticipated that, without mitigation, impacts related to construction noise and vibration would be potentially adverse.

7.3.7 Maintenance and Storage Facility

7.3.7.1 Paramount MSF Site Option

Noise

Construction of the maintenance and storage facility at Paramount would utilize equipment most similar to those utilized for at-grade construction of the alignment. The1-hour L_{eq} for MSF construction is anticipated to be 91.2 dBA at 50 feet. Sensitive receptors near Paramount MSF construction activity would include residences adjacent to the lead tracks as well as Bianchi Stadium 11 Theatres to the north, and Paramount Adult School Our Lady of the Rosary Parish and associated facilities to the east of the MSF site. The 1-hour L_{eq} of 91.2 dBA would exceed the FTA standards for residential uses. Therefore, without mitigation, Paramount MSF construction activity is expected to result in a potentially adverse noise impact.

Vibration

Construction equipment utilized during construction of the Paramount MSF would be most similar to a large bulldozer. A large bulldozer would generate a vibration level of approximately 0.089 inches per second PPV at 25 feet. Vibration generating activities could result in noticeable levels of vibration but would largely occur within the MSF site and are unlikely to result in building damage. Most buildings within the project corridor are constructed of engineered concrete and masonry (no plaster) or non-engineered timber masonry which are held to vibration damage thresholds of 0.3 PPV and 0.2 PPV, respectively. Nearby structures would typically be more than 25 feet away from construction occurring at the MSF site and are unlikely to exceed the vibration damage threshold. However, construction of lead tracks could result in the exceedance of the vibration damage threshold due to the proximity of nearby residences.

7.3.7.2 Bellflower MSF Site Option

Noise

Construction of the maintenance and storage facility at Bellflower would utilize equipment most similar to those utilized for at-grade construction of the alignment. The 1-hour L_{eq} for MSF construction is anticipated to be 91.2 dBA at 50 feet. Sensitive receptors near Bellflower MSF construction activity would include residences to the north, west, east, and south and Albert Baxter Elementary School approximately 400 feet to the north. The 1-hour L_{eq} of 91.2 dBA would exceed the FTA standards for residential uses. Therefore, without mitigation, Bellflower MSF construction activity is expected to result in a potentially adverse noise impact.

Vibration

Construction equipment utilized during construction of the Paramount MSF would be most similar to a large bulldozer. A large bulldozer would generate a vibration level of approximately 0.089 inches per second PPV at 25 feet. Vibration generating activities could result in noticeable levels of vibration but would largely occur within the MSF site and are unlikely to result in building damage. Most buildings within the project corridor are constructed of engineered concrete and masonry (no plaster) or non-engineered timber masonry which are held to vibration damage thresholds of 0.3 PPV and 0.2 PPV, respectively. Nearby structures would typically be more than 25 feet away from construction occurring at the MSF site and are unlikely to exceed the vibration damage threshold. However, residences to the northwest and north east of the MSF site are adjacent to where construction activity would occur, which could result in the exceedance of the vibration damage threshold.

7.4 California Environmental Quality Act Determination

To satisfy CEQA requirements, noise and vibration impacts would also be analyzed in accordance with Appendix G of the *CEQA Guidelines*.

7.4.1 Would the Project result in the generation of a substantial temporary or permanent increase in ambient noise levels in the vicinity of the project in excess of standards established by FTA or in the local general plan or noise ordinances?

7.4.1.1 No Project Alternative

Under the No Project Alternative, the project alignment would not be developed; properties would not be acquired for the Project; no structures along the project alignment would be demolished; and no new structures would be constructed along the rail and street ROWs. The existing freight tracks within the rail ROWs would remain in place and the rail ROWs would be undisturbed. No construction noise impacts would occur related to the Project. Therefore, impacts would be less than significant and no mitigation measures are required.

Mitigation Measures

No mitigation measures required.

Impacts Remaining After Mitigation

Less than significant impact.

7.4.1.2 Alternative 1

Alternative 1 would result in temporary and periodic increases in ambient noise levels due to construction activity that would exceed FTA's criteria, and, where applicable, the standards established by the local noise ordinances of the City of Artesia, City of Bell, City of Bellflower, City of Cerritos, City of Cudahy, City of Huntington Park, City of Paramount, City of South Gate, City of Vernon, City of Downey, City of Los Angeles, and County of Los Angeles, listed in Table 7.1. Therefore, without mitigation, impacts related to temporary or periodic increases in ambient noise levels would be potentially significant.

Regarding health effects of noise, it is unlikely for construction noise to result in noise-induced hearing loss for person residing or working near construction zones, as this is an occupational hazard related to working over long periods of time (years) in high noise environments. However, construction noise could increase stress and the potential for stress-related diseases at affected sensitive uses. Health effects related to noise would be the same for other alternatives and where noise impacts would occur.

Mitigation Measures

Refer to Mitigation Measure **NOI-8**.

Impacts Remaining After Mitigation

Mitigation Measure **NOI-8** is anticipated to reduce construction noise levels. However, in some instances the FTA construction impact criteria may still be exceeded. Therefore, impacts related to temporary or periodic increases in ambient noise levels would be significant and unavoidable with mitigation.

7.4.1.3 Alternative 2

Similar to Alternative 1, Alternative 2 would result in temporary and periodic increases in ambient noise levels due to construction activity that would exceed FTA's criteria, and, where applicable, the standards established by the local noise ordinances of the City of Artesia, City of Bell, City of Bellflower, City of Cerritos, City of Cudahy, City of Huntington Park, City of Paramount, City of South Gate, City of Vernon, City of Downey, City of Los Angeles, and County of Los Angeles, listed in Table 7.1. Therefore, without mitigation, impacts related to temporary or periodic increases in ambient noise levels would be potentially significant.

Mitigation Measures

Refer to Mitigation Measure **NOI-8**.

Impacts Remaining After Mitigation

Mitigation Measure **NOI-8** is anticipated to reduce construction noise levels. However, in some instances the FTA construction impact criteria may still be exceeded. Therefore, impacts related to temporary or periodic increases in ambient noise levels would be significant and unavoidable with mitigation.

7.4.1.4 Alternative 3

Similar to Alternative 1, Alternative 3 would result in temporary and periodic increases in ambient noise levels due to construction activity that would exceed FTA's criteria, and, where applicable, the standards established by the local noise ordinances of the City of Artesia, City of Bell, City of Bellflower, City of Cerritos, City of Cudahy, City of Huntington Park, City of Paramount, City of South Gate, City of Vernon, City of Downey, City of Los Angeles, and County of Los Angeles, listed in Table 7.1. Therefore, without mitigation, impacts related to temporary or periodic increases in ambient noise levels would be potentially significant.

Mitigation Measures

Refer to Mitigation Measure **NOI-8**.

Impacts Remaining After Mitigation

Mitigation Measure **NOI-8** is anticipated to reduce construction noise levels. However, in some instances the FTA construction impact criteria may still be exceeded. Therefore, impacts related to temporary or periodic increases in ambient noise levels would be significant and unavoidable with mitigation.

7.4.1.5 Alternative 4

Similar to Alternative 1, Alternative 4 would result in temporary and periodic increases in ambient noise levels due to construction activity that would exceed FTA's criteria, and, where applicable, the standards established by the local noise ordinances of the City of Artesia, City of Bellflower, City of Cerritos, City of Paramount, and City of South Gate, listed in Table 7.1. Therefore, without mitigation, impacts related to temporary or periodic increases in ambient noise levels would be potentially significant.

Mitigation Measures

Refer to Mitigation Measure **NOI-8**.

Impacts Remaining After Mitigation

Mitigation Measure **NOI-8** is anticipated to reduce construction noise levels. However, in some instances the FTA construction impact criteria may still be exceeded. Therefore, impacts related to temporary or periodic increases in ambient noise levels would be significant and unavoidable with mitigation.

7.4.1.6 Design Options

Design Option 1

Similar to the Build Alternatives, Design Option 1 would result in temporary and periodic increases in ambient noise levels due to construction activity that would exceed FTA's criteria, and, where applicable, the standards established by local noise ordinances in Table 7.1. Therefore, without mitigation, impacts related to temporary or periodic increases in ambient noise levels would be potentially significant.

Design Option 2

Similar to the Build Alternatives, Design Option 2 would result in temporary and periodic increases in ambient noise levels due to construction activity that would exceed FTA's criteria, and, where applicable, the standards established by local noise ordinances in Table 7.1. Therefore, without mitigation, impacts related to temporary or periodic increases in ambient noise levels would be potentially significant.

Mitigation Measures

Refer to Mitigation Measure **NOI-8**.

Impacts Remaining After Mitigation

Mitigation Measure **NOI-8** is anticipated to reduce construction noise levels. However, in some instances the FTA construction impact criteria may still be exceeded. Therefore, impacts related to temporary or periodic increases in ambient noise levels would be significant and unavoidable with mitigation.

7.4.1.7 Maintenance and Storage Facility

Paramount MSF Site Option

The City of Paramount has not established a quantitate construction noise standard, therefore an impact determination has been made based upon FTA construction noise criteria. Construction of the maintenance and storage facility at Paramount would exceed the

FTA standards for residential uses. Therefore, without mitigation, impacts related to temporary or periodic increases in ambient noise levels would be potentially significant.

Bellflower MSF Site Option

The City of Bellflower has not established a quantitate construction noise standard, therefore an impact determination has been made based upon FTA construction noise criteria. Construction of the maintenance and storage facility at Paramount would exceed the FTA standards for residential uses. Therefore, without mitigation, impacts related to temporary or periodic increases in ambient noise levels would be potentially significant.

Mitigation Measures

Refer to Mitigation Measure **NOI-8**.

Impacts Remaining After Mitigation

Mitigation Measure **NOI-8** is anticipated to reduce construction noise levels. However, in some instances the FTA construction impact criteria may still be exceeded. Therefore, impacts related to temporary or periodic increases in ambient noise levels would be significant and unavoidable with mitigation.

7.4.2 Would the Project result in generation of excessive GBV or GBN levels?

7.4.2.1 No Project Alternative

Under the No Project Alternative, the project alignment would not be developed; properties would not be acquired for the Project; no structures along the project alignment would be demolished; and no new structures would be constructed along the rail and street ROWs. The existing freight tracks within the rail ROWs would remain in place and the rail ROWs would be undisturbed. No construction vibration impacts would occur related to the Project. Therefore, impacts would be less than significant and no mitigation measures are required.

Mitigation Measures

No mitigation measures required.

Impacts Remaining After Mitigation

Less than significant impact.

7.4.2.2 Alternative 1

The FTA has provided guidance for assessing construction vibration associated with transit projects. The vibration criteria are based on potential damage risk to buildings and potential annoyance to building occupants. The FTA standards are used in this analysis to ensure that the potential for construction vibration impacts is assessed equally throughout the corridor. Typical construction equipment to be used during construction is listed in Section 7.3 along with the predicted vibration levels at 25 feet. To limit the damage risk to buildings along the alignment, operation of the vibratory roller would be restricted to no closer than 15 feet, and other equipment such as large bull dozers, front-end loaders, and hoe rams would operate no closer than 8 feet to a building. Construction activities beyond 15 feet from a building are unlikely to cause damage. Therefore, without mitigation, construction activity is expected to result in a potentially significant vibration impact.

Mitigation Measures

Refer to Mitigation Measures **VIB-3** through **VIB-7**.

Impacts Remaining After Mitigation

Mitigation Measure **VIB-3** would require the contractor to prepare a vibration control plan to be approved by Metro to reduce construction vibration levels. Typical approaches to reducing vibration levels are outlined in Mitigation Measure **VIB-4** through **VIB-7**. Mitigation Measure **VIB-4** through **VIB-7** include typical approaches to avoiding vibration levels that would exceed the FTA damage risk thresholds. Mitigation Measures **VIB-3** through **VIB-7** are anticipated to avoid construction vibration levels that would exceed the FTA construction impact criteria. Therefore, impacts related to construction vibration would be less than significant with mitigation incorporated.

7.4.2.3 Alternative 2

Similar to Alternative 1, Alternative 2 construction activity is expected to result in a potentially significant vibration impact. Therefore, without mitigation, construction activity is expected to result in a potentially significant vibration impact.

Mitigation Measures

Refer to Mitigation Measures **VIB-3** through **VIB-7**.

Impacts Remaining After Mitigation

Mitigation Measures **VIB-3** through **VIB-7** are anticipated to avoid construction vibration levels that would exceed the FTA construction impact criteria. Therefore, impacts related to construction vibration would be less than significant with mitigation incorporated.

7.4.2.4 Alternative 3

Similar to Alternatives 1 and 2, Alternative 3 construction activity is expected to result in a potentially significant vibration impact. Therefore, without mitigation, construction activity is expected to result in a potentially significant vibration impact.

Mitigation Measures

Refer to Mitigation Measures **VIB-3** through **VIB-7**.

Impacts Remaining After Mitigation

Mitigation Measures **VIB-3** through **VIB-7** are anticipated to avoid construction vibration levels that would exceed the FTA construction impact criteria. Therefore, impacts related to construction vibration would be less than significant with mitigation incorporated.

7.4.2.5 Alternative 4

Similar to Alternatives 1, 2, and 3, Alternative 4 construction activity is expected to result in a potentially significant vibration impact. Therefore, without mitigation, construction activity is expected to result in a potentially significant vibration impact.

Mitigation Measures

Refer to Mitigation Measures **VIB-3** through **VIB-7**.

Impacts Remaining After Mitigation

Mitigation Measures **VIB-3** through **VIB-7** are anticipated to avoid construction vibration levels that would exceed the FTA construction impact criteria. Therefore, impacts related to construction vibration would be less than significant with mitigation incorporated.

7.4.2.6 Design Options

Design Option 1

Similar to the Build Alternatives, Design Option 1 would result in temporary and periodic increases in vibration levels that would exceed the FTA damage risk thresholds, Therefore, without mitigation, construction activity is expected to result in a potentially significant vibration impact.

Design Option 2

Similar to the Build Alternatives, Design Option 2 would result in temporary and periodic increases in vibration levels that would exceed the FTA damage risk thresholds, Therefore, without mitigation, construction activity is expected to result in a potentially significant vibration impact.

Mitigation Measures

Refer to Mitigation Measures **VIB-3** through **VIB-7**.

Impacts Remaining After Mitigation

Mitigation Measures **VIB-3** through **VIB-7** are anticipated to avoid construction vibration levels that would exceed the FTA construction impact criteria. Therefore, impacts related to construction vibration would be less than significant with mitigation incorporated.

7.4.2.7 Maintenance and Storage Facility

Paramount MSF Site Option

Construction equipment utilized during construction of the Paramount MSF would be most similar to a large bulldozer. Nearby structures would typically be more than 25 feet away from construction occurring at the MSF site and are unlikely to exceed the vibration damage threshold. However, construction of lead tracks could result in the exceedance of the vibration damage threshold due to the proximity of nearby residences. Therefore, without mitigation, construction activity is expected to result in a potentially significant vibration impact.

Bellflower MSF Site Option

Construction equipment utilized during construction of the Bellflower MSF would be most similar to a large bulldozer. Nearby structures would typically be more than 25 feet away from construction occurring at the MSF site and are unlikely to exceed the vibration damage threshold. However, residences to the northwest and north east of the MSF site are adjacent to where construction activity would occur, which could result in the exceedance of the vibration damage threshold. Therefore, without mitigation, construction activity is expected to result in a potentially significant vibration impact.

Mitigation Measures

Refer to Mitigation Measures **VIB-3** through **VIB-7**.

Impacts Remaining After Mitigation

Mitigation Measures **VIB-3** through **VIB-7** are anticipated to avoid construction vibration levels that would exceed the FTA construction impact criteria. Therefore, impacts related to construction vibration would be less than significant with mitigation incorporated.

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

No public airports or private airstrips are located within 2 miles of the project area. Therefore, no impacts related to airport noise would occur.

Mitigation Measures

No mitigation measures required.

Impacts Remaining After Mitigation

Less than significant impact.

8 PROJECT MEASURES AND MITIGATION MEASURES

8.1 Project Measures

No project measures required.

8.2 Mitigation Measures

8.2.1 Operation

8.2.1.1 Noise

NOI-1 Soundwalls. Soundwalls would be placed at the edge of the right-of-way or at the edge of aerial structures to reduce noise related to light rail transit vehicles at the identified sensitive receiver locations shown in Table 8.1 where moderate and severe impacts have been identified based on design completed to date. Height and length will be verified during final design to meet FTA requirements.

Table 8.1: NOI-1 LRT Soundwall Locations

Civil Station	Location	Track Side	Placement	Height
562+00 to 570+00	Between 21st St and 24th St	Left	Aerial	4 Feet
563+00 to 571+50	Between 22nd St and 25th St	Right	Aerial	4 Feet
577+00 to 658+25	Between Adams Blvd. and 57th St	Right	Aerial	4 Feet
596+50 to 627+00	Between 41st Pl. and 48th Pl	Left	Aerial	4 Feet
635+75 to 660+75	Between 51st St and 57th St	Left	Aerial	4 Feet
764+00 to 779 +15	Between Boyle Ave and Hollenbeck St	Right	Edge of Right-of-Way	8 feet
777+40 to 792+50	Between Hollenbeck St and Benedict Wy	Right	Aerial	4 Feet
803+25 to 813+50	Between Gage Ave and Bell Ave	Left	Edge of Right-of-Way	8 feet
815+15 to 829+15	Between Bell Ave and Florence Ave	Left	Edge of Right-of-Way	8 feet
807+50 to 812+50	Between Iris Ave and Bell Ave	Right	Edge of Right-of-Way	8 feet
840+00 to 869+00	Between Live Oak St and Otis Ave	Right	Edge of Right-of-Way	8 feet
840+00 to 861+50	Between Live Oak St and Olive St	Left	Edge of Right-of-Way	8 feet
871+00 to 877+50	Between Otis Ave and Santa Ana St	Right	Edge of Right-of-Way	8 feet
872+50 to 878+00	Between Otis Ave and Santa Ana St	Left	Edge of Right-of-Way	8 feet

Civil Station	Location	Track Side	Placement	Height
881+20 to 893+50	Between Santa Ana St and Cecilia St	Left	Edge of Right-of-Way	8 feet
957+50 to 968+00	Between Southern Ave and center of Los Angeles River Channel	Right	Edge of Right-of-Way	8 feet
960+00 to 973+00	Between McCallum Ave and center of Los Angeles River Channel	Right	Aerial	4 Feet
968+00 to 982+00	Between center of Los Angeles River Channel and Frontage Rd	Left	Aerial	4 feet
1067+75 to 1073+50	Between Main St and Lincoln Ave	Left	Edge of Right-of-Way	8 feet
1070+50 to 1074+00	Between Harding Ave and Lincoln Ave	Right	Edge of Right-of-Way	8 feet
1083+50 to 1084+50	Between Century Blvd and Grove St	Right	Edge of Right-of-Way	8 feet
1088+00 to 1107+75	Between I-105 Fwy and Racine Ave	Right	Edge of Right-of-Way	8 feet
1089+50 to 1108+00	Between I-105 Fwy and Rose St	Left	Edge of Right-of-Way	8 feet
1095+00 to 1136+25	Between Denver St and approximately 300 feet east of 144th St	Left	Aerial	4 feet
1095+00 to 1108+00	Between Denver St and Rose St	Right	Aerial	4 feet
1141+00 to 1155+50	Between Paramount High School railroad pedestrian crossing and Downey Ave	Left	Aerial	4 feet
1140+00 to 1167+00	Between Paramount High School railroad pedestrian crossing and approximately 400 feet west Somerset Blvd	Right	Aerial	4 feet
1167+00 to 1171+00	Between approximately 400 feet west of Somerset Blvd and Somerset Blvd	Right	Edge of Right-of-Way	8 feet
1173+00 to 1184+00	Between Somerset Blvd and Lakewood Blvd	Right	Edge of Right-of-Way	8 feet
1186+50 to 1215+70	Between Lakewood Blvd and approximately 400 feet west of Clark Ave	Right	Edge of Right-of-Way	8 feet
1198+50 to 1215+70	Between approximately 50 feet west of Virginia Ave and Clark Ave	Left	Edge of Right-of-Way	8 feet

Civil Station	Location	Track Side	Placement	Height
1217+00 to 1222+00	Between Clark Ave and Alondra Blvd	Left	Edge of Right-of-Way	8 feet
1224+00 to 1241+75	Between Alondra Blvd and Orchard Ave	Right	Edge of Right-of-Way	8 feet
1226+50 to 1241+75	Between approximately 220 feet southeast of Alondra Blvd and Orchard Ave	Left	Edge of Right-of-Way	8 feet
1248+50 to 1255+50	Between Bellflower Blvd and approximately 120 feet northwest of Civic Center Dr	Left	Edge of Right-of-Way	8 feet
1250+00 to 1263+00	Between approximately 350 southeast of Bellflower Blvd and Pacific Ave	Right	Edge of Right-of-Way	8 feet
1261+00 to 1286+00	Between Pacific Ave and approximately 70 feet southeast of California Ave	Left	Aerial	4 Feet
1261+00 to 1286+00	Between Pacific Ave and approximately 270 feet southeast of California Ave	Right	Aerial	4 Feet
1286+00 to 1303+00	Between California Ave and Beach St	Right	Edge of Right-of-Way	8 feet
1286+00 to 1300+00	Between California Ave and approximately 100 feet northwest of Beach St	Left	Edge of Right-of-Way	8 feet
1309+00 to 1316+00	Between SR-91 Fwy and approximately 220 feet southeast of San Gabriel River Channel	Right	Edge of Right-of-Way/Structure	4 feet
1355+10 to 1360+00	Between Rosewood Park and approximately 450 feet northwest of Harvest Ave	Left	Edge of Right-of-Way	8 feet
1360+00 to 1389+00	Between approximately 900 feet northwest of Harvest Ave and approximately 300 feet northwest of 186th St	Left	Aerial	4 Feet
1374+50 to 1389+00	Between 183rd St and approximately 300 feet northwest of 186th St	Right	Aerial	4 Feet
1390+00 to 1392+40	Between approximately 200 feet northwest of 186th St and approximately 150 feet northwest of 186th St	Left	Edge of Right-of-Way	8 feet

Civil Station	Location	Track Side	Placement	Height
1390+00 to 1391+50	Between approximately 200 feet northwest of 186th St and approximately 150 feet northwest of 186th St	Right	Edge of Right-of-Way	8 feet
1393+75 to 1401+20	Between 186th St and 187th St	Left	Edge of Right-of-Way	8 feet
1393+40 to 1400+75	Between 186th St and 187th St	Right	Edge of Right-of-Way	8 feet
1409+50 to 1417+87	Between Pioneer Blvd and South St	Left	Edge of Right-of-Way	8 feet
1409+20 to 1413+60	Between Pioneer Blvd and approximately 300 feet northwest of South St	Right	Edge of Right-of-Way	8 feet

NOI-2 **Low Impact Frogs**. Low impact frogs (Crossing point of two rails) would be installed at the identified locations shown in Table 8.2 to reduce crossover impact noise. Locations will be verified during final design.

Table 8.2: NOI-2 Low Impact Frog Locations

Civil Station	Location
602+00	Between 41st Pl and 42nd St
655+00	Between 55th St and 57th St
740+50	Between Templeton St and Miles Ave
808+00	Between Iris Ave and Nevada St
874+00	Between Otis Ave and Santa Ana St
1075+50	Between Lincoln Ave and Florence Ave
1179+00	Between Castana Ave and Olivia Ave
1229+50	Between Alondra Blvd and Harvard St
1289+50	Between Flora Vista St and Park St
1294+00	Between Flora Vista St and Park St
1399+00	Between 184th St and 186th St
1411+50	Between Pioneer Blvd and South Ave

NOI-3 **Wheel Squeal Noise Monitoring**. Metro would conduct wheel squeal noise monitoring prior to the start of revenue operations to determine if wheel squeal is occurring at the curves identified in Table 8.3. If wheel squeal occurs, Metro would use wayside rail lubrication.

Table 8.3: NOI-3 Wheel Squeal Wayside Friction Applicator Locations

Civil Station	Curve
670+00	Curve from Randolph St to Long Beach Ave
788+00	Curve from San Pedro Subdivision Right-of-Way to Randolph St
1109+00	Curve from PEROW to San Pedro Subdivision Right-of-Way following Arthur Ave

NOI-4 **Crossing Signal Bells**. Crossing signal bells at the locations identified in Table 8.4 would be equipped with shrouds to direct bell noise away from sensitive receivers. Crossing signal bell noise would not exceed 104 dBA sound exposure level at 50 feet. This measure is subject to CPUC approval.

Table 8.4: NOI-4 Crossing Signal Bells Shroud Locations

Civil Station	Grade Crossing Locations
709+00	Santa Fe Ave
716+50	Malabar St
732+50	Seville Ave
743+00	Miles Ave
756+50	Arbutus Ave
763+00	State St/Boyle Ave
801+00	Gage Ave
814+50	Bell Ave
830+50	Florence Ave
869+50	Otis Ave
879+50	Santa Ana St
1067+00	Main St
1083+00	Century Blvd
1172+50	Somerset Blvd
1185+50	Lakewood Blvd
1216+50	Clark Ave
1223+00	Alondra Blvd
1247+50	Bellflower Blvd
1393+00	186th St
1408+00	Pioneer Blvd

NOI-5 Gate-Down-Bell-Stop Variance. Metro would apply for a gate-down-bell-stop variance at the locations identified in Table 8.5 to reduce the duration of bell ringing and therefore reduce impacts at sensitive receivers. Crossing signal noise would not exceed 30 seconds in duration. This measure is subject to CPUC approval.

Table 8.5: NOI-5 Gate Down Stop Variance Locations

Civil Station	Grade Crossing Locations
814+50	Bell Ave
1083+00	Century Blvd
1393+00	186th St

NOI-6 TPSS Noise Reduction. At the traction power substation (TPSS) locations identified in the following table, Metro would implement measures to reduce TPSS noise below the performance criteria shown in Table 8.6. Federal Transit Administration impact criteria shown in the table are based on existing noise levels per Federal Transit Administration guidance. Measures to reduce TPSS noise may include, but are not limited to:

- Orient cooling fans and HVAC equipment away from sensitive receivers
- Utilize quieter cooling fans or HVAC equipment
- Provide a surrounding enclosure around the TPSS unit and HVAC equipment
- Install baffles on the exterior of the cooling fan
- Sound insulation of TPSS unit enclosure or mounting of sound isolation materials to minimize transformer hum

Table 8.6: NOI-6 TPSS Locations

Civil Station	TPSS	Location	FTA Impact Criteria (dBA, L_{eq})
589+00	18 (e)	South of E Martin Luther King Jr Blvd on the west side of Long Beach Ave and within private property.	62.0
638+00	17	South of E 51st St on the west side of Long Beach Ave within private property.	64.7
640+00	17b	Just north of E 52nd St on the west side of Long Beach Ave within private property.	64.7
642+25	17a	Between E 52nd and 53rd St on the west side of Long Beach Ave within private property.	64.7
737+75	15(e)	East of Stafford Ave and north of Randolph St within private property.	58.8
1110+50	8(e)	Just southwest of Arthur Ave/Rose St and north of Rosecrans Ave within public-owned property.	57.1
1372+50	2	Northwest of the crossing at Gridley Rd and 183rd St within Metro-owned property	53.8

NOI-7 Freight Track Relocation Soundwalls. Soundwalls would be placed at the edge of the right-of-way at the locations identified in Table 8.7 to reduce freight and LRT noise related to the freight track relocation. Height and length will be verified during final design to meet FTA requirements.

Table 8.7: NOI-7 Freight Track Relocation Soundwalls

Civil Station	Location	Track Side	Placement	Height
1111+00 to 1121+00	Between Arthur Ave and Colorado Ave	Left	Edge of Right-of-Way	8 feet
1088+00 to 1107+75	Between I-105 Fwy and Rose St	Right	Edge of Right-of-Way	8 feet
1089+50 to 1108+00	Between I-105 Fwy and Rose St	Left	Edge of Right-of-Way	8 feet

8.2.1.2 Vibration

VIB-1 Ballast Mat or Resilient Rail Fasteners. At the locations identified in Table 8.8 where vibration impacts would occur, Metro would isolate trackwork using ballast mats for ballast and tie track and resilient rail fasteners for direct fixation track or other comparable vibration isolation techniques. Locations will be verified during final design.

Table 8.8: VIB-1 Ballast Mat or Resilient Rail Fasteners

Civil Station	Location
705+00 to 757+00	Between Albany St and Arbutus Ave
802+00 to 893+00	Between Gage Ave. and Cecilia St
1082+00 to 1135+00	Between Nevada Ave and Paramount High School
1162+00 to 1232+00	Between approximately 600 feet southeast of Downey Ave and Ardmore Ave
1251+00 to 1257+00	Between approximately 300 feet southeast of Bellflower Blvd and approximately 200 feet northeast of Civic Center Dr
1273+00 to 1311+00	Between Flower St and San Gabriel River Channel
1363+00 to 1403+00	Between approximately 500 feet southeast of Rosewood Park and 187th St
1410+00 to 1419+00	Between Pioneer Blvd and South St

VIB-2 Low Impact Frogs. Low impact frogs would be used at the turnout and crossover track locations identified in Table 8.9 where exceedance of the FTA impact thresholds have been identified. These locations would be verified during final design.

Table 8.9: VIB-2 Low Impact Frogs

Civil Station	Location	Clusters
415+50	Between Flower St and Hope St	8, 9, and 10
602+00	Between 41st Pl and 42nd St	31, 33, and 34
655+00	Between 55th St and 57th St	43
740+50	Between Templeton St and Miles Ave	62, 63, and 64
808+00	Between Iris Ave and Nevada St	81
874+00	Between Otis Ave and Santa Ana St	115 and 116
1179+00	Between Lincoln Ave and Florence Ave	153, 154, and 156
1229+50	Between Castana Ave and Olivia Ave	172, 173, 174, and 175
1289+50	Between Alondra Blvd and Harvard St	192, 193, and 194
1294+00	Between Flora Vista St and Park St	195, 196, 197, 198
1399+00	Between 186th St and 187th St	221, 222, and 223
1411+50	Between Pioneer Blvd and South Ave	230, 231 and 232

8.2.2 Construction

8.2.2.1 Noise

NOI-8 Noise Control Plan. Metro's contractor would develop a Noise Control Plan demonstrating how noise criteria would be achieved during construction. The Noise Control Plan would be designed to follow Metro requirements, Construction Noise Control, and would include measurements of existing noise, a list of the major pieces of construction equipment that would be used, and predictions of the noise levels at the closest noise-sensitive receivers (residences, hotels, schools, churches, temples, and similar facilities). The Noise Control Plan would be approved by Metro prior to initiating construction. Where the construction cannot be performed in accordance with the FTA 1-hour L_{eq} construction noise standards, the contractor would investigate alternative construction measures that would result in lower sound levels. The FTA 1-hour L_{eq} construction noise standards are as follows: Residential daytime standard of 90 dBA L_{eq} and nighttime standard of 80 dBA L_{eq}, and Commercial and Industrial daytime standard of 100 dBA L_{eq} and nighttime standard of 100 dBA L_{eq}. The contractor would conduct noise monitoring to demonstrate compliance with contract noise limits. In addition, Metro would comply with local noise ordinances when applicable. Noise-reducing methods that may be implemented by Metro include:

- If nighttime construction is planned, a noise variance may be prepared by the contractor, if required by the jurisdiction, that demonstrates the implementation of control measures to maintain noise levels below the applicable FTA standards.
- Where construction occurs near noise sensitive land uses, specialty equipment with enclosed engines, acoustically attenuating shields, and/or high-performance mufflers may be used.
- Limit unnecessary idling of equipment.

- Install temporary noise barriers or noise-control curtains, where feasible and desirable.
- Reroute construction-related truck traffic away from local residential streets and/or sensitive receivers.
- Limit impact pile driving where feasible and effective.
- Use electric instead of diesel-powered equipment and hydraulic instead of pneumatic tools where feasible.
- Minimize the use of impact devices such as jackhammers and hoe rams, using concrete crushers and pavement saws instead.

8.2.2.2 Vibration

VIB-3 Metro's contractor would prepare a Vibration Control Plan demonstrating how the Federal Transit Administration building damage risk criteria and the Federal Transit Administration vibration annoyance criteria would be achieved. The Vibration Control Plan would include a list of the major pieces of construction equipment that would be used and predictions of the vibration levels at the closest sensitive receivers (residences, hotels, schools, churches, temples, and similar facilities). The Vibration Control Plan would need to be approved by FTA prior to initiating construction. Where the construction cannot be performed to meet the Metro vibration criteria, the contractor would investigate alternative means and methods of construction measures that would result in lower vibration levels. The contractor would conduct vibration monitoring to demonstrate compliance with contract vibration limits.

VIB-4 Metro's contractor would avoid or minimize the use of impact devices such as jackhammers and hoe rams, using concrete crushers and pavement saws instead.

VIB-5 Where building foundation systems are needed, drilling instead of driven piles would be used.

VIB-6 Historic structures would be held to a vibration damage threshold of 0.20 inches per second peak particle velocity (PPV). Where possible, operation of the compactor/ballast tamper would be restricted to no closer than 40 feet, and other equipment, such as, and similar to, vibratory rollers, large bull dozers, caisson drills, and hoe rams no closer than 25 feet to a historic structure. This measure applies to structures identified as eligible for the National Register of Historic Places and/or California Register of Historical Resources in the *West Santa Ana Branch Transit Corridor Final Cultural Resources Survey Report – Rev 1.*

VIB-7 The contractor would monitor construction vibration levels within 200 feet of historic buildings and structures to ensure the vibration damage threshold for that building or structure of 0.20 inches per second peak particle velocity would not be exceeded. A pre-construction and post-construction survey of these buildings would be conducted by a qualified structural engineer. Any damage would be noted. All vibration monitors used for these measurements would be equipped with an "alarm" feature to provide notification that vibration impact criteria have been approached or exceeded. This measure applies to structures identified as eligible for the National Register of Historic Places and/or California Register of Historical Resources in the *West Santa Ana Branch Transit Corridor Final Cultural Resources Survey Report – Rev 1.*

8.3 Impacts Remaining After Mitigation

8.3.1 Alternative 1

8.3.1.1 LRT

Noise

Clusters that have been determined to have moderate to severe impacts related to LRT pass-by noise are discussed below with recommended mitigation measures implemented. LRT pass-by noise is mitigated by breaking the line-of-sight between receivers and the train. This can be achieved using soundwalls, which provides up to a 12-dB reduction in noise levels at receivers when located at the edge of the ROW (Mitigation Measure **NOI-1**). The level of noise reduction is based on the height of the soundwall, and elevation of the receiver relative to the trackwork. Mitigation to second story receivers will require higher soundwalls. Soundwalls can be installed both at-grade and on aerial-structures. Soundwalls may not be feasible if for instance if there is a grade crossing or other physical features that prevent installation. Soundwalls would also provide mitigation for freight train noise. Increased LRT noise also occurs as a result of impact noise created by crossovers. A low impact frog, which decreases impact noise caused by the wheels hitting the crossover, is a common mitigation measure for reducing crossover noise. The low impact frogs would eliminate the impact created by the LRT passing over the crossover (Mitigation Measure **NOI-2**). For curves of 600-foot radius or less, the Project will be designed to accommodate a wayside lubrication system if wheel squeal occurs during pre-revenue operations Mitigation Measure **NOI-3**). Wheel squeal noise is considered mitigated.

Crossing signal bell noise can be reduced using shrouds, which would direct bell noise away from sensitive receivers. Shrouds have the capability of providing approximately 1 to 5 dB of attenuation (Mitigation Measure **NOI-4**). This would reduce the crossing signal bell noise level from 109 SEL to 104 SEL. The mitigation has been recommended at grade crossings with receivers where noise levels would exceed impact criteria. Shrouds can only be installed through CPUC approval. The bell noise can be further reduced by applying to the CPUC for a gate-down-bell-stop variance (Mitigation Measure **NOI-5**). Obtaining approval requires demonstrating to the CPUC that the safety measures in place on the crossing more than compensate for stopping the bell noise once the gates are in the horizontal position. Mitigation Measure **NOI-5** has been recommended at grade crossings that would benefit from additional mitigation to reduce the impact determination at a cluster. However, the analysis does not take reductions associated with Mitigation Measures **NOI-4 or NOI-5** because they would first require CPUC approval.

As shown in Table 8.10 and Table 8.11, the majority of LRT related noise impacts could be mitigated with the use of soundwalls (Mitigation Measure **NOI-1**) and Mitigation Measures **NOI-2** through **NOI-3**. However, soundwalls would not be feasible at several receivers or would not provide enough of a noise reduction to totally mitigate all impacts. Available mitigation methods, including soundwalls, methods to reduce special track work noise, and wheel squeal have been applied to reduce LRT noise to the greatest extent feasible. An explanation of areas where mitigation is not feasible or reasonable is included in Table 8.12. Under Alternative 1, 76 clusters would be reduced from a severe impact to a moderate impact, 52 clusters would be reduced from a moderate impact to no impact, and 37 clusters would be reduced from severe to no impact for a total of 165 benefited clusters. One-hundred and three moderate impacts and 60 severe impacts would remain at Category 2 clusters after implementation of Mitigation Measures **NOI-1** through **NOI-3**. Seven moderate impacts would remain at Category 3 clusters. Therefore, impacts would remain adverse even after implementation of mitigation. Mitigated clusters and impacts are shown in Appendix G. Calculation details are included in Appendix J.

Table 8.10. Mitigated LRT Noise – Alternative 1

Cluster No.[1]	Land Use	Near Track Distance (ft)[2]	Speed (mph)	Soundwalls	Soundwall Height (ft)	Mitigation Measures	Noise Level (dBA, L_{dn})					Impact after Mitigation
							Existing	Unmitigated	Mitigated	Impact Threshold		
										Moderate	Severe	
N2	SFR/MFR	80	55	Yes	4	NOI-1	56.3	68.3	60.3	55.9	61.7	Moderate
N3	SFR/MFR	210	55	Yes	4	NOI-1	56.3	64.1	59.1	55.9	61.7	Moderate
N4	SFR/MFR	45	55	Yes	4	NOI-1	56.3	70.8	61.8	55.9	61.7	Severe
N5	SFR/MFR	240	55	Yes	4	NOI-1	56.3	63.5	58.5	55.9	61.7	Moderate
N6	SFR/MFR	80	55	Yes	4	NOI-1	56.3	68.3	60.3	55.9	61.7	Moderate
N7	SFR/MFR	240	55	Yes	4	NOI-1	56.3	63.5	58.5	55.9	61.7	Moderate
N10	SFR/MFR	240	55	Yes	4	NOI-1	66.8	63.5	57.5	62.0	67.3	No
N11	SFR/MFR	185	55	Yes	4	NOI-1	66.8	64.7	58.7	62.0	67.3	No
N12	SFR/MFR	110	55	Yes	4	NOI-1	66.8	66.9	59.9	62.0	67.3	No
N13	SFR/MFR	230	55	Yes	4	NOI-1, NOI-2	66.8	68.7	58.7	62.0	67.3	No
N14	SFR/MFR	110	55	Yes	4	NOI-1, NOI-2	66.8	71.9	59.9	62.0	67.3	No
N15	SFR/MFR	140	55	Yes	4	NOI-1, NOI-2	66.8	70.9	59.9	62.0	67.3	No
N16	SFR/MFR	240	55	Yes	4	NOI-1, NOI-2	66.8	68.5	58.5	62.0	67.3	No
N17	SFR/MFR	15	55	Yes	4	NOI-1, NOI-2	66.8	80.6	65.6	62.0	67.3	Moderate
N18	SFR/MFR	140	55	Yes	4	NOI-1	66.8	65.9	59.9	62.0	67.3	No
N19	SFR/MFR	15	55	Yes	4	NOI-1	66.8	75.6	65.6	62.0	67.3	Moderate
N20	SFR/MFR	110	55	Yes	4	NOI-1, NOI-2	66.8	71.9	59.9	62.0	67.3	No

Cluster No.[1]	Land Use	Near Track Distance (ft)[2]	Speed (mph)	Soundwalls	Soundwall Height (ft)	Mitigation Measures	Noise Level (dBA, L_{dn})					Impact after Mitigation
							Existing	Unmitigated	Mitigated	Impact Threshold		
										Moderate	Severe	
N21	SFR/MFR	320	55	Yes	4	NOI-1	66.8	62.3	57.3	62.0	67.3	No
N22	SFR/MFR	320	55	Yes	4	NOI-1	66.8	62.3	57.3	62.0	67.3	No
N23	SFR/MFR	110	55	Yes	4	NOI-1	66.8	66.9	59.9	62.0	67.3	No
N24	SFR	30	55	Yes	4	NOI-1	66.8	72.6	62.6	62.0	67.3	Moderate
N25	SFR/MFR	80	55	Yes	4	NOI-1	66.8	68.3	60.3	62.0	67.3	No
N27	SFR/MFR	300	55	Yes	4	NOI-1	66.8	62.6	57.6	62.0	67.3	No
N29	SFR/MFR	110	55	Yes	4	NOI-1	66.8	66.9	59.9	62.0	67.3	No
N30	SFR/MFR	230	55	Yes	4	NOI-1	66.8	63.7	58.7	62.0	67.3	No
N32	SFR/MFR	90	50	Yes	4	NOI-1	70.5	67.0	55.0	64.7	69.8	No
N34	MFR	60	55	Yes	4	NOI-1	70.5	69.6	58.6	64.7	69.8	No
N35	SFR/MFR	80	55	Yes	4	NOI-1	70.5	68.3	57.3	64.7	69.8	No
N37	MFR	90	45	Yes	4	NOI-1	70.5	66.1	55.1	64.7	69.8	No
N38	MFR	110	45	Yes	4	NOI-1	70.5	65.2	58.2	64.7	69.8	No
N40	SFR	215	45	Yes	4	NOI-1, NOI-2	70.5	67.3	56.3	64.7	69.8	No
N42	SFR/MFR	100	45	Yes	4	NOI-1, NOI-2	70.5	70.6	55.6	64.7	69.8	No
N43	SFR	40	45	Yes	4	NOI-1, NOI-2	70.5	75.6	58.6	64.7	69.8	No
N44	SFR	155	45	Yes	4	NOI-1, NOI-2	70.5	69.7	57.7	64.7	69.8	No
N45	SFR	100	25	No	0	NOI-2	70.5	66.5	61.5	64.7	69.8	No
N50	SFR/MFR	90	20	No	0	NOI-3	65.4	74.0	64.0	61.1	66.4	Moderate

Cluster No.[1]	Land Use	Near Track Distance (ft)[2]	Speed (mph)	Soundwalls	Soundwall Height (ft)	Mitigation Measures	Noise Level (dBA, L_{dn})					Impact after Mitigation
							Existing	Unmitigated	Mitigated	Impact Threshold		
										Moderate	Severe	
N54	SFR	70	35	No	0	NOI-4	68.0	64.4	64.4	62.9	68.1	Moderate
N56	SFR	60	35	No	0	NOI-4	68.0	67.0	67.0	62.9	68.1	Moderate
N58	SFR/MFR	70	35	No	0	NOI-4	68.0	64.4	64.4	62.9	68.1	Moderate
N60	SFR/MFR	50	35	No	0	NOI-4	68.0	68.6	68.6	62.9	68.1	Severe
N61	SFR	70	35	No	0	NOI-4	68.0	64.9	64.9	62.9	68.1	Moderate
N65	SFR/MFR	70	25	No	0	NOI-4	68.0	65.8	65.8	62.9	68.1	Moderate
N71	MFR	55	20	No	0	NOI-4	61.8	67.0	67.0	58.8	64.3	Severe
N73	SFR/MFR	65	35	No	0	NOI-2, NOI-4	61.8	68.0	65.4	58.8	64.3	Severe
N74	SFR/MFR	130	35	No	0	NOI-2	61.8	63.3	58.3	58.8	64.3	No
N75	MFR	100	35	No	0	NOI-2	61.8	59.9	54.9	58.8	64.3	No
N76	SFR/MFR	55	35	No	0	NOI-2	61.8	67.0	62.0	58.8	64.3	Moderate
N77	SFR/MFR	140	35	No	0	NOI-2	61.8	63.0	58.0	58.8	64.3	No
N78	SFR/MFR	110	35	No	0	NOI-2, NOI-4	61.8	63.1	59.2	58.8	64.3	Moderate
N79	SFR/MFR	55	35	No	0	NOI-2, NOI-4	61.8	71.2	67.9	58.8	64.3	Severe
N80	SFR/MFR	65	35	No	0	NOI-2, NOI-4	61.8	70.6	67.6	58.8	64.3	Severe
N81	SFR	220	35	No	0	NOI-2	61.8	61.0	56.0	58.8	64.3	No
N82	SFR/MFR	230	35	No	0	NOI-4	61.8	59.6	59.6	58.8	64.3	Moderate
N85	SFR/MFR	50	35	No	0	None[3]	61.8	62.4	62.4	58.8	64.3	Moderate
N86	SFR/MFR	65	35	No	0	NOI-4	61.8	67.6	67.6	58.8	64.3	Severe

Cluster No.[1]	Land Use	Near Track Distance (ft)[2]	Speed (mph)	Soundwalls	Soundwall Height (ft)	Mitigation Measures	Noise Level (dBA, L_{dn})					Impact after Mitigation
							Existing	Unmitigated	Mitigated	Impact Threshold		
										Moderate	Severe	
N88	SFR/MFR	70	35	No	0	NOI-4	61.8	66.1	66.1	58.8	64.3	Severe
N89	SFR/MFR	45	35	No	0	None[3]	63.1	62.9	62.9	59.6	65.1	Moderate
N92	SFR/MFR	130	35	No	0	NOI-4	63.1	61.6	61.6	59.6	65.1	Moderate
N93	SFR	50	35	No	0	NOI-4	63.1	67.0	67.0	59.6	65.1	Severe
N94	SFR/MFR	75	35	No	0	NOI-4	63.1	64.3	64.3	59.6	65.1	Moderate
N96	SFR	90	35	No	0	NOI-4	63.1	62.4	62.4	59.6	65.1	Moderate
N98	SFR/MFR	100	35	No	0	NOI-4	63.1	63.1	63.1	59.6	65.1	Moderate
N99	SFR/MFR	220	35	No	0	NOI-4	63.1	60.9	60.9	59.6	65.1	Moderate
N102	SFR	120	55	Yes	8	NOI-1	63.1	62.6	58.6	59.6	65.1	No
N104	SFR	140	55	Yes	4	NOI-1	63.1	61.9	57.9	59.6	65.1	No
N105	SFR/MFR	135	55	Yes	4	NOI-1, NOI-3	63.1	76.0	55.0	59.6	65.1	No
N107	SFR	130	55	No	0	NOI-2, NOI-4	66.8	66.1	62.6	62.0	67.3	Moderate
N108	SFR	20	55	Yes	8	NOI-1, NOI-2, NOI-4	66.8	78.4	65.6	62.0	67.3	Moderate
N109	SFR	145	55	Yes	8	NOI-1, NOI-2	66.8	62.2	48.2	62.0	67.3	No
N110	SFR	220	55	Yes	8	NOI-1, NOI-2	66.8	64.9	53.9	62.0	67.3	No
N111	SFR	120	55	Yes	8	NOI-1	66.8	67.6	62.6	62.0	67.3	Moderate
N112	SFR/MFR	65	55	Yes	8	NOI-1, NOI-4, NOI-5	66.8	68.3	59.6	62.0	67.3	No

Cluster No.[1]	Land Use	Near Track Distance (ft)[2]	Speed (mph)	Soundwalls	Soundwall Height (ft)	Mitigation Measures	Noise Level (dBA, L_{dn})					Impact after Mitigation
							Existing	Unmitigated	Mitigated	Impact Threshold		
										Moderate	Severe	
N113	SFR/MFR	35	55	Yes	8	NOI-1, NOI-2, NOI-4, NOI-5	66.8	77.1	71.6	62.0	67.3	Severe
N114	SFR	110	50	No	0	NOI-4, NOI-5	66.8	66.0	66.0	62.0	67.3	Moderate
N116	SFR/MFR	25	50	Yes	8	NOI-1, NOI-4, NOI-5	64.0	74.2	71.6	60.2	65.6	Severe
N118	SFR	25	45	Yes	8	NOI-1	64.0	67.6	59.6	60.2	65.6	No
N119	SFR	35	40	Yes	8	NOI-1, NOI-4	64.0	69.4	63.2	60.2	65.6	Moderate
N120	SFR	240	35	No	0	NOI-4	64.0	60.3	60.3	60.2	65.6	Moderate
N133	SFR	110	55	Yes	8	NOI-1	63.1	62.9	58.9	59.6	65.1	No
N135	SFR	200	55	Yes	8	NOI-1	63.1	60.3	57.3	59.6	65.1	No
N137	SFR	60	55	Yes	8	NOI-1	63.1	65.6	57.6	59.6	65.1	No
N140	MFR	115	55	Yes	8	NOI-1	63.1	62.7	56.7	59.6	65.1	No
N141	SFR	85	55	Yes	8	NOI-1	63.1	64.1	59.1	59.6	65.1	No
N144	SFR	70	55	Yes	8	NOI-1	63.1	64.9	58.9	59.6	65.1	No
N146	SFR	100	55	Yes	8	NOI-1	63.1	63.4	59.4	59.6	65.1	No
N149	SFR	100	55	Yes	8	NOI-1	63.1	63.4	59.4	59.6	65.1	No
N153	SFR	65	55	Yes	8	NOI-1	63.1	65.2	59.2	59.6	65.1	No
N155	SFR	200	55	Yes	8	NOI-1	63.1	60.3	56.3	59.6	65.1	No
N156	SFR	90	55	Yes	8	NOI-1	63.1	63.8	58.8	59.6	65.1	No

Cluster No.[1]	Land Use	Near Track Distance (ft)[2]	Speed (mph)	Soundwalls	Soundwall Height (ft)	Mitigation Measures	Noise Level (dBA, L_{dn})					Impact after Mitigation
							Existing	Unmitigated	Mitigated	Impact Threshold		
										Moderate	Severe	
N157	SFR	140	55	Yes	4	NOI-1	61.1	61.4	61.4	58.4	64.0	Moderate
N158	SFR	90	55	Yes	4	NOI-1	61.1	67.8	66.8	58.4	64.0	Severe
N159	SFR	205	55	Yes	4	NOI-1	61.1	64.2	65.2	58.4	64.0	Severe
N160	SFR	140	55	Yes	8	NOI-1, NOI-4	61.1	65.5	62.2	58.4	64.0	Moderate
N161	SFR	110	55	No	0	NOI-4	61.1	67.8	67.8	58.4	64.0	Severe
N162	SFR	170	55	Yes	8	NOI-1, NOI-2, NOI-4	61.1	69.1	60.4	58.4	64.0	Moderate
N163	SFR/MFR	95	55	Yes	8	NOI-1, NOI-2, NOI-4	61.1	71.6	61.9	58.4	64.0	Moderate
N164	SFR/MFR	180	55	Yes	8	NOI-1, NOI-2	61.1	65.8	54.8	58.4	64.0	No
N165	MFR	185	55	No	0	NOI-4	61.1	64.0	64.0	58.4	64.0	Severe
N166	MFR	60	55	Yes	8	NOI-1, NOI-4	61.1	68.6	61.9	58.4	64.0	Moderate
N168	Mobile Homes	70	55	Yes	8	NOI-1	61.1	64.9	58.9	58.4	64.0	Moderate
N169	Motel	220	50	No	0	None[3]	68.0	63.1	63.1	62.9	68.1	Moderate
N170	SFR	305	55	Yes	4	NOI-1, NOI-4	58.7	61.9	60.1	57.1	62.8	Moderate
N171	SFR	250	55	Yes	4	NOI-1	58.7	59.4	57.4	57.1	62.8	Moderate
N172	SFR	130	55	Yes	4	NOI-1	58.7	62.2	60.2	57.1	62.8	Moderate
N173	SFR	240	55	Yes	4	NOI-1	58.7	63.5	60.5	57.1	62.8	Moderate
N174	SFR	140	55	Yes	4	NOI-1	68.0	65.9	62.9	62.9	68.1	No

Cluster No.[1]	Land Use	Near Track Distance (ft)[2]	Speed (mph)	Soundwalls	Soundwall Height (ft)	Mitigation Measures	Noise Level (dBA, L_{dn})					Impact after Mitigation
							Existing	Unmitigated	Mitigated	Impact Threshold		
										Moderate	Severe	
N175	SFR	240	55	Yes	4	NOI-1	58.7	63.5	59.5	57.1	62.8	Moderate
N176	MFR	145	55	Yes	4	NOI-1	58.7	65.7	60.7	57.1	62.8	Moderate
N177	Thunderbird Villa Mobile Home Estates	140	55	Yes	4	NOI-1	57.4	65.9	59.9	56.4	62.2	Moderate
N178	Thunderbird Villa Mobile Home Estates	175	55	Yes	4	NOI-1	57.4	64.9	59.9	56.4	62.2	Moderate
N179	Thunderbird Villa Mobile Home Estates	90	55	Yes	4	NOI-1	57.4	67.8	61.8	56.4	62.2	Moderate
N180	Thunderbird Villa Mobile Home Estates	25	55	Yes	4	NOI-1	57.4	73.4	64.4	56.4	62.2	Severe
N185	SFR	210	25	Yes	8	NOI-1, NOI-2	59.9	58.3	45.3	57.7	63.3	No
N188	SFR	220	25	No	0	NOI-4, NOI-5	60.3	58.4	58.4	58.0	63.5	Moderate
N189	SFR	185	25	No	0	NOI-4, NOI-5	61.2	60.0	60.0	58.5	64.0	Moderate
N190	SFR	95	55	No	0	NOI-4, NOI-5	63.7	70.2	70.2	60.0	65.4	Severe
N191	SFR	30	55	Yes	8	NOI-1	64.0	69.6	62.6	60.2	65.6	Moderate
N192	SFR	20	55	Yes	8	NOI-1	64.0	71.3	63.3	60.2	65.6	Moderate
N193	SFR	15	55	Yes	8	NOI-1	64.0	72.6	63.6	60.2	65.6	Moderate
N194	SFR	45	55	Yes	8	NOI-1	64.0	67.8	60.8	60.2	65.6	Moderate

Cluster No.[1]	Land Use	Near Track Distance (ft)[2]	Speed (mph)	Soundwalls	Soundwall Height (ft)	Mitigation Measures	Noise Level (dBA, L_{dn})					Impact after Mitigation
							Existing	Unmitigated	Mitigated	Impact Threshold		
										Moderate	Severe	
N195	SFR	230	55	Yes	8	NOI-1	64.0	60.7	56.7	60.2	65.6	No
N196	SFR	45	55	Yes	8	NOI-1	64.0	67.8	60.8	60.2	65.6	Moderate
N197	SFR	15	55	Yes	8	NOI-1	64.0	72.6	63.6	60.2	65.6	Moderate
N199	SFR	285	55	Yes	4	NOI-1	57.9	62.8	58.8	56.7	62.4	Moderate
N200	SFR	15	55	Yes	4	NOI-1	66.7	75.6	65.6	62.0	67.3	Moderate
N201	SFR	65	55	Yes	4	NOI-1	66.1	69.2	59.2	61.6	66.9	No
N202	SFR	240	55	Yes	4	NOI-1	58.9	63.5	52.5	57.2	62.9	No
N203	SFR	190	20	No	0	NOI-3	50.3	65.8	55.8	53.5	59.7	Moderate
N204	SFR	65	20	No	0	NOI-3	50.3	70.4	60.4	53.5	59.7	Severe
N205	SFR	280	20	Yes	4	NOI-1, NOI-3	59.9	64.1	49.1	57.7	63.3	No
N206	SFR	15	20	Yes	4	NOI-1, NOI-3	65.1	76.8	56.8	60.9	66.3	No
N207	SFR	75	20	Yes	4	NOI-1, NOI-3	58.7	69.8	50.8	57.1	62.8	No
N208	SFR	170	20	Yes	4	NOI-1, NOI-3	64.6	66.3	50.3	60.6	66.0	No
N209	SFR	290	35	Yes	4	NOI-1, NOI-3	67.5	68.8	53.8	62.5	67.8	No
N210	SFR	80	35	Yes	4	NOI-1, NOI-3	60.6	74.4	55.4	58.1	63.7	No
N213	SFR	55	20	Yes	4	NOI-1	65.2	61.2	49.2	61.0	66.3	No
N214	MFR	335	45	Yes	4	NOI-1	51.7	60.4	56.4	53.9	60.0	Moderate
N215	SFR	100	55	Yes	4	NOI-1	58.0	67.4	59.4	56.7	62.4	Moderate

Cluster No.[1]	Land Use	Near Track Distance (ft)[2]	Speed (mph)	Soundwalls	Soundwall Height (ft)	Mitigation Measures	Noise Level (dBA, L_{dn})					Impact after Mitigation
							Existing	Unmitigated	Mitigated	Impact Threshold		
										Moderate	Severe	
N216	SFR	70	55	Yes	4	NOI-1	58.0	68.9	59.9	56.7	62.4	Moderate
N217	SFR	100	55	Yes	4	NOI-1	58.0	67.4	60.4	56.7	62.4	Moderate
N218	SFR	75	55	Yes	4	NOI-1	58.0	68.6	60.6	56.7	62.4	Moderate
N219	SFR	120	65	Yes	4	NOI-1	58.0	68.0	62.0	56.7	62.4	Moderate
N220	SFR	130	65	Yes	4	NOI-1	58.0	67.7	60.7	56.7	62.4	Moderate
N222	SFR	130	65	Yes	4	NOI-1	51.7	67.7	61.7	53.9	60.0	Severe
N223	SFR	135	65	Yes	4	NOI-1, NOI-2	51.7	67.5	59.5	53.9	60.0	Moderate
N224	SFR	135	65	Yes	8	NOI-1, NOI-4	51.7	66.6	59.8	53.9	60.0	Moderate
N225	SFR	220	65	No	0	None[3]	51.7	61.4	61.4	53.9	60.0	Severe
N226	SFR	125	65	No	0	NOI-4	51.7	67.2	67.2	53.9	60.0	Severe
N227	SFR	20	65	Yes	8	NOI-1, NOI-2, NOI-4	51.7	79.9	68.0	53.9	60.0	Severe
N228	SFR	200	65	Yes	8	NOI-1, NOI-2	51.7	66.8	55.8	53.9	60.0	Moderate
N229	SFR	100	65	Yes	8	NOI-1, NOI-2	51.7	69.8	58.8	53.9	60.0	Moderate
N230	SFR	30	65	Yes	8	NOI-1, NOI-2	51.7	75.0	63.0	53.9	60.0	Severe
N231	SFR	60	65	Yes	8	NOI-1, NOI-4	51.7	70.4	65.5	53.9	60.0	Severe
N232	SFR	115	65	No	0	NOI-4	51.7	67.7	67.7	53.9	60.0	Severe
N233	SFR/MFR	210	65	No	0	None[3]	51.7	61.6	61.6	53.9	60.0	Severe

Cluster No.[1]	Land Use	Near Track Distance (ft)[2]	Speed (mph)	Soundwalls	Soundwall Height (ft)	Mitigation Measures	Noise Level (dBA, L_{dn})					Impact after Mitigation
							Existing	Unmitigated	Mitigated	Impact Threshold		
										Moderate	Severe	
N234	Mobile Homes	160	65	Yes	8	NOI-1	52.0	58.3	52.3	54.1	60.1	No
N235	Mobile Homes	60	65	Yes	8	NOI-1	52.0	67.0	59.0	54.1	60.1	Moderate
N236	SFR	100	65	Yes	8	NOI-1	52.0	64.8	56.8	54.1	60.1	Moderate
N237	SFR	160	65	Yes	8	NOI-1	52.0	62.8	54.8	54.1	60.1	Moderate
N238	SFR	95	65	Yes	8	NOI-1	52.0	60.5	53.5	54.1	60.1	No
N239	SFR	170	65	Yes	8	NOI-1	48.1	62.5	56.5	52.8	59.2	Moderate
N240	SFR	90	65	Yes	8	NOI-1	48.1	65.3	59.3	52.8	59.2	Severe
N241	SFR	155	65	Yes	8	NOI-1	52.0	62.9	55.9	54.1	60.1	Moderate
N242	SFR	215	65	Yes	8	NOI-1	52.0	61.5	53.5	54.1	60.1	No
N243	SFR	60	65	Yes	8	NOI-1	52.0	67.0	59.0	54.1	60.1	Moderate
N245	MFR	70	65	No	0	None[3]	51.2	66.4	66.4	53.8	59.9	Severe
N246	MFR	65	65	No	0	NOI-4	51.2	70.9	70.9	53.8	59.9	Severe
N247	SFR	95	65	No	0	NOI-4	51.2	68.2	68.2	53.8	59.9	Severe
N248	MFR	170	65	Yes	8	NOI-1	51.2	62.5	57.5	53.8	59.9	Moderate
N249	SFR	165	55	No	0	NOI-4	59.5	64.6	64.6	57.5	63.1	Severe
N251	SFR	85	55	No	0	NOI-4	59.5	67.4	67.4	57.5	63.1	Severe
NN253	SFR	100	45	No	0	NOI-4	59.5	65.4	65.4	57.5	63.1	Severe
N254	SFR	100	45	Yes	8	NOI-1, NOI-2	59.5	66.6	57.6	57.5	63.1	Moderate
N255	Aztec Mobile Home	35	35	Yes	8	NOI-1, NOI-2	59.5	69.0	56.0	57.5	63.1	No
N259	SFR	100	35	Yes	8	NOI-1	59.5	59.4	55.4	57.5	63.1	No

Cluster No.[1]	Land Use	Near Track Distance (ft)[2]	Speed (mph)	Soundwalls	Soundwall Height (ft)	Mitigation Measures	Noise Level (dBA, L_{dn})					Impact after Mitigation
							Existing	Unmitigated	Mitigated	Impact Threshold		
										Moderate	Severe	
N261	SFR/MFR	90	20	No	0	NOI-4, NOI-5	59.5	65.8	65.8	57.5	63.1	Severe
N264	MFR	160	20	No	0	NOI-4	59.5	57.7	57.7	57.5	63.1	Moderate
N267	MFR	30	45	No	0	NOI-4, NOI-5	56.0	69.9	69.9	55.7	61.6	Severe
N268	MFR	50	55	No	0	None[3]	56.0	66.4	66.4	55.7	61.6	Severe
N270	MFR	140	65	Yes	8	NOI-1	56.0	63.3	57.3	55.7	61.6	Moderate
N271	MFR	130	65	Yes	8	NOI-1	56.0	63.7	59.7	55.7	61.6	Moderate
N274	SFR	125	65	Yes	4	NOI-1	56.0	67.8	62.8	55.7	61.6	Severe
N275	MFR	295	65	Yes	4	NOI-1	56.0	64.1	62.1	55.7	61.6	Severe
N276	MFR	220	65	Yes	4	NOI-1	69.4	68.4	63.4	63.9	69.1	No
N277	SFR	130	65	Yes	4	NOI-1	69.4	66.2	59.2	63.9	69.1	No
N278	SFR/MFR	60	65	Yes	4	NOI-1	69.4	74.0	65.0	63.9	69.1	Moderate
N279	SFR	245	65	Yes	4	NOI-1	69.4	67.9	61.9	63.9	69.1	No
N281	MFR	235	65	Yes	4	NOI-1	69.4	68.1	62.1	63.9	69.1	No
N282	MFR	205	65	Yes	4	NOI-1	69.4	68.7	64.7	63.9	69.1	Moderate
N283	SFR	110	65	Yes	4	NOI-1	57.7	71.4	67.4	56.6	62.3	Severe
N284	SFR	175	65	Yes	4	NOI-1	57.7	66.4	63.4	56.6	62.3	Severe
N285	SFR	185	65	Yes	8	NOI-1, NOI-2	57.7	71.1	61.1	56.6	62.3	Moderate
N286	Bel Tooren Villa Convalescent Hospital	120	65	Yes	4	NOI-1	69.4	68.0	61.0	63.9	69.1	No
N287	SFR	50	65	Yes	4	NOI-1	57.7	71.8	64.8	56.6	62.3	Severe

Cluster No.[1]	Land Use	Near Track Distance (ft)[2]	Speed (mph)	Soundwalls	Soundwall Height (ft)	Mitigation Measures	Noise Level (dBA, L_{dn})					Impact after Mitigation
							Existing	Unmitigated	Mitigated	Impact Threshold		
										Moderate	Severe	
N288	SFR	220	65	Yes	4	NOI-1	57.7	65.4	61.4	56.6	62.3	Moderate
N289	SFR	200	65	Yes	8	NOI-1, NOI-2	57.7	70.8	57.8	56.6	62.3	Moderate
N290	SFR	45	65	Yes	8	NOI-1, NOI-2	57.7	73.3	59.3	56.6	62.3	Moderate
N291	SFR	100	65	Yes	8	NOI-1, NOI-2	57.7	69.8	58.8	56.6	62.3	Moderate
N292	SFR	160	65	Yes	8	NOI-1, NOI-2	57.7	63.3	54.3	56.6	62.3	No
N293	SFR	230	65	Yes	8	NOI-1, NOI-2	57.7	66.2	57.2	56.6	62.3	Moderate
N294	SFR	65	65	Yes	8	NOI-1, NOI-2	57.7	71.7	61.7	56.6	62.3	Moderate
N295	SFR	160	65	Yes	8	NOI-1	57.7	62.8	54.8	56.6	62.3	No
N296	SFR	150	65	Yes	8	NOI-1, NOI-2	57.7	63.5	54.5	56.6	62.3	No
N297	SFR	60	65	Yes	8	NOI-1, NOI-2	57.7	72.0	60.0	56.6	62.3	Moderate
N298	SFR	95	65	Yes	4	NOI-1	57.7	65.0	62.0	56.6	62.3	Moderate
N299	SFR	150	65	Yes	4	NOI-1	57.7	63.0	59.0	56.6	62.3	Moderate
N300	SFR	80	65	Yes	4	NOI-1	57.7	65.8	61.8	56.6	62.3	Moderate
N301	SFR	75	65	Yes	4	NOI-1	57.7	66.1	62.1	56.6	62.3	Moderate
N306	SFR	210	65	Yes	8	NOI-1	51.2	65.6	57.6	53.8	59.9	Moderate
N307	SFR	50	65	Yes	8	NOI-1	51.2	71.8	64.8	53.8	59.9	Severe
N308	SFR	210	65	Yes	4	NOI-1	51.2	65.6	60.6	53.8	59.9	Severe

Cluster No.[1]	Land Use	Near Track Distance (ft)[2]	Speed (mph)	Soundwalls	Soundwall Height (ft)	Mitigation Measures	Noise Level (dBA, L_{dn})					Impact after Mitigation
							Existing	Unmitigated	Mitigated	Impact Threshold		
										Moderate	Severe	
N309	SFR	50	65	Yes	4	NOI-1	51.2	71.8	61.8	53.8	59.9	Severe
N310	SFR	50	65	Yes	4	NOI-1	51.2	71.8	61.8	53.8	59.9	Severe
N311	SFR	140	65	Yes	4	NOI-1	51.2	67.3	61.3	53.8	59.9	Severe
N312	SFR	50	65	Yes	4	NOI-1	51.2	71.8	62.8	53.8	59.9	Severe
N313	SFR	175	65	Yes	4	NOI-1	51.2	66.4	60.4	53.8	59.9	Severe
N314	SFR	70	65	Yes	4	NOI-1	51.2	70.4	59.4	53.8	59.9	Moderate
N315	SFR	40	65	Yes	4	NOI-1	51.2	72.8	57.8	53.8	59.9	Moderate
N316	SFR	130	65	Yes	4	NOI-1	51.2	63.2	51.2	53.8	59.9	No
N317	SFR	220	65	Yes	4	NOI-1	51.2	65.4	55.4	53.8	59.9	Moderate
N318	SFR	110	65	Yes	4	NOI-1	51.2	68.4	57.4	53.8	59.9	Moderate
N319	SFR	50	65	Yes	4	NOI-1	51.2	71.8	58.8	53.8	59.9	Moderate
N320	SFR	110	65	Yes	4	NOI-1	51.2	63.9	52.9	53.8	59.9	No
N321	SFR	210	65	Yes	4	NOI-1	48.0	65.6	61.6	52.7	59.2	Severe
N322	SFR	40	65	Yes	4	NOI-1, NOI-4, NOI-5	48.0	75.8	69.8	52.7	59.2	Severe
N323	SFR	45	65	Yes	4	NOI-1	48.0	72.3	64.3	52.7	59.2	Severe
N324	SFR	200	65	Yes	4	NOI-1	48.0	65.8	60.8	52.7	59.2	Severe
N325	SFR	140	65	Yes	4	NOI-1	48.0	67.3	63.3	52.7	59.2	Severe
N326	SFR	50	65	Yes	4	NOI-1, NOI-4, NOI-5	48.0	74.9	70.0	52.7	59.2	Severe
N327	MFR	210	65	No	0	NOI-4, NOI-5	48.0	64.6	64.6	52.7	59.2	Severe

Cluster No.[1]	Land Use	Near Track Distance (ft)[2]	Speed (mph)	Soundwalls	Soundwall Height (ft)	Mitigation Measures	Noise Level (dBA, L_{dn})					Impact after Mitigation
							Existing	Unmitigated	Mitigated	Impact Threshold		
										Moderate	Severe	
N328	SFR, MFR	45	45	Yes	8	NOI-1, NOI-2, NOI-4, NOI-5	48.0	73.5	65.2	52.7	59.2	Severe
N329	SFR	190	55	Yes	8	NOI-1	48.0	60.6	54.6	52.7	59.2	Moderate
N330	SFR	180	45	Yes	8	NOI-1, NOI-2	48.0	59.6	48.6	52.7	59.2	No
N331	MFR, SFR	35	35	Yes	8	NOI-1, NOI-2	48.0	72.0	60.0	52.7	59.2	Severe
N333	SFR	175	55	No	0	None[3]	48.0	59.4	59.4	52.7	59.2	Severe
N334	SFR	40	45	Yes	8	NOI-1, NOI-2, NOI-4, NOI-5	48.0	74.1	66.2	52.7	59.2	Severe
N335	SFR, MFR	200	45	No	0	None[3]	48.0	58.6	58.6	52.7	59.2	Moderate
N336	SFR	180	35	Yes	8	NOI-1, NOI-2	48.0	61.9	48.9	52.7	59.2	No
N338	SFR, MFR	160	35	Yes	8	NOI-1, NOI-2	48.0	63.4	50.4	52.7	59.2	No
N339	SFR, MFR	90	35	Yes	8	NOI-1, NOI-2	48.0	68.9	57.9	52.7	59.2	Moderate
N340	SFR	200	20	No	0	NOI-2	48.0	57.6	52.6	52.7	59.2	No
N341	SFR	110	20	No	0	NOI-2	48.0	63.2	58.2	52.7	59.2	Moderate
N342	SFR	80	20	No	0	NOI-2	48.0	64.5	59.5	52.7	59.2	Severe
N343	SFR	200	20	No	0	NOI-2	48.0	57.6	52.6	52.7	59.2	No

Cluster No.[1]	Land Use	Near Track Distance (ft)[2]	Speed (mph)	Soundwalls	Soundwall Height (ft)	Mitigation Measures	Noise Level (dBA, L_{dn})					Impact after Mitigation
							Existing	Unmitigated	Mitigated	Impact Threshold		
										Moderate	Severe	
N344	SFR	40	15	Yes	8	NOI-1, NOI-2	52.0	64.0	52.0	54.1	60.1	No
N346	SFR	40	15	Yes	8	NOI-1, NOI-2	52.0	61.0	49.0	54.1	60.1	No
N347	SFR	45	15	Yes	8	NOI-1	52.0	55.5	48.5	54.1	60.1	No

Source: TAHA, 2020
Notes: [1] Cluster sites are shown in Appendix G.
[2] Distance to the closest area of human use or closest building façade.
[2] See Table 8.12 for explanation.
NF = Not Feasible; SFR = Single-Family Residential; MFR = Multi-Family Residential

Table 8.11. Mitigated Category 3 Land Use LRT Noise – Alternative 1

Cluster No.[1]	Land Use	Near Track Distance (ft)[2]	Speed (mph)	Soundwall	Soundwall Height	Mitigation Measures	Noise Level (dBA, L_{dn})					Impact After Mitigation
							Existing	Unmitigated	Mitigated	Impact Threshold		
										Moderate	Severe	
N62	Templo Asamblea De Oracion	80	35	No	0	NOI-4	64.2	73.9	66.2	65.3	70.7	Moderate
N83	Huntington Park High School	50	35	No	0	NOI-4	63.8	71.9	65.8	65.1	70.5	Moderate
N181	Trinity Bible Church	20	35	No	0	NOI-4	75.3	78.9	76.9	70.0	78.4	Moderate
N184	American Indian Bible Church	80	35	No	0	NOI-4	74.7	76.7	76.7	70.0	78	Moderate
N221	Paramount High School	85	65	Yes	4	NOI-1	53.7	66.0	58.0	59.7	65.7	No
N252	Door Christian Fellowship Church	150	55	No	0	NOI-4	61.5	64.0	64.0	63.6	69.2	Moderate
N266	Los Angeles County Fire Museum	110	25	No	0	NOI-4	58.0	61.7	61.7	61.7	67.4	Moderate
N272	Bristol Civic Auditorium	70	65	Yes	8	NOI-1	58.0	66.8	58.8	61.7	67.4	No
N273	Bellflower Health Center	120	65	Yes	4	NOI-1	58.0	64.5	60.5	61.7	67.4	No
N303	Rio Hondo Metal Health Clinic	160	65	No	0	NOI-4	61.4	63.7	63.7	63.6	69.1	Moderate
N332	Artesia Historical Museum	45	35	Yes	8	NOI-1, NOI-2	50.0	64.4	53.4	58.4	64.6	No

Cluster No.[1]	Land Use	Near Track Distance (ft)[2]	Speed (mph)	Soundwall	Soundwall Height	Mitigation Measures	Noise Level (dBA, L_{dn})					Impact After Mitigation
							Existing	Unmitigated	Mitigated	Impact Threshold		
										Moderate	Severe	
N337	Wan Yuen Temple	55	35	Yes	8	NOI-1, NOI-2	50.0	66.5	54.5	58.4	64.6	No

Source: TAHA, 2020
Note: [1] Cluster Sites are shown in Appendix G.
[2] Distance to the closest area of human use or closest building façade.
NF = Not Feasible

Table 8.12. Sensitive Land Uses Where Mitigation Not Feasible or Reasonable

Cluster No.	Cat.[1]	Land Use	Mitigation Measures	Explanation of Feasibility/Reasonableness of Mitigation
N85	2	SFR/MFR	None	Soundwall not physically feasible., design speed reduced at this location.
N89	2	SFR/MFR	None	Soundwall not physically feasible., design speed reduced at this location.
N169	2	Motel	None	No other receptor within 1,000 feet of receptor. FTA moderate impact criteria exceeded only by 0.2 dBA, resulting in a moderate impact. Not reasonable to implement soundwall for isolated receptor.
N225	2	SFR	None	Receptor at intersection and implementation of soundwall not physically feasible.
N233	2	SFR/MFR	None	Receptor at intersection and implementation of soundwall not physically feasible.
N245	2	MFR	None	Receptor greater than height of soundwall and located near intersection.
N268	2	MFR	None	Receptor greater than height of soundwall.
N333	2	SFR	None	Receptor at intersection and implementation of soundwall not physically feasible.
N335	2	SFR	None	Receptor at intersection and implementation of soundwall not physically feasible.

Source: Metro 2020
Notes: [1] Category 2: Residences and buildings where people normally sleep. This category includes homes, hospitals, and hotels where a nighttime sensitivity to noise is assumed to be of utmost importance.
Cat. = category; dBA = A-weighted decibel; SFR = single-family residential; MFR = multifamily residential

Table 8.13. Vibration Category 2 Mitigated LRT Vibration – Alternative 1

Cluster No.[1]	Land Use	Near Track Distance (ft)[1]	Speed (mph)	Predicted GBV Level, VdB	Mitigation Measure	Predicted Mitigated GBV Level, VdB	FTA GBV Impact Criteria	Residual Impact?[2]
V7	SFR/MFR	6	35	79	Resilient DF Rail Fasteners	74	72	Yes
V31	SFR/MFR	40	55	80[3]	Resilient DF Rail Fasteners & Low Impact Frog	69	72	No
V33	SFR/MFR	40	55	78[3]	Resilient DF Rail Fasteners & Low Impact Frog	68	72	No
V34	SFR/MFR	110	55	74[3]	Resilient DF Rail Fasteners & Low Impact Frog	65	72	No
V37	SFR/MFR	40	55	73	Resilient DF Rail Fasteners	68	72	No
V48	SFR	55	35	73	Ballast Mat	65	72	No
V53	SFR/MFR	40	35	75	Ballast Mat	67	72	No
V56	SFR/MFR	55	35	73	Ballast Mat	65	72	No
V58	MFR	55	35	73	Ballast Mat	65	72	No
V59	SFR/MFR	50	35	74	Ballast Mat	66	72	No
V62	SFR/MFR	110	35	74[3]	Ballast Mat & Low Impact Frog	60	72	No
V63	SFR/MFR	50	35	81[3]	Ballast Mat & Low Impact Frog	65	72	No
V66	SFR/MFR	40	35	75	Ballast Mat	67	72	No
V67	SFR/MFR	50	35	74	Ballast Mat	66	72	No
V68	SFR/MFR	50	35	74	Ballast Mat	66	72	No
V69	SFR/MFR	45	35	75	Ballast Mat	67	72	No
V72	SFR	50	35	74	Ballast Mat	66	72	No

Cluster No.[1]	Land Use	Near Track Distance (ft)[1]	Speed (mph)	Predicted GBV Level, VdB	Mitigation Measure	Predicted Mitigated GBV Level, VdB	FTA GBV Impact Criteria	Residual Impact?[2]
V81	SFR	20	55	92[3]	Ballast Mat & Low Impact Frog	74	72	Yes
V82	SFR	90	55	77	Ballast Mat	69	72	No
V84	SFR/MFR	35	50	79	Ballast Mat	71	72	No
V86	SFR/MFR	25	50	80	Ballast Mat	72	72	No
V88	SFR	25	55	81	Ballast Mat	73	72	Yes
V89	SFR	30	40	78	Ballast Mat	70	72	No
V94	SFR/MFR	55	45	75	Ballast Mat	67	72	No
V96	SFR	80	55	73	Ballast Mat	65	72	No
V99	SFR	60	55	75	Ballast Mat	67	72	No
V101	SFR	80	55	73	Ballast Mat	65	72	No
V102	SFR	50	55	77	Ballast Mat	69	72	No
V103	SFR	85	55	73	Ballast Mat	65	72	No
V105	SFR	80	55	73	Ballast Mat	65	72	No
V108	SFR	65	55	75	Ballast Mat	67	72	No
V110	SFR	75	55	74	Ballast Mat	66	72	No
V112	SFR	70	55	74[3]	Ballast Mat & Low Impact Frog	66	72	No
V113	SFR	80	55	73[3]	Ballast Mat & Low Impact Frog	65	72	No
V114	SFR	75	55	74[3]	Ballast Mat & Low Impact Frog	66	72	No
V115	SFR	140	55	75[3]	Ballast Mat & Low Impact Frog	60	72	No
V116	SFR/MFR	80	55	80[3]	Ballast Mat & Low Impact Frog	65	72	No
V117	MFR	75	55	74	Ballast Mat	66	72	No
V119	Mobile Homes	85	55	73	Ballast Mat	65	72	No

Cluster No.[1]	Land Use	Near Track Distance (ft)[1]	Speed (mph)	Predicted GBV Level, VdB	Mitigation Measure	Predicted Mitigated GBV Level, VdB	FTA GBV Impact Criteria	Residual Impact?[2]
V127	SFR	60	55	75	Ballast Mat	67	72	No
V128	SFR	25	55	81	Ballast Mat	73	72	Yes
V129	SFR	15	55	84	Ballast Mat	76	72	Yes
V130	SFR	24	55	81	Ballast Mat	73	72	Yes
V131	SFR	20	55	82	Resilient DF Rail Fasteners	77	72	Yes
V132	SFR	34	55	79	Ballast Mat	71	72	No
V133	SFR	20	55	82	Ballast Mat	74	72	Yes
V134	SFR	20	55	82	Ballast Mat	74	72	Yes
V135	SFR	25	55	81	Ballast Mat	73	72	Yes
V140	SFR	70	55	74	Ballast Mat	66	72	No
V141	SFR	60	55	75	Ballast Mat	67	72	No
V142	SFR	72	55	74	Ballast Mat	66	72	No
V144	SFR	66	55	75	Ballast Mat	67	72	No
V149	SFR	125	55	75[3]	Ballast Mat & Low Impact Frog	61	72	No
V152	SFR	20	55	82	Ballast Mat	74	72	Yes
V153	SFR	33	55	84[3]	Ballast Mat & Low Impact Frog	71	72	No
V154	SFR	31	55	90[3]	Ballast Mat & Low Impact Frog	72	72	No
V155	SFR	50	55	77[3]	Ballast Mat & Low Impact Frog	69	72	No
V157	Mobile Homes	70	55	74	Ballast Mat	66	72	No
V158	SFR	66	55	75	Ballast Mat	67	72	No
V160	SFR	70	55	74	Ballast Mat	66	72	No
V162	SFR	65	55	75	Ballast Mat	67	72	No

Cluster No.[1]	Land Use	Near Track Distance (ft)[1]	Speed (mph)	Predicted GBV Level, VdB	Mitigation Measure	Predicted Mitigated GBV Level, VdB	FTA GBV Impact Criteria	Residual Impact?[2]
V163	SFR	75	55	74	Ballast Mat	66	72	No
V165	MFR	80	55	73	Ballast Mat	65	72	No
V166	MFR	65	55	75	Ballast Mat	67	72	No
V171	SFR	60	55	75	Ballast Mat	67	72	No
V173	SFR	117	55	76[3]	Ballast Mat & Low Impact Frog	62	72	No
V174	Aztec Mobile Home	25	55	91[3]	Ballast Mat & Low Impact Frog	73	72	Yes
V175	SFR	120	55	76[3]	Ballast Mat & Low Impact Frog	62	72	No
V180	MFR	25	55	81	Ballast Mat	73	72	Yes
V181	MFR	60	55	75	Ballast Mat	67	72	No
V187	SFR/MFR	40	55	78	Ballast Mat	70	72	No
V189	SFR	25	55	81[3]	Ballast Mat & Low Impact Frog	73	72	Yes
V192	SFR	60	55	84[3]	Ballast Mat & Low Impact Frog	67	72	No
V193	SFR	50	55	86[3]	Ballast Mat & Low Impact Frog	67	72	No
V194	SFR	30	55	90[3]	Ballast Mat & Low Impact Frog	72	72	No
V195	SFR	45	55	78[3]	Ballast Mat & Low Impact Frog	70	72	No
V197	SFR	58	55	76[3]	Ballast Mat & Low Impact Frog	68	72	No
V199	SFR	65	55	75	Ballast Mat	67	72	No
V202	SFR	65	55	75	Ballast Mat	67	72	No
V204	SFR	50	55	77	Ballast Mat	69	72	No

Cluster No.[1]	Land Use	Near Track Distance (ft)[1]	Speed (mph)	Predicted GBV Level, VdB	Mitigation Measure	Predicted Mitigated GBV Level, VdB	FTA GBV Impact Criteria	Residual Impact?[2]
V205	SFR	60	55	75	Ballast Mat	67	72	No
V206	SFR	45	55	77	Ballast Mat	69	72	No
V207	SFR	40	55	78	Ballast Mat	70	72	No
V210	SFR	60	55	75	Ballast Mat	67	72	No
V211	SFR	40	55	78	Ballast Mat	70	72	No
V212	SFR	50	55	77	Ballast Mat	69	72	No
V213	SFR	80	55	73	Ballast Mat	65	72	No
V214	SFR	50	55	77	Ballast Mat	69	72	No
V215	SFR	78	55	73	Ballast Mat	65	72	No
V216	SFR	40	55	78	Ballast Mat	70	72	No
V217	SFR	56	55	76	Ballast Mat	69	72	No
V218	SFR	50	55	77	Ballast Mat	68	72	No
V219	SFR	39	55	79	Ballast Mat	70	72	No
V221	SFR/MFR	64	55	81[3]	Ballast Mat & Low Impact Frog	67	72	No
V222	SFR/MFR	42	55	83[3]	Ballast Mat & Low Impact Frog	70	72	No
V223	SFR	45	45	81[3]	Ballast Mat & Low Impact Frog	68	72	No
V225	SFR/MFR	80	55	73	Ballast Mat	65	72	No
V226	SFR/MFR	58	55	76	Ballast Mat	68	72	No
V228	SFR	80	45	79	Ballast Mat	71	72	No
V230	SFR	52	45	84[3]	Ballast Mat & Low Impact Frog	67	72	No

Cluster No.[1]	Land Use	Near Track Distance (ft)[1]	Speed (mph)	Predicted GBV Level, VdB	Mitigation Measure	Predicted Mitigated GBV Level, VdB	FTA GBV Impact Criteria	Residual Impact?[2]
V232	SFR	50	45	85[3]	Ballast Mat & Low Impact Frog	67	72	No
V233	SFR	57	55	76[3]	Ballast Mat & Low Impact Frog	68	72	No

Source: WSP, 2020

Note: [1] Cluster sites shown in Appendix H.

[2] A vibration level is considered an impact if it exceeds the impact criteria threshold.

[3] Predicted GBV at these locations include the added vibration from turnouts and crossovers.

GBV = Groundborne Vibration; SFR = Single-Family Residential; MFR = Multi-Family Residential

Vibration

Receivers that have been predicted to exceed the FTA vibration impact thresholds are discussed below with possible mitigation measures evaluated. LRT pass-by vibration can be mitigated by isolating the trackwork. This can be achieved using ballast mats for the ballast and tie track and resilient rail fasteners for the direct fixation (DF) track (Mitigation Measure **VIB-1**). At those clusters where the GBV impact is from special trackwork the mitigation can be achieved by using low impact frogs at turnout and crossover track locations (Mitigation Measure **VIB-2**). Other measures with similar effectiveness could be implemented during final design to achieve the same vibration reduction. The specific limits for trackwork isolation would be defined during final design. A site by site assessment of the ground conditions will also be assessed during final design to determine the proper mitigation.

As shown in Table 8.12, although Mitigation Measures **VIB-1** and **VIB-2** would reduce vibration impacts, remaining impacts would occur at 14 clusters, in the range of 1 VdB to 5 VdB. Mitigated clusters and impacts are shown in Appendix H. According to FTA Guidance, there is a strong chance that after mitigation ground-borne vibration levels at the 14 clusters will be below the impact threshold. A FTA Detailed Vibration Analysis will be conducted to refine the vibration impact analysis at these locations during final design. During the Detailed Vibration Analysis, appropriate mitigation, if necessary, will be identified. A Detailed Vibration Analysis at these locations may show that vibration impacts would not occur and control measures are not needed. Nonetheless, impacts would be adverse even after implementation of mitigation.

8.3.1.1 Ancillary Facilities

Implementation of Mitigation Measure NOI-6 (TPSS Noise Reduction) would reduce TPSS noise levels where feasible. However, at this stage in design, various TPSS noise reduction methods may or may not be completely effective due to design constraints for individual TPSS locations which will be determined as part of final design. Five moderate impacts and two severe impacts resulting from ancillary facility noise would remain. Therefore, adverse effects related to TPSS noise would remain after implementation of mitigation.

8.3.1.2 Parking Facilities

No impacts have been identified at parking facilities and no mitigation is required.

8.3.1.3 Freight Track Relocation

Noise

In many cases mitigation of the LRT would reduce impacts related to Freight Track relocation. The combination of the LRT noise with Freight noise is the primary driver for noise impacts in the instances that freight and LRT would pass-by at the same time. Mitigation Measures **NOI-1** through **NOI-5** would apply for LRT noise, which would reduce overall noise impact related to freight track relocation. However, the analysis does not take reductions associated with Mitigation Measures **NOI-4** or **NOI-5** because they would first require CPUC approval. Additional soundwalls necessary to mitigate noise related to freight track relocation have been proposed under Mitigation Measure **NOI-7**

Mitigated noise levels for Category 2 clusters are shown in Table 8.13 and Category 3 clusters are shown in Table 8.14. Under Alternative 1, nine clusters would be reduced from a moderate impact to no impact, and four clusters would be reduced from severe to no impact for a total of 13 benefited clusters. Thirty-three moderate impacts and nine severe impacts would remain at Category 2 clusters after implementation of Mitigation Measures **NOI-1** through **NOI-3** and **NOI-7**. Four moderate impacts and two severe impacts would remain at Category 3 clusters. Category 3 clusters along Randolph Street are unlikely to be regularly experience impacts due to a combination of freight and LRT noise. This is because Category 3 uses are daytime uses and would not typically be open when the freight is traversing Randolph Street at night. Mitigation Measures **NOI-4** and **NOI-5** would provide noise reductions to clusters near grade crossing should CPUC approval be obtained. Nonetheless, impacts would remain adverse even after implementation of mitigation.

Vibration

No vibration impacts have been identified at the freight track relocations.

Table 8.14. Mitigated Category 2 Land Use Freight Track Relocation Noise Assessment – Alternative 1

Cluster No.[1]	Land Use	Freight Track Distance (ft)[2]	Speed (mph)	Noise Level (dBA, L_{dn})						Impact after Mitigation
				Mitigation Measure	Existing	Unmitigated	Mitigated	Impact Threshold		
								Moderate	Severe	
Randolph Street										
N50	SFR/MFR	70	10	NOI-3	68.9	74.3	66.3	63.5	68.7	Moderate
N54	SFR	50	10	NOI-4	71.0	67.2	67.2	65.1	70.2	Moderate
N56	SFR	60	10	NOI-4	71.0	68.5	68.5	65.1	70.2	Moderate
N58	SFR/MFR	60	10	NOI-4	71.0	66.8	66.8	65.1	70.2	Moderate
N60	SFR/MFR	80	10	NOI-4	71.0	69.4	69.4	65.1	70.2	Moderate
N61	SFR	60	10	NOI-4	71.0	67.1	67.1	65.1	70.2	Moderate
N65	SFR/MFR	50	10	NOI-4	71.0	68.0	68.0	65.1	70.2	Moderate
N66	MFR	50	10	NOI-4	71.0	65.9	65.2	65.1	70.2	Moderate
N71	MFR	40	10	NOI-4	64.8	69.1	69.1	60.7	66.1	Severe
N73	SFR/MFR	90	10	NOI-2, NOI-4	64.8	68.9	66.8	60.7	66.1	Severe
N74	SFR/MFR	210	10	NOI-2	64.8	64.4	61.0	60.7	66.1	Moderate
N75	MFR	100	10	NOI-2	64.8	61.5	58.7	60.7	66.1	No
N76	SFR/MFR	45	10	NOI-2	64.8	68.9	66.4	60.7	66.1	Severe
N77	SFR/MFR	130	10	NOI-2	64.8	64.7	62.0	60.7	66.1	Moderate
N78	SFR/MFR	100	10	NOI-2, NOI-4	64.8	63.9	61.0	60.7	66.1	Moderate
N79	SFR/MFR	45	10	NOI-2, NOI-4	64.8	72.0	69.5	60.7	66.1	Severe
N80	SFR/MFR	80	10	NOI-2, NOI-4	64.8	71.1	68.6	60.7	66.1	Severe
N81	SFR	250	10	NOI-2	64.8	62.4	59.5	60.7	66.1	No
N82	SFR/MFR	200	10	NOI-4	64.8	61.8	61.9	60.7	66.1	Moderate
N85	SFR/MFR	85	10	None	64.8	65.0	65.1	60.7	66.1	Moderate

Cluster No.[1]	Land Use	Freight Track Distance (ft)[2]	Speed (mph)	Noise Level (dBA, L_{dn})						Impact after Mitigation
				Mitigation Measure	Existing	Unmitigated	Mitigated	Impact Threshold		
								Moderate	Severe	
N86	SFR/MFR	50	10	NOI-4	64.8	69.1	69.1	60.7	66.1	Severe
N88	SFR/MFR	50	10	NOI-4	64.8	68.1	68.1	60.7	66.1	Severe
N89	SFR/MFR	90	10	None	66.1	65.2	65.2	61.6	66.9	Moderate
N92	SFR/MFR	165	10	NOI-4	66.1	63.4	63.4	61.6	66.9	Moderate
N93	SFR	80	10	NOI-4	66.1	68.2	68.2	61.6	66.9	Severe
N94	SFR/MFR	110	10	NOI-4	66.1	65.8	65.8	61.6	66.9	Moderate
N96	SFR	80	10	NOI-4	66.1	65.2	65.1	61.6	66.9	Moderate
N98	SFR/MFR	80	10	NOI-4	66.1	65.6	65.5	61.6	66.9	Moderate
N99	SFR/MFR	200	10	NOI-4	66.1	62.7	62.7	61.6	66.9	Moderate
N101	SFR	190	10	NOI-1	66.1	61.8	57.8	61.6	66.9	No
N102	SFR	80	10	NOI-1	66.1	65.3	60.4	61.6	66.9	No
Façade Avenue										
N182	SFR	270	10	NOI-4	59.3	58.9	57.5	57.1	62.8	Moderate
N185	SFR	240	10	NOI-1, NOI-2	59.9	60.8	52.9	57.4	63	No
N186	SFR	290	10	NOI-1	59.3	57.6	53.6	57.1	62.8	No
N187	SFR	250	10	NOI-2	59.9	59.5	58.0	57.4	63	Moderate
N188	SFR	250	10	NOI-4, NOI-5	60.3	60.7	60.8	57.6	63.2	Moderate
N189	SFR	160	10	NOI-4, NOI-5	61.2	62.5	62.5	58.1	63.7	Moderate
N190	SFR	70	10	NOI-4, NOI-5	63.7	70.9	70.9	59.5	65	Severe
N191	SFR	35	10	NOI-1, NOI-7	64.0	71.0	63.7	60.2	65.6	Moderate
N192	SFR	60	10	NOI-1, NOI-7	64.0	71.9	64.3	60.2	65.6	Moderate
N193	SFR	60	10	NOI-1, NOI-7	64.0	73.1	64.3	60.2	65.6	Moderate

Cluster No.[1]	Land Use	Freight Track Distance (ft)[2]	Speed (mph)	Noise Level (dBA, L_{dn})						Impact after Mitigation
				Mitigation Measure	Existing	Unmitigated	Mitigated	Impact Threshold		
								Moderate	Severe	
N194	SFR	35	10	NOI-1, NOI-7	64.0	69.8	62.5	60.2	65.6	Moderate
N195	SFR	240	10	NOI-1, NOI-7	64.0	61.3	57.1	60.2	65.6	No
N196	SFR	30	10	NOI-1, NOI-7	64.0	70.0	62.7	60.2	65.6	Moderate
N197	SFR	45	10	NOI-1, NOI-7	64.0	73.2	64.5	60.2	65.6	Moderate
N199	SFR	315	10	NOI-1, NOI-7	57.9	63.1	59.0	56.3	62	Moderate
N200	SFR	50	10	NOI-1, NOI-7	66.7	75.9	66.1	61.3	66.6	Moderate
N201	SFR	30	10	NOI-1, NOI-7	66.1	70.9	61.7	60.9	66.3	Moderate
N202	SFR	225	10	NOI-1, NOI-7	58.9	63.9	53.4	56.7	62.4	No
N205	SFR	320	10	NOI-1, NOI-3, NOI-7	57.7	64.3	51.0	56.2	61.9	No
N209	SFR	280	10	NOI-1, NOI-3, NOI-7	58	68.9	54.2	56.4	62.1	No
N210	SFR	30	10	NOI-1, NOI-3, NOI-7	65.6	75.0	60.7	60.6	66	Moderate
N212	SFR	150	10	NOI-1, NOI-7	60.1	59.1	49.0	57.4	63	No
N213	SFR	35	10	NOI-1,NOI-7	65.2	66.9	59.0	60.3	65.7	No

Source: TAHA, 2019
Notes: [1] Cluster sites shown in Appendix A.
[2] Distance to the closest area of human use or closest building façade.

Table 8.15. Mitigated Category 3 Land Use Freight Track Relocation Noise Assessment – Alternative 1

Cluster No.[1]	Land Use	Freight Track Distance (ft)[2]	Speed (mph)	Noise Level (dBA, L_{eq})						Impact after Mitigation
				Mitigation Measure	Existing	Unmitigated	Mitigated	Impact Threshold		
								Moderate	Severe	
Randolph Street										
N51	Lillian Street Elementary	60.0	10	NOI-2	71.6	73.5	73.0	70.0	76.7	Moderate
N62	Templo Asamblea De Oracion	70.0	10	NOI-4	71.1	73.2	73.2	70.0	75.9	Moderate
N67	UEI College	85.0	10	NOI-4	70.4	71.8	71.8	70.0	75.4	Moderate
N83	Huntington Park High School	120.0	10	NOI-4	70.6	71.3	71.3	70.0	75.5	Moderate
N100	San Antonio Elementary	130.0	10	NOI-1, NOI-4	69.8	70.4	63.5	70.0	75.3	No
Façade Avenue										
N181	Trinity Bible Church	50.0	10	NOI-4	75.2	78.6	78.6	70.0	78.4	Severe
N184	American Indian Bible Church	110	10	NOI-4	70.6	77.5	77.5	70.0	75.1	Severe

Source: TAHA, 2020
Notes: [1] Cluster sites shown in Appendix I.
[2] Distance to the closest area of human use or closest building façade.

8.3.2 Alternative 2

8.3.2.1 LRT

Noise

Mitigation Measures **NOI-1** through **NOI-5** would apply to Alternative 2. Under Alternative 2 headways would be decreased to 2.5-minute headways during one hour of each weekday peak period between 7th St/Metro Center Station and the Slauson/A Line Station. This would affect noise level at clusters 1 through 50, which are shown in Table 8.15. Cluster 51 would only experience a severe impact as a result of freight train noise due should a freight train and LRT train pass-by at the same time. The LRT would not cause an adverse impact on its own. The remainder of clusters would be mitigated to the same extent as Alternatives 1 and 2.

As shown in Table 8.10 and Table 8.11, the majority of LRT related noise impacts could be mitigated with the use of soundwalls (Mitigation Measure **NOI-1**) and Mitigation Measures **NOI-2** through **NOI-3**. However, soundwalls would not be feasible at several receivers or would not provide enough of a noise reduction to totally mitigate all impacts. Under Alternative 2, 76 clusters would be reduced from a severe impact to a moderate impact, 48 clusters would be reduced from a moderate impact to no impact, and 42 clusters would be reduced from severe to no impact for a total of 166 benefited clusters. Under Alternative 2, 103 moderate impacts and 60 severe impacts would remain at Category 2 clusters after implementation of Mitigation Measures **NOI-1** through **NOI-3**. Seven moderate impacts would remain at Category 3 clusters. Therefore, impacts would remain adverse even after implementation of mitigation.

Vibration

Mitigation Measures **VIB-1** and **VIB-2** would apply to Alternative 2. The underground segment of Alternative 2 would not result in vibration impacts. The remainder of Alternative 2 would follow the same alignment as Alternative 1. As shown in Table 8.12, although Mitigation Measures **VIB-1** and **VIB-2** would reduce vibration impacts, 14 clusters would still be affected by LRT vibration, 14 of which would exceed the FTA criterion in the range of 1 VdB to 5 VdB. Mitigated clusters and impacts are shown in Appendix G. According to FTA Guidance, there is a strong chance that after mitigation ground-borne vibration levels at these 14 clusters will be below the impact threshold. A more detailed study to refine the vibration impact analysis will be conducted at these locations during the Final EIS. During the Detailed Vibration Analysis, appropriate mitigation, if necessary, will be identified. A Detailed Vibration Analysis at these locations may show that vibration impacts would not occur and control measures are not needed. Nonetheless, impacts would be adverse even after implementation of mitigation.

8.3.2.2 Ancillary Facilities

Similar to Alternative 1, implementation of Mitigation Measure **NOI-6** would reduce TPSS noise levels but may or may not reduce levels below the FTA criteria. Five moderate impacts and two severe impacts resulting from ancillary facility noise would remain. Therefore, adverse effects related to TPSS noise would remain after implementation of mitigation.

8.3.2.3 Parking Facilities

No impacts have been identified at parking facilities and no mitigation is required.

Table 8.16. Mitigated Category 2 Land Use LRT Noise – Alternative 2

Cluster No.[1]	Land Use	Near Track Distance (ft)[2]	Speed (mph)	Soundwalls	Soundwall Height (ft)	Mitigation Measures	Noise Level (dBA, L_{dn})					Impact after Mitigation
							Existing	Unmitigated	Mitigated	Impact Threshold		
										Moderate	Severe	
N2	SFR/MFR	80	55	Yes	4	NOI-1	56.3	68.7	60.7	55.9	61.7	Moderate
N3	SFR/MFR	210	55	Yes	4	NOI-1	56.3	64.6	59.6	55.9	61.7	Moderate
N4	SFR/MFR	45	55	Yes	4	NOI-1	56.3	71.2	62.2	55.9	61.7	Severe
N5	SFR/MFR	240	55	Yes	4	NOI-1	56.3	64.0	59.0	55.9	61.7	Moderate
N6	SFR/MFR	80	55	Yes	4	NOI-1	56.3	68.7	60.7	55.9	61.7	Moderate
N7	SFR/MFR	240	55	Yes	4	NOI-1	56.3	64.0	59.0	55.9	61.7	Moderate
N10	SFR/MFR	240	55	Yes	4	NOI-1	66.8	63.6	58.0	62.0	67.3	No
N11	SFR/MFR	185	55	Yes	4	NOI-1	66.8	65.1	59.1	62.0	67.3	No
N12	SFR/MFR	110	55	Yes	4	NOI-1	66.8	67.4	60.4	62.0	67.3	No
N13	SFR/MFR	230	55	Yes	4	NOI-1, NOI-2	66.8	69.2	59.2	62.0	67.3	No
N14	SFR/MFR	110	55	Yes	4	NOI-1, NOI-2	66.8	72.4	60.4	62.0	67.3	No
N15	SFR/MFR	140	55	Yes	4	NOI-1, NOI-2	66.8	71.3	60.3	62.0	67.3	No
N16	SFR/MFR	240	55	Yes	4	NOI-1, NOI-2	66.8	69.0	59.0	62.0	67.3	No
N17	SFR/MFR	15	55	Yes	4	NOI-1, NOI-2	66.8	81.0	66.0	62.0	67.3	Moderate
N18	SFR/MFR	140	55	Yes	4	NOI-1	66.8	66.3	60.3	62.0	67.3	No
N19	SFR/MFR	15	55	Yes	4	NOI-1	66.8	76.0	66.0	62.0	67.3	Moderate
N20	SFR/MFR	110	55	Yes	4	NOI-1, NOI-2	66.8	72.4	60.4	62.0	67.3	No
N21	SFR/MFR	320	55	Yes	4	NOI-1	66.8	62.7	57.7	62.0	67.3	No
N22	SFR/MFR	320	55	Yes	4	NOI-1	66.8	62.7	57.7	62.0	67.3	No
N23	SFR/MFR	110	55	Yes	4	NOI-1	66.8	67.4	60.4	62.0	67.3	No
N24	SFR	30	55	Yes	4	NOI-1	66.8	73.0	63.0	62.0	67.3	Moderate

Cluster No.[1]	Land Use	Near Track Distance (ft)[2]	Speed (mph)	Soundwalls	Soundwall Height (ft)	Mitigation Measures	Noise Level (dBA, L_{dn}) Existing	Unmitigated	Mitigated	Impact Threshold Moderate	Severe	Impact after Mitigation
N25	SFR/MFR	80	55	Yes	4	NOI-1	66.8	68.7	60.7	62.0	67.3	No
N27	SFR/MFR	300	55	Yes	4	NOI-1	66.8	63.0	58.0	62.0	67.3	No
N29	SFR/MFR	110	55	Yes	4	NOI-1	66.8	67.4	60.4	62.0	67.3	No
N30	SFR/MFR	230	55	Yes	4	NOI-1	66.8	64.2	59.2	62.0	67.3	No
N32	SFR/MFR	90	50	Yes	4	NOI-1	70.5	67.4	55.4	64.7	69.8	No
N33	MFR	200	55	Yes	4	NOI-1	70.5	64.8	58.8	64.7	69.8	No
N34	MFR	60	55	Yes	4	NOI-1	70.5	70.0	59.0	64.7	69.8	No
N35	SFR/MFR	80	55	Yes	4	NOI-1	70.5	68.7	57.7	64.7	69.8	No
N37	MFR	90	45	Yes	4	NOI-1	70.5	66.5	55.5	64.7	69.8	No
N38	MFR	110	45	Yes	4	NOI-1	70.5	66.0	58.6	64.7	69.8	No
N40	SFR	215	45	Yes	4	NOI-1, NOI-2	70.5	67.7	56.7	64.7	69.8	No
N42	SFR/MFR	100	45	Yes	4	NOI-1, NOI-2	70.5	71.0	56.0	64.7	69.8	No
N43	SFR	40	45	Yes	4	NOI-1, NOI-2	70.5	76.0	59.0	64.7	69.8	No
N44	SFR	155	45	Yes	4	NOI-1, NOI-2	70.5	70.1	58.1	64.7	69.8	No
N45	SFR	100	25	No	0	NOI-2	70.5	66.9	61.9	64.7	69.8	No
N50	SFR/MFR	90	20	No	0	NOI-3	65.4	74.4	64.4	61.1	66.4	Moderate

Source: TAHA, 2020
Notes: Only clusters (groups of sensitive uses) that would have different effects from Alternative 1 are shown.
[1] Cluster Sites are shown in Appendix G.
[2] Distance to the closest area of human use or closest building façade.
NF = Not Feasible; SFR = Single-Family Residential; MFR = Multi-Family Residential

8.3.2.1 Freight Track Relocation

Noise

Similar to Alternative 1, thirty-three moderate impacts and nine severe impacts would remain at Category 2 clusters after implementation of Mitigation Measures **NOI-1** through **NOI-3** and **NOI-8**. Four moderate impacts and two severe impacts would remain at Category 3 clusters. Category 3 clusters along Randolph Street are unlikely to be regularly experience impacts due to a combination of freight and LRT noise. This is because Category 3 uses are daytime uses and would not typically be open when the freight is traversing Randolph Street at night. Mitigation Measures **NOI-4** and **NOI-5** would provide noise reductions to clusters near grade crossing should CPUC approval be obtained. Nonetheless, impacts would remain adverse even after implementation of mitigation.

Vibration

No vibration impacts have been identified at the freight track relocations.

8.3.3 Alternative 3

8.3.3.1 LRT

Noise

Mitigation Measures **NOI-1** through **NOI-5** would apply to Alternative 3. The northern tail tracks would end at civil station 645+50 which would reduce speeds and noise levels at Clusters 33 through 45. This would largely eliminate impacts at these clusters that would be experienced under Alternatives 1 and 2, with only Cluster 43 having a moderate impact. As shown in Table 8.16, Cluster 43 would be mitigated through implementation of Mitigation Measure **NOI-4**. Soundwalls (Mitigation Measure **NOI-1**) would not be necessary for Clusters 33 through 50. The remainder of cluster would be mitigated to the same extent as Alternatives 1 and 2.

As shown in Table 8.10 and Table 8.11, The majority of LRT related noise impacts could be mitigated with the use of soundwalls (Mitigation Measure **NOI-1**) and Mitigation Measures **NOI-2** through **NOI-3**. However, soundwalls would not be feasible at several receivers or would not provide enough of a noise reduction to totally mitigate all impacts. Under Alternative 3, 68 clusters would be reduced from a severe impact to a moderate impact, 35 clusters would be reduced from a moderate impact to no impact, and 29 clusters would be reduced from severe to no impact for a total of 132 benefited clusters. Under Alternative 3, 94 moderate impacts and 59 severe impacts would remain at Category 2 clusters after implementation of Mitigation Measures **NOI-1** through **NOI-3**. Seven moderate impacts would remain at Category 3 clusters. Therefore, impacts would remain adverse even after implementation of mitigation.

Table 8.17. Mitigated Category 2 Land Use LRT Noise – Alternative 3

Cluster No.[1]	Land Use	Near Track Distance (ft)[2]	Speed (mph)	Soundwalls	Soundwall Height (ft)	Mitigation Measures	Noise Level (dBA, L_{dn})					Impact after Mitigation
							Existing	Unmitigated	Mitigated	Impact Threshold		
										Moderate	Severe	
N43	SFR	40	15	No	0	NOI-2	70.5	66.0	61.0	64.7	69.8	No

Source: TAHA, 2020
Notes: Only clusters (groups of sensitive uses) that would have different effects from Alternative 1 are shown.
[1] Cluster Sites are shown in Appendix G.
[2] Distance to the closest area of human use or closest building façade.
NF = Not Feasible; SFR = Single-Family Residential; MFR = Multi-Family Residential

Vibration

Mitigation Measures **VIB-1** and **VIB-2** would apply to Alternative 3. No underground portion is proposed and therefore no vibration impacts related to underground LRT-pass by would occur. Vibration impacts would be reduced overall due to the shortened length of the alignment. Alternative 3 would affect vibration clusters 41 through 233. Mitigation Measures **VIB-1**and **VIB-2** would reduce vibration impacts at all but 13 clusters which would still be affected by LRT vibrations in the range of 1 VdB to 5 VdB (Table 8.12). Mitigated clusters and impacts are shown in Appendix G. According to FTA Guidance, there is a strong chance that after mitigation ground-borne vibration levels at these 13 clusters will be below the impact threshold. A more detailed study to refine the vibration impact analysis will be conducted at these locations during the Final EIS. During the Detailed Vibration Analysis, appropriate mitigation, if necessary, will be identified. A Detailed Vibration Analysis at these locations may show that vibration impacts would not occur and control measures are not needed. Nonetheless, impacts would be adverse even after implementation of mitigation.

8.3.3.2 Ancillary Facilities

Implementation of Mitigation Measure **NOI-6** would reduce TPSS noise levels but may or may not reduce levels below the FTA criteria. One moderate impact and two severe impacts resulting from ancillary facility noise would remain. Therefore, adverse effects related to TPSS noise would remain after implementation of mitigation.

8.3.3.3 Parking Facilities

No impacts have been identified at parking facilities and no mitigation is required.

8.3.3.4 Freight Track Relocation

Noise

Similar to Alternatives 1 and 2, thirty-three moderate impacts and nine severe impacts would remain at Category 2 clusters after implementation of Mitigation Measures **NOI-1** through **NOI-3** and **NOI-7**. Four moderate impacts and two severe impacts would remain at Category 3 clusters. Category 3 clusters along Randolph Street are unlikely to be regularly experience impacts due to a combination of freight and LRT noise. This is because Category 3 uses are daytime uses and would not typically be open when the freight is traversing Randolph Street at night. Mitigation Measures **NOI-4** and **NOI-5** would provide noise reductions to clusters near grade crossing should CPUC approval be obtained. Nonetheless, impacts would remain adverse even after implementation of mitigation.

Vibration

No vibration impacts have been identified at the freight track relocations.

8.3.4 Alternative 4

8.3.4.1 LRT

Noise

Mitigation Measures **NOI-1** through **NOI-5** would apply to Alternative 4. The northern tail tracks would end at civil station 1068+50 which would reduce speeds and noise levels at Clusters 181 through 187. No impacts would occur at Clusters 181 through 187 under Alternative 4. The majority of LRT related noise impacts could be mitigated with the use of soundwalls (Mitigation Measure **NOI-1**) and Mitigation Measures **NOI-2** through **NOI-3**. However, soundwalls would not be feasible at several receivers or would not provide enough of a noise reduction to totally mitigate all impacts. Under Alternative 4, 52 clusters would be reduced from a severe impact to a moderate impact, 14 clusters would be reduced from a moderate impact to no impact, and 23 clusters would be reduced from severe to no impact for a total of 89 benefited clusters. Under Alternative 4, 56 moderate impacts and 44 severe impacts would remain at Category 2 clusters after implementation of Mitigation Measures **NOI-1** through **NOI-3**. Three moderate impacts would remain at Category 3 clusters. Therefore, impacts would remain adverse even after implementation of mitigation.

Vibration

Mitigation Measures **VIB-1** and **VIB-2** would apply to Alternative 4. No underground portion is proposed and therefore no vibration impacts related to underground LRT-pass by would occur. Vibration impacts would be reduced overall due to the shortened length of the alignment. Alternative 3 would affect vibration clusters 125 through 233. As shown in Table 8.12, although Mitigation Measures **VIB-1** and **VIB-2** would reduce vibration impacts, 11 clusters would still be affected by LRT vibration in the range of 1 VdB to 5 VdB. Mitigated clusters and impacts are shown in Appendix G. According to FTA Guidance, there is a strong chance that after mitigation ground-borne vibration levels at these 11 cluster will be below the impact threshold. A more detailed study to refine the vibration impact analysis will be conducted at these locations during the Final EIS. During the Detailed Vibration Analysis, appropriate mitigation, if necessary, will be identified. A Detailed Vibration Analysis at these locations may show that vibration impacts would not occur and control measures are not needed. Nonetheless, impacts would be adverse even after implementation of mitigation.

8.3.4.2 Ancillary Facilities

Implementation of Mitigation Measure **NOI-6** would reduce TPSS noise levels but may or may not reduce levels below the FTA criteria. One moderate impact and one severe impact resulting from ancillary facility noise would remain. Therefore, adverse effects related to TPSS noise would remain after implementation of mitigation.

8.3.4.3 Parking Facilities

No impacts have been identified at parking facilities and no mitigation is required.

8.3.4.4 Freight-Track Relocation

Noise

Mitigation Measures **NOI-1** through **NOI-5** would apply for LRT noise, which would reduce overall noise impact related to freight track relocation. However, the analysis does not take reductions associated with Mitigation Measures **NOI-4** or **NOI-5** because they would first require CPUC approval. Additional soundwalls necessary to mitigate noise related to freight track relocation have been proposed under Mitigation Measure **NOI-8.**

Mitigated noise levels for Category 2 clusters are shown in Table 8.17 and Category 3 clusters are shown Table 8.18. Under Alternative 4, four clusters would be reduced from a moderate impact to no impact, and four clusters would be reduced from severe to no impact for a total of eight benefited clusters. Thirteen moderate impacts and one severe impacts would remain at Category 2 clusters after implementation of Mitigation Measures **NOI-1** through **NOI-3** and **NOI-7**. One moderate impact would remain at Category 3 clusters. Mitigation Measures **NOI-4** and **NOI-5** would provide noise reductions to clusters near grade crossing should CPUC approval be obtained. Nonetheless, impacts would remain adverse even after implementation of mitigation.

Vibration

No vibration impacts have been identified at the freight track relocations.

Table 8.18. Mitigated Category 2 Land Use Freight Track Relocation Noise Assessment – Alternative 4

Cluster No.[1]	Land Use	Freight Track Distance (ft)[2]	Speed (mph)	Noise Level (dBA, L_{dn})						Impact after Mitigation
				Mitigation Measure	Existing	Unmitigated	Mitigated	Impact Threshold		
								Moderate	Severe	
Façade Avenue										
N185	SFR	240	10	NOI-1, NOI-2	59.3	58.8	52.4	57.4	63.0	No
N187	SFR	250	10	NOI-2	59.2	58.6	57.5	57.4	63.0	Moderate

Source: TAHA, 2020
Notes: [1] Cluster sites shown in Appendix I.
[2] Distance to the closest area of human use or closest building façade.

Table 8.19. Mitigated Category 3 Land Use Freight Track Relocation Noise Assessment – Alternative 4

Cluster No.[1]	Land Use	Freight Track Distance (ft)[2]	Speed (mph)	Noise Level (dBA, L_{eq})						Impact after Mitigation
				Mitigation Measure	Existing	Unmitigated	Mitigated	Impact Threshold		
								Moderate	Severe	
Façade Avenue										
N184	American Indian Bible Church	110	10	NOI-4	74.7	70.2	70.2	70.0	78.0	Moderate

Source: TAHA, 2020
Notes: [1] Cluster sites shown in Appendix I.
[2] Distance to the closest area of human use or closest building façade.

8.3.5 Maintenance and Storage Facility – Mitigated

8.3.5.1 Mitigated Maintenance and Storage Facility – Paramount Option

Noise

No noise impacts were identified for the Paramount MSF site option.

Vibration

No vibration impacts were identified for the lead tracks to and from the Paramount MSF or from operations inside the facility.

8.3.5.2 Mitigated Maintenance and Storage Facility– Bellflower Option

Noise

No noise impacts were identified for the Bellflower MSF site option.

Vibration

No vibration impacts were identified for the Bellflower MSF site option.

8.3.6 Construction – Mitigated

Noise

The Project would exceed the noise limits without mitigation. Mitigation Measure **NOI-8** would require the contractor to prepare a noise control plan to be approved by Metro to reduce construction noise levels. Noise reducing methods that could be utilized include acoustically attenuating shields around construction equipment, high performance noise reducing mufflers, temporary noise barriers, and substitution of diesel power equipment for quieter electric equipment. The Noise Control Plan would require the contractor to conduct periodic noise monitoring in response to noise complaints to demonstrate compliance with FTA standards. Other less conventional techniques, such as temporarily relocating affected residents, could be employed when the noise-reducing options would not suffice, particularly when loud, necessary construction operations must occur. However, construction noise would still likely exceed the FTA construction noise criteria. Therefore, with mitigation incorporated, impacts related to construction noise would remain adverse.

Vibration

Mitigation Measure **VIB-3** would require the contractor to prepare a vibration control plan to be approved by Metro to reduce construction vibration levels. Mitigation Measure **VIB-4** through **VIB-7** include good engineering practices that would avoid exceeding the FTA building damage risk thresholds and not exceeding the FTA construction impact criteria. Therefore, with mitigation incorporated, impacts related to construction vibration would be less than adverse.

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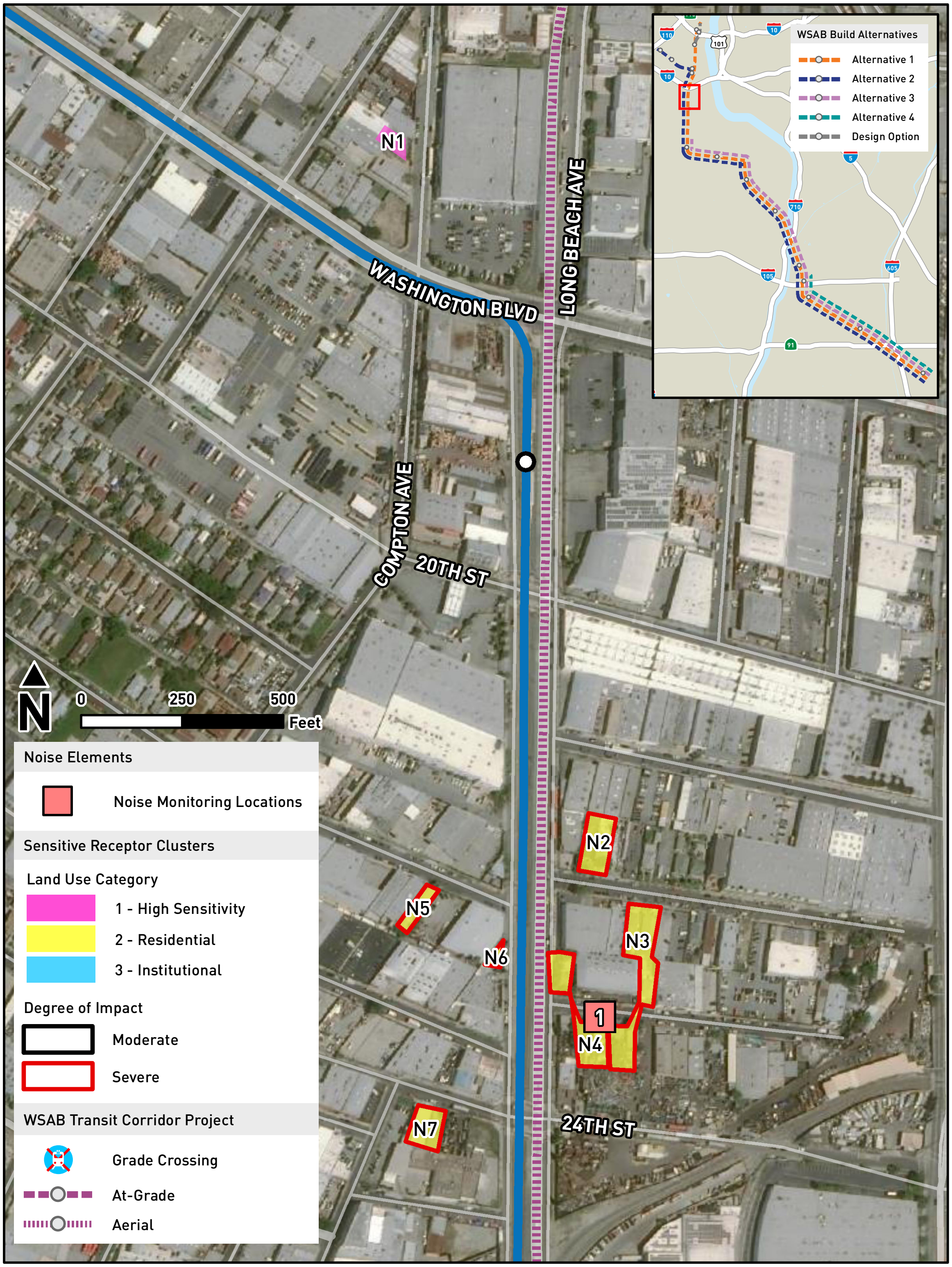
APPENDIX A UNMITIGATED LRT NOISE CLUSTERS, NOISE MONITORING LOCATIONS AND IMPACTS

Appendix A
Unmitigated LRT Noise Clusters, Noise Monitoring Locations and Impacts



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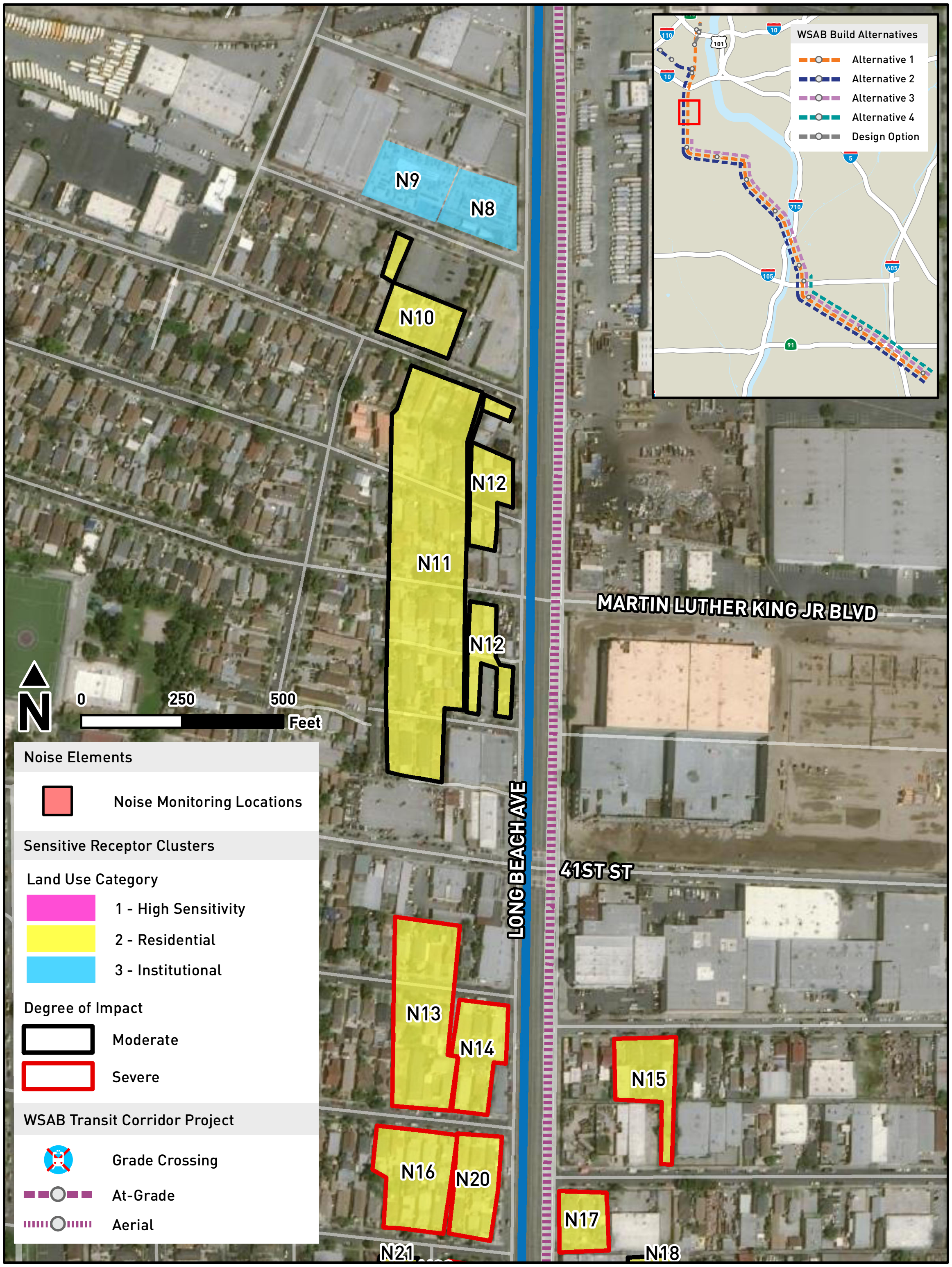

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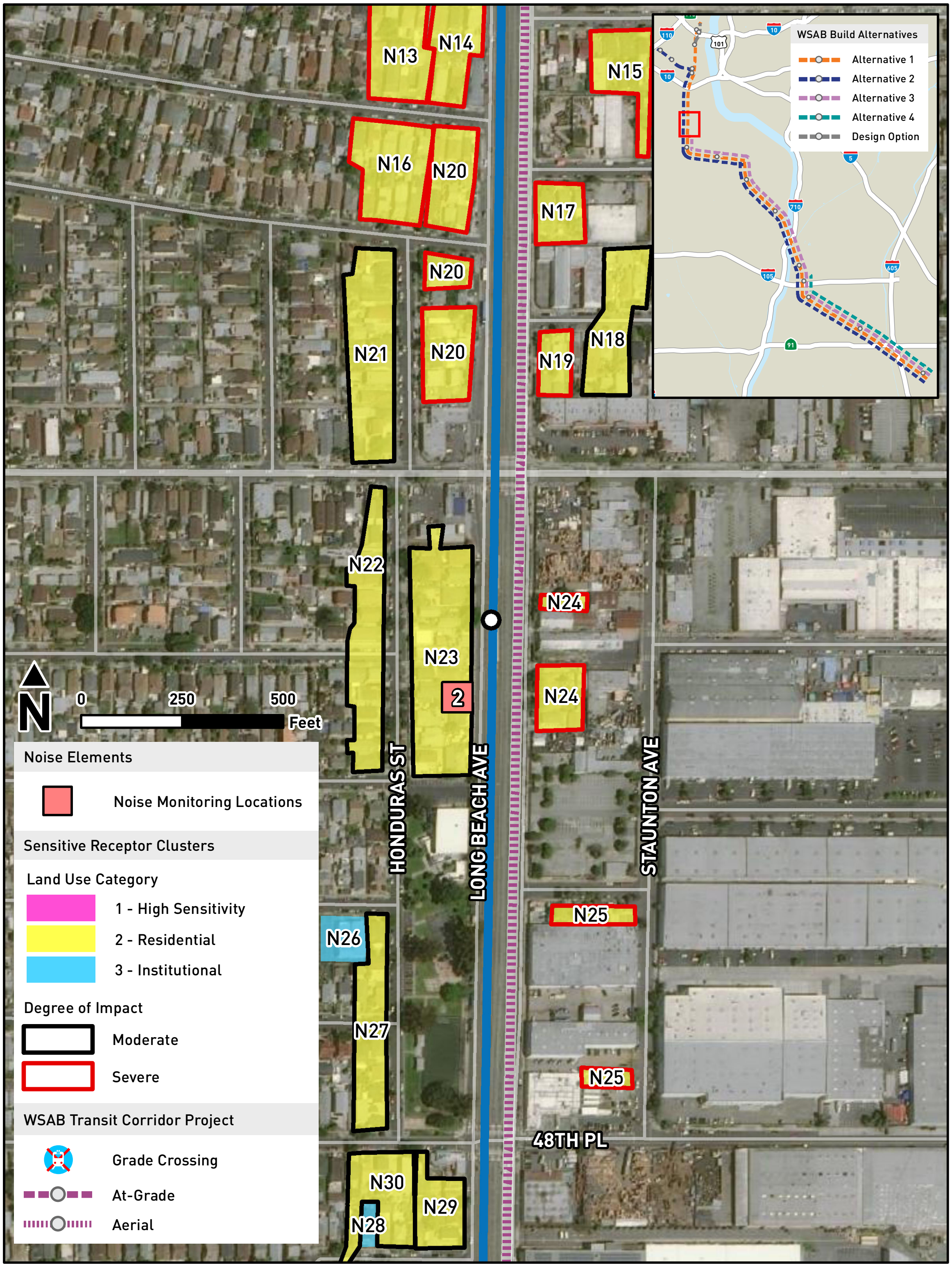

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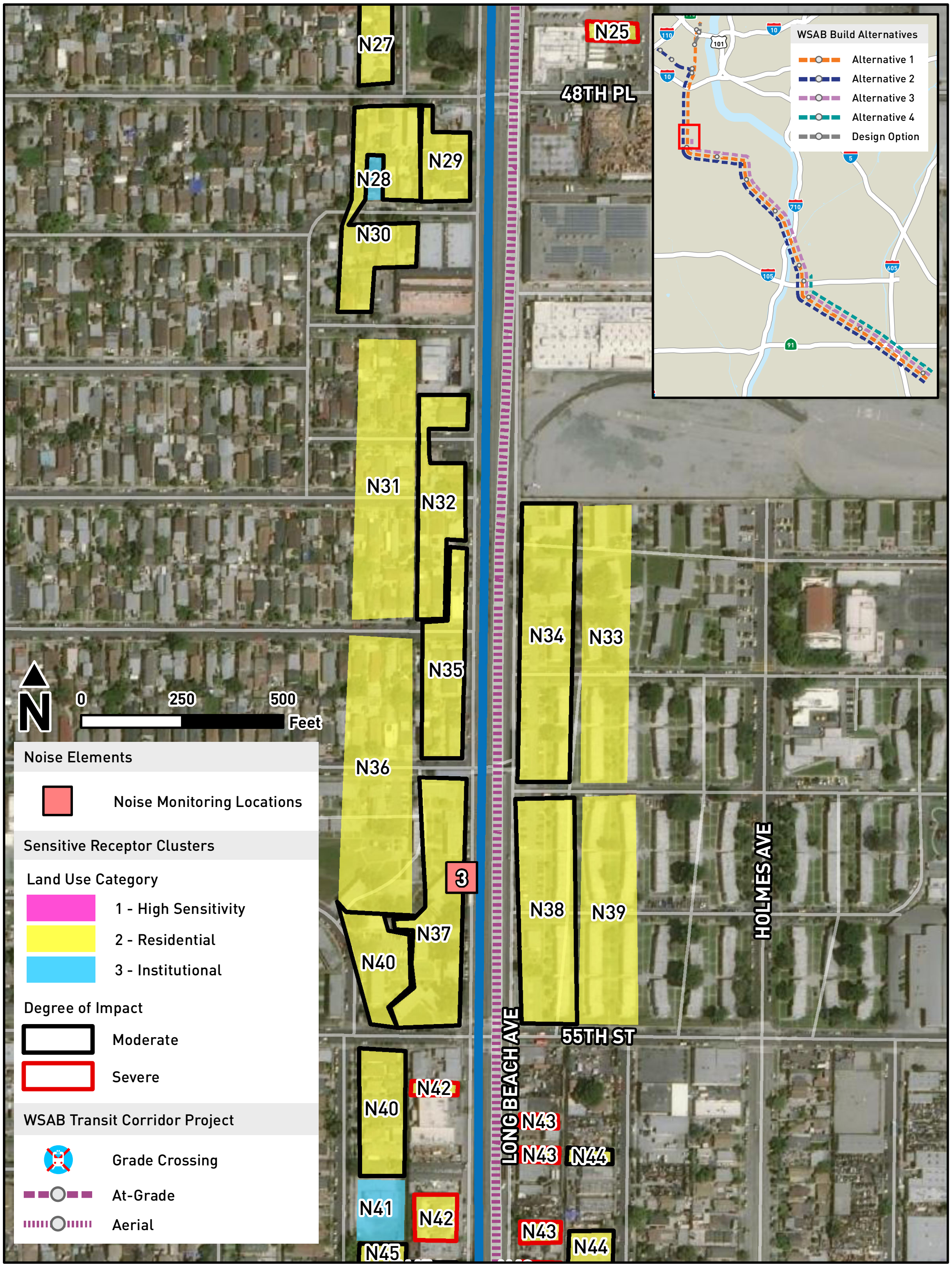

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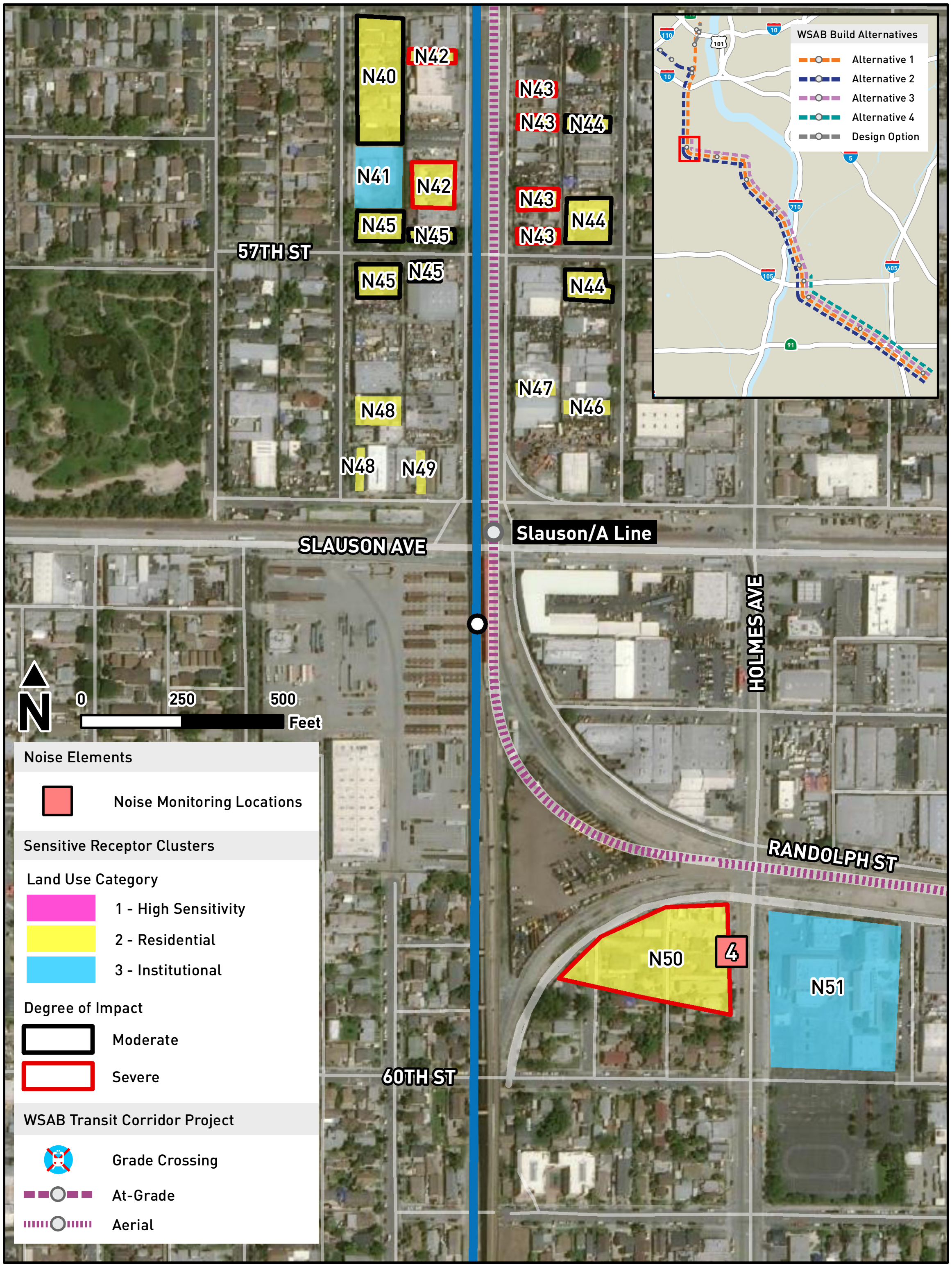

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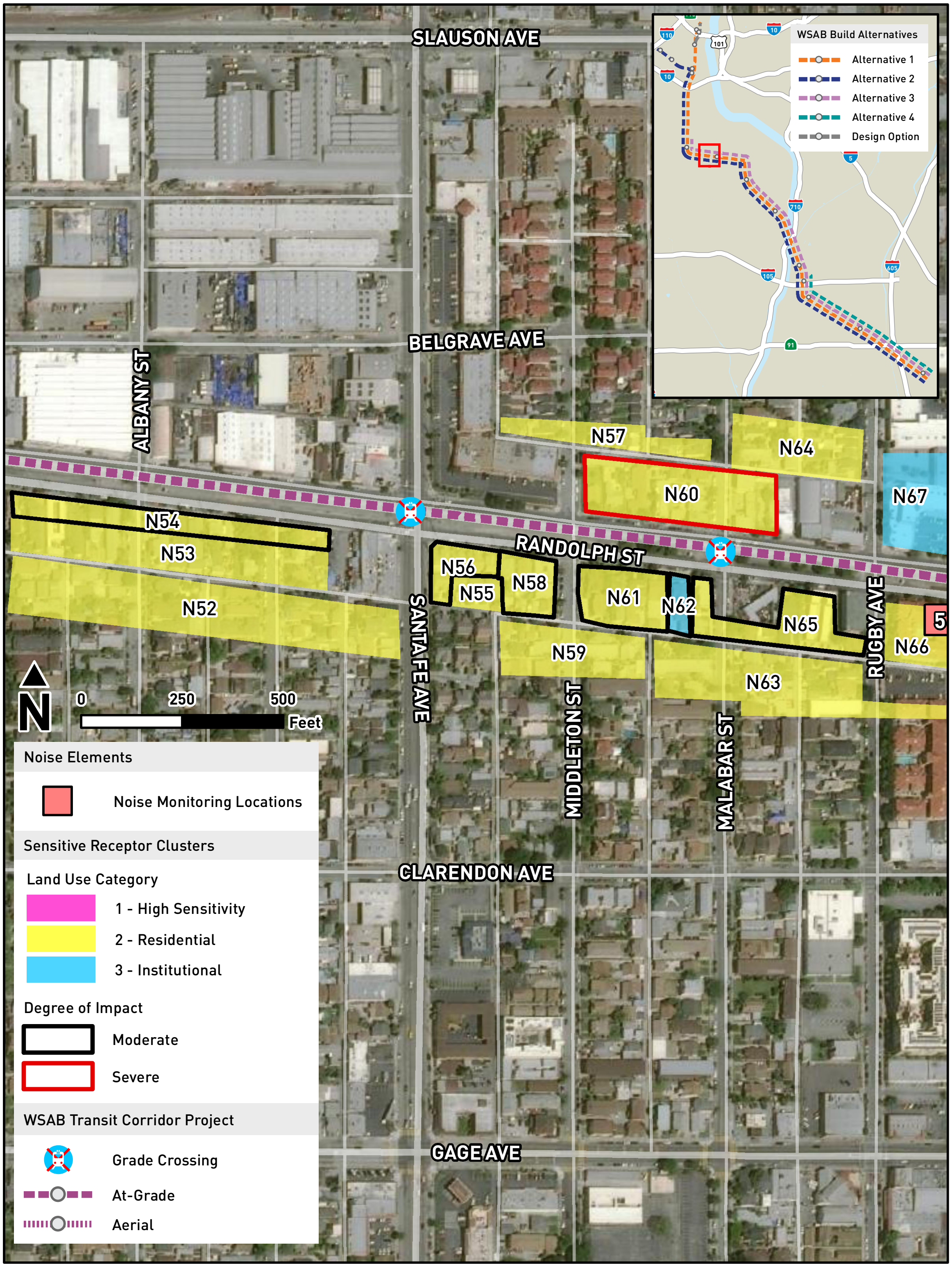

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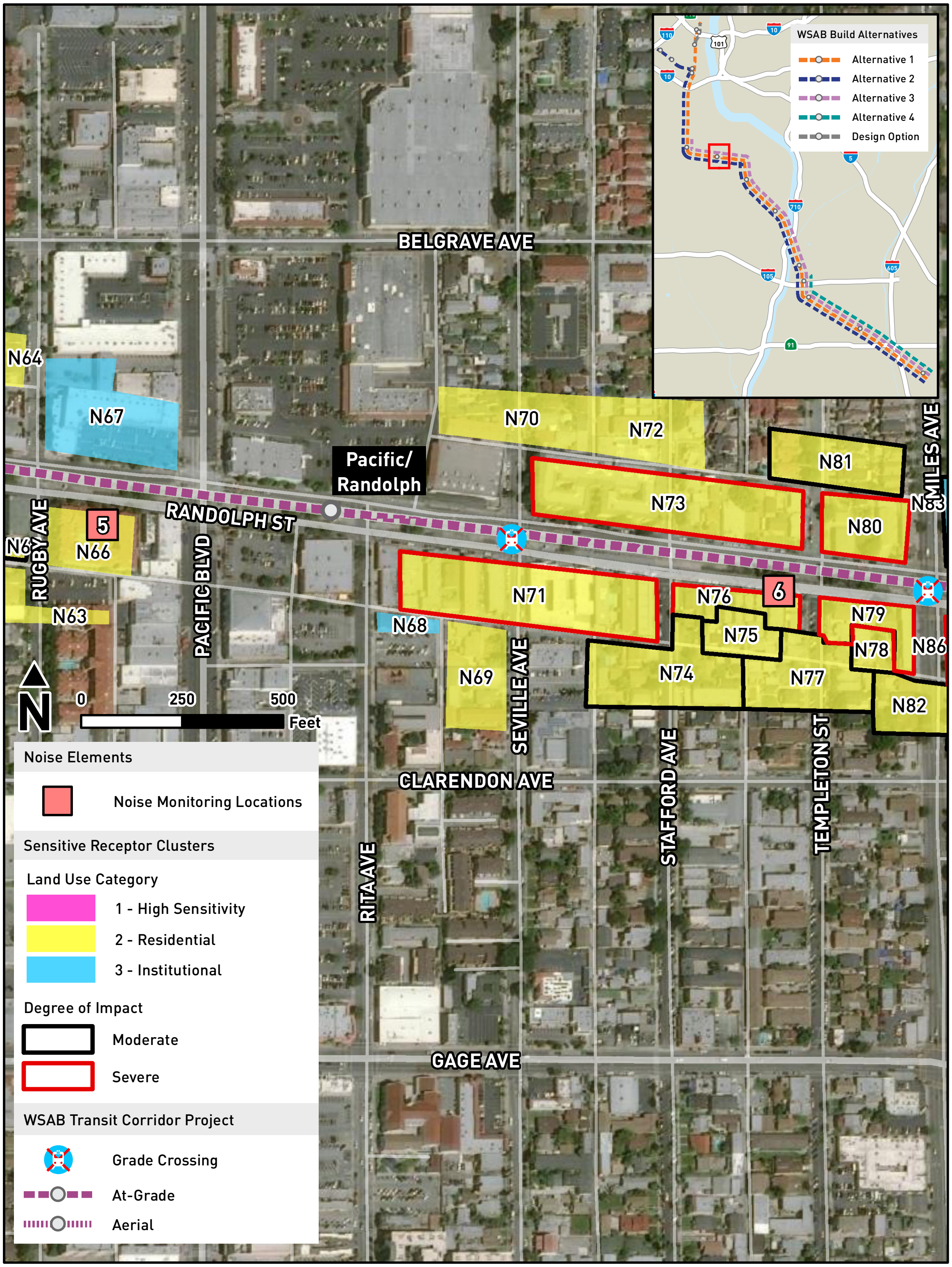

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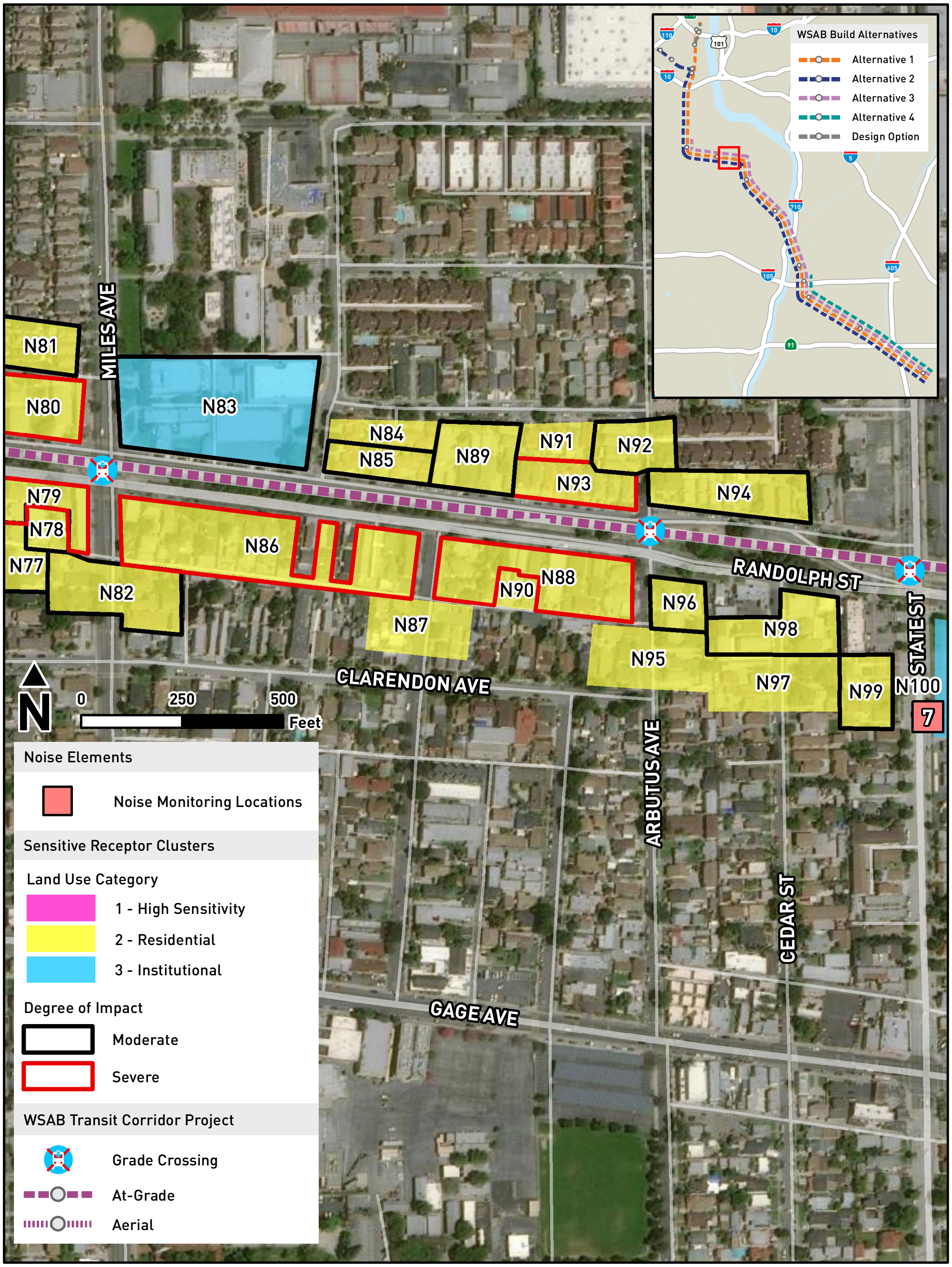

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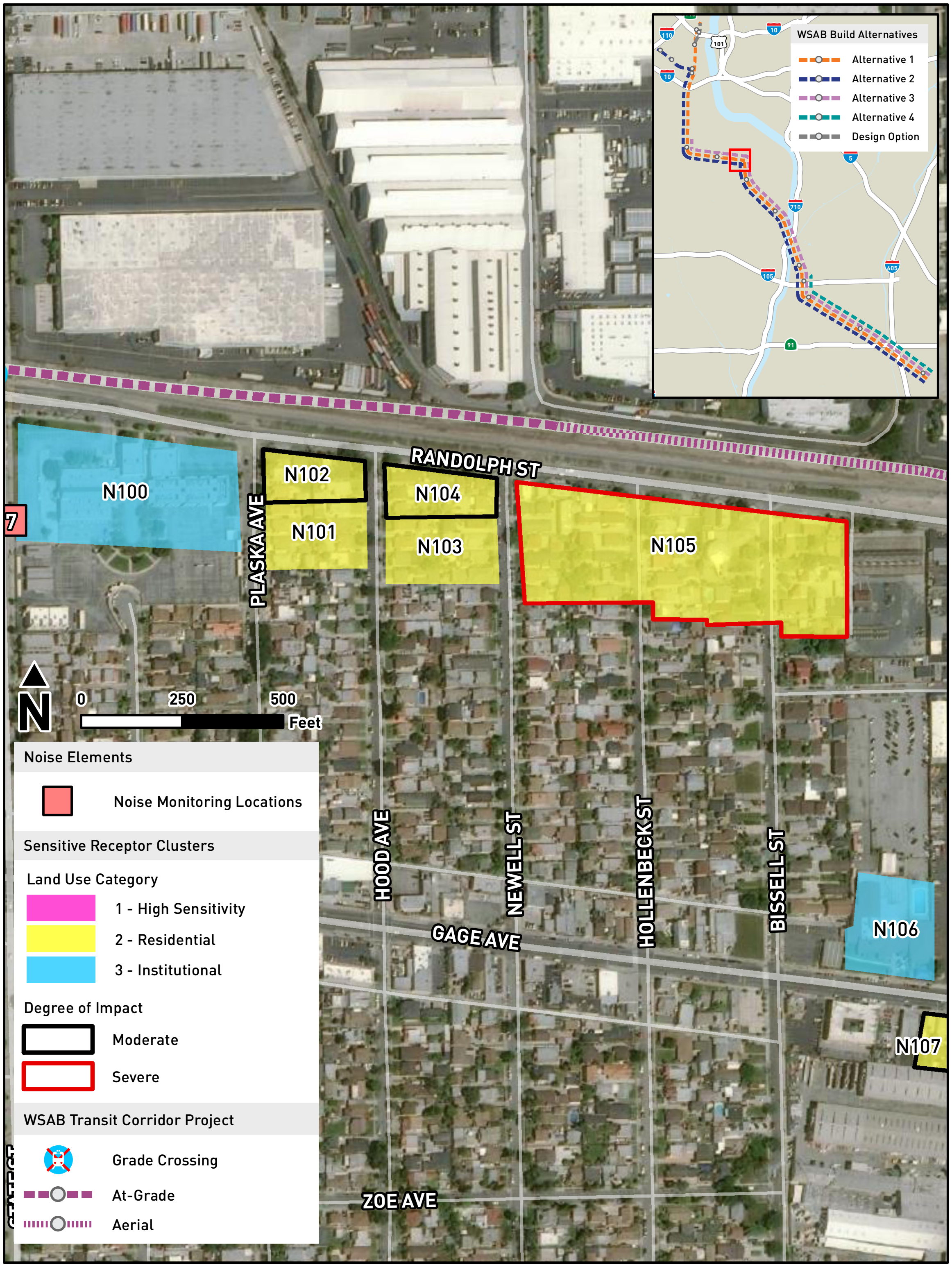

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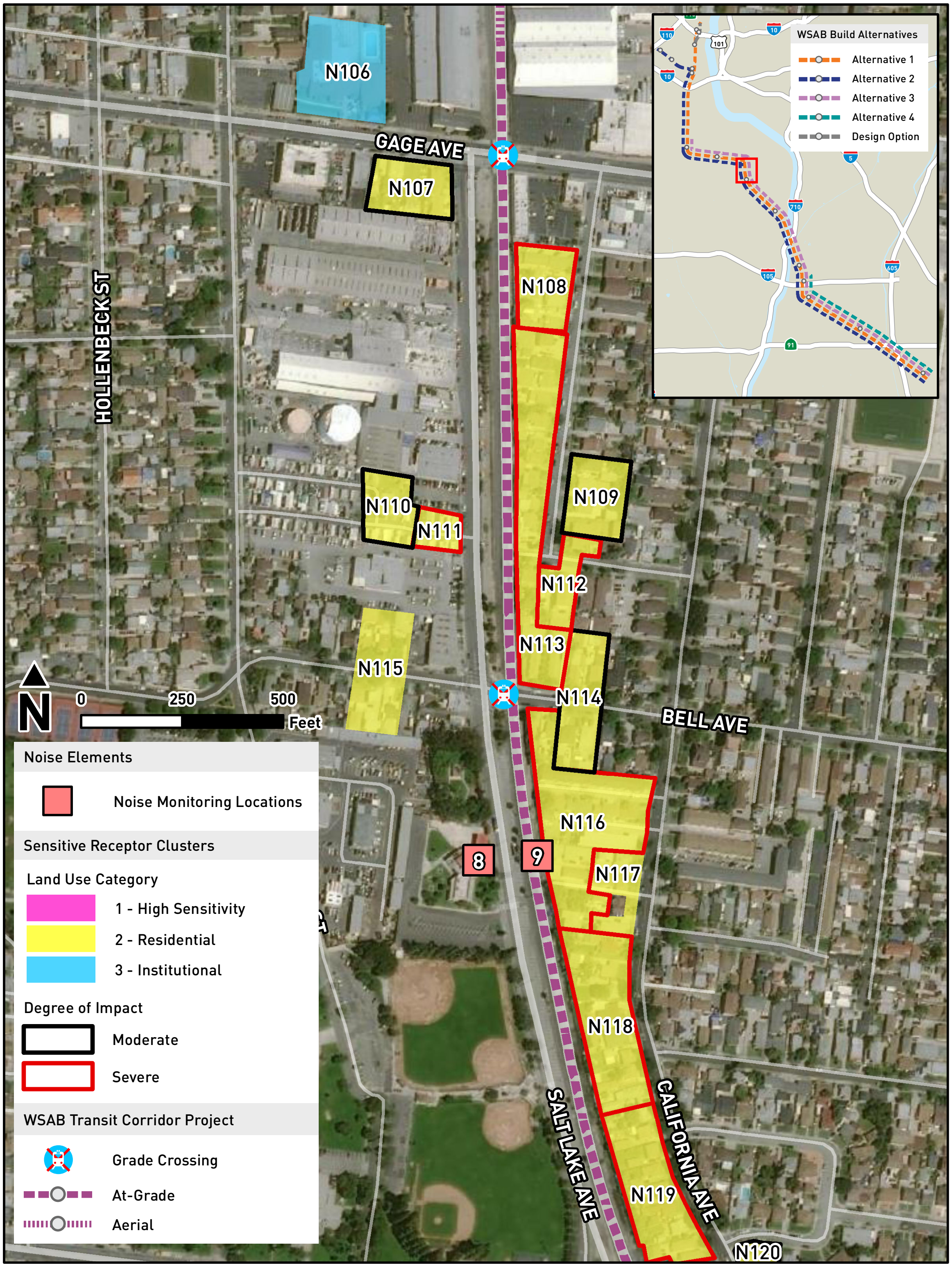

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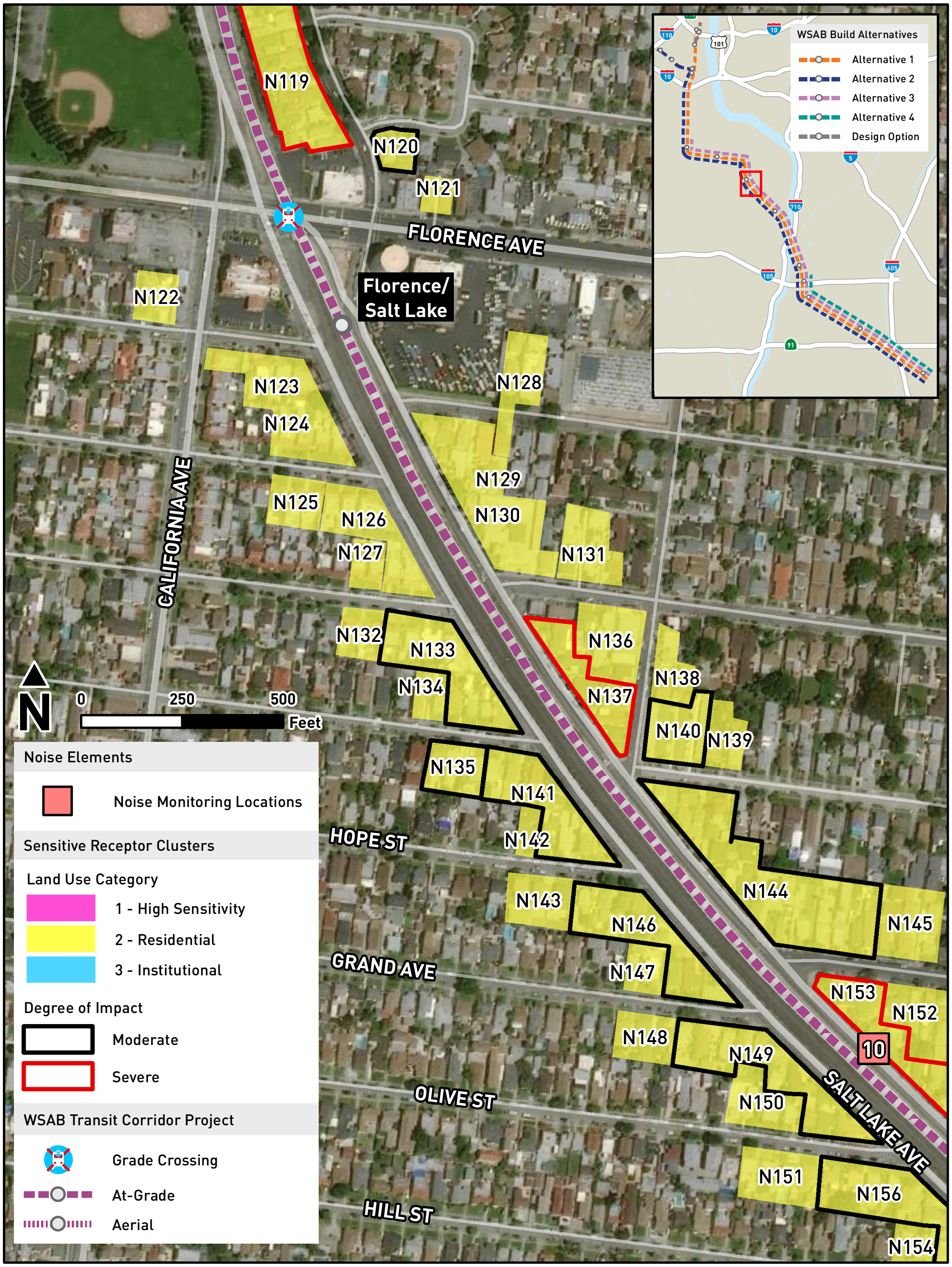

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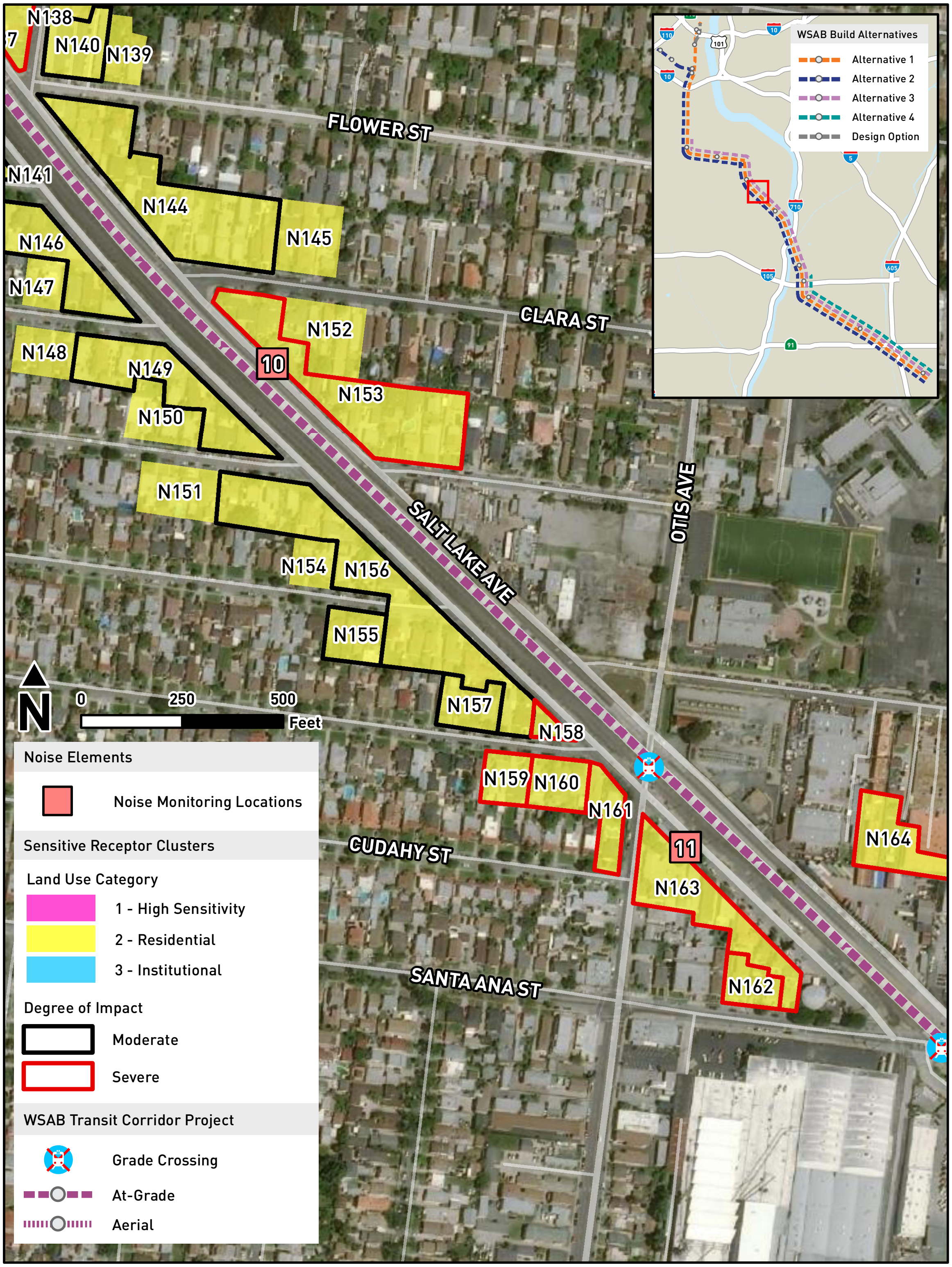

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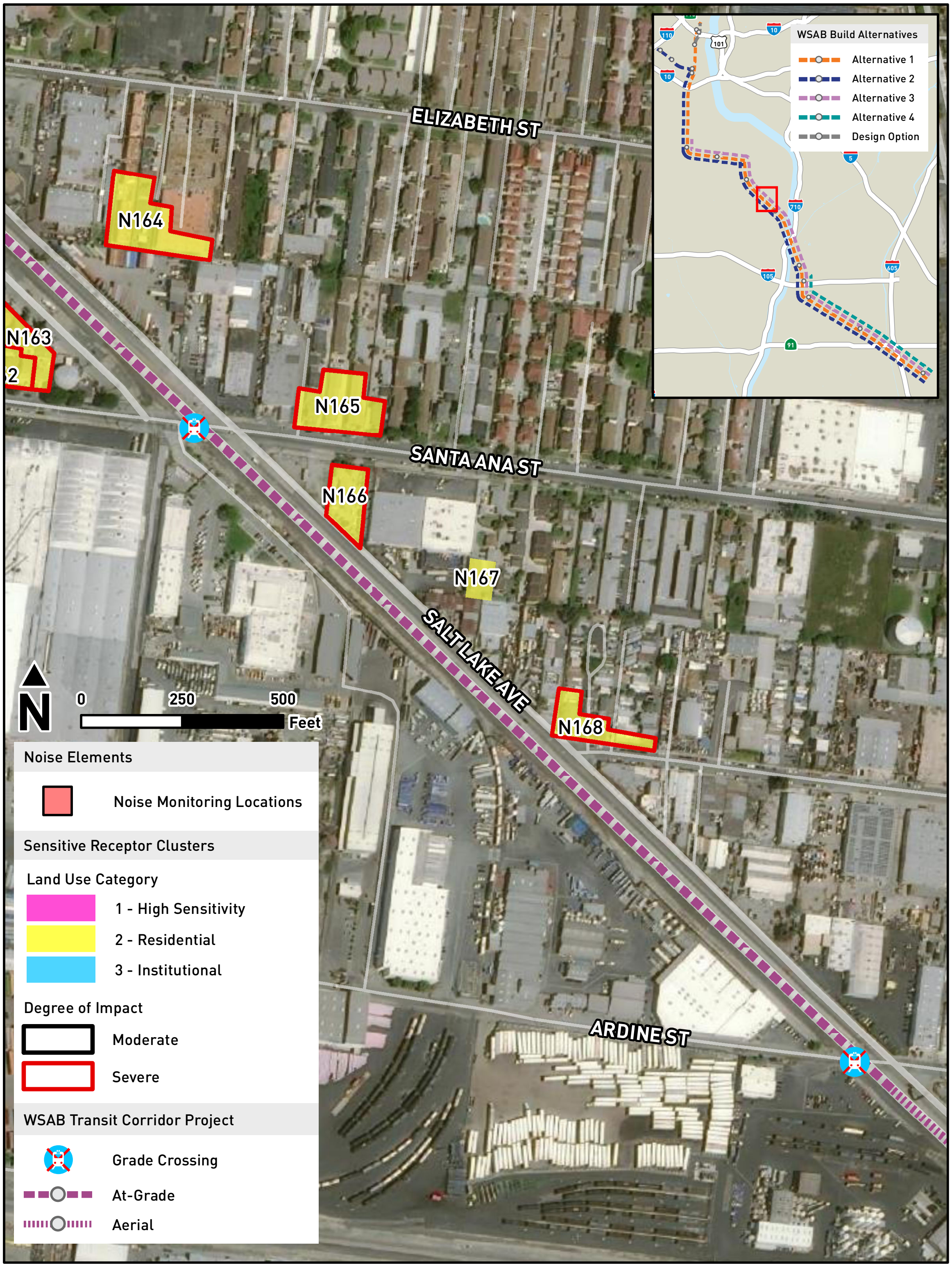

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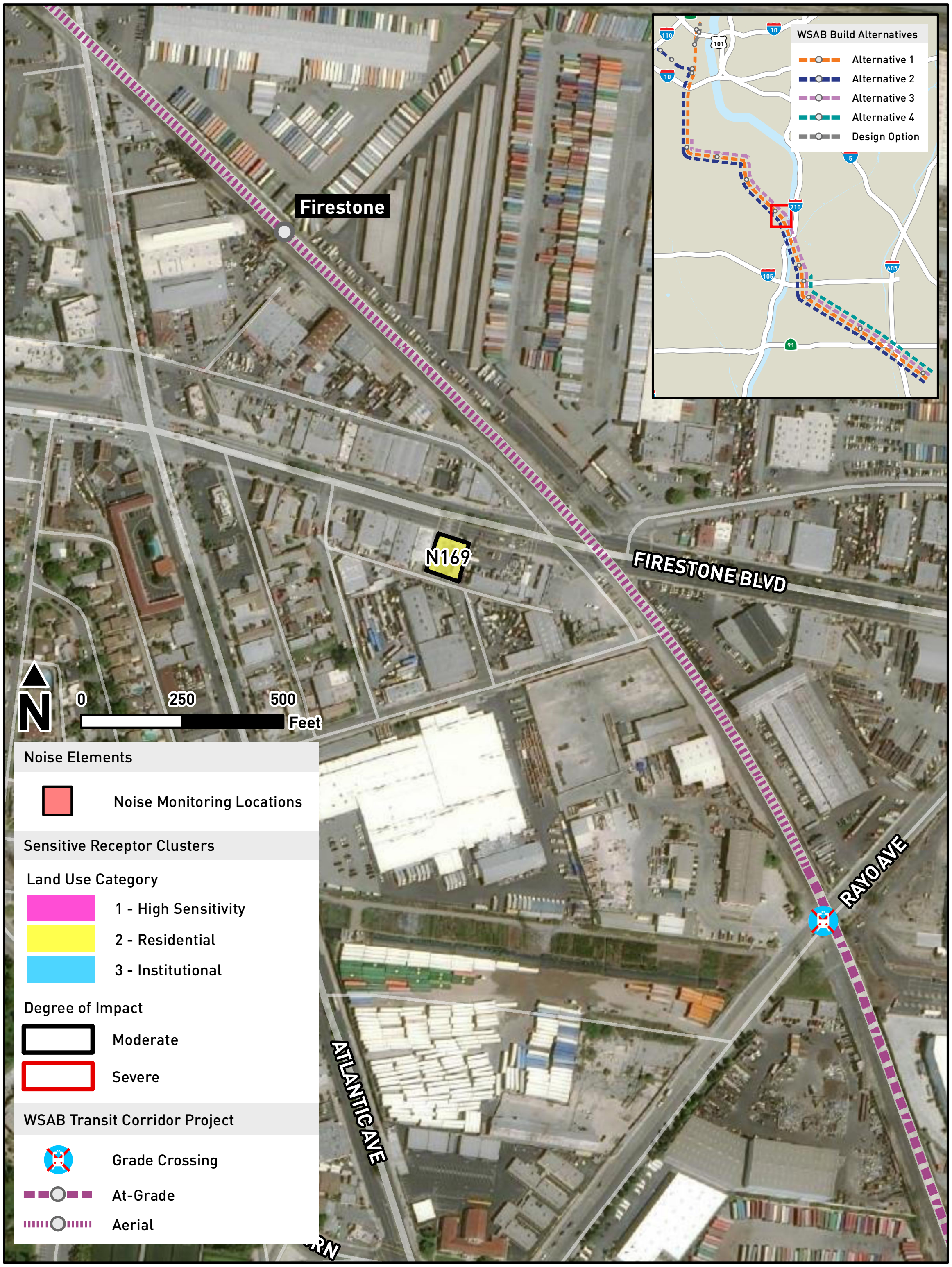

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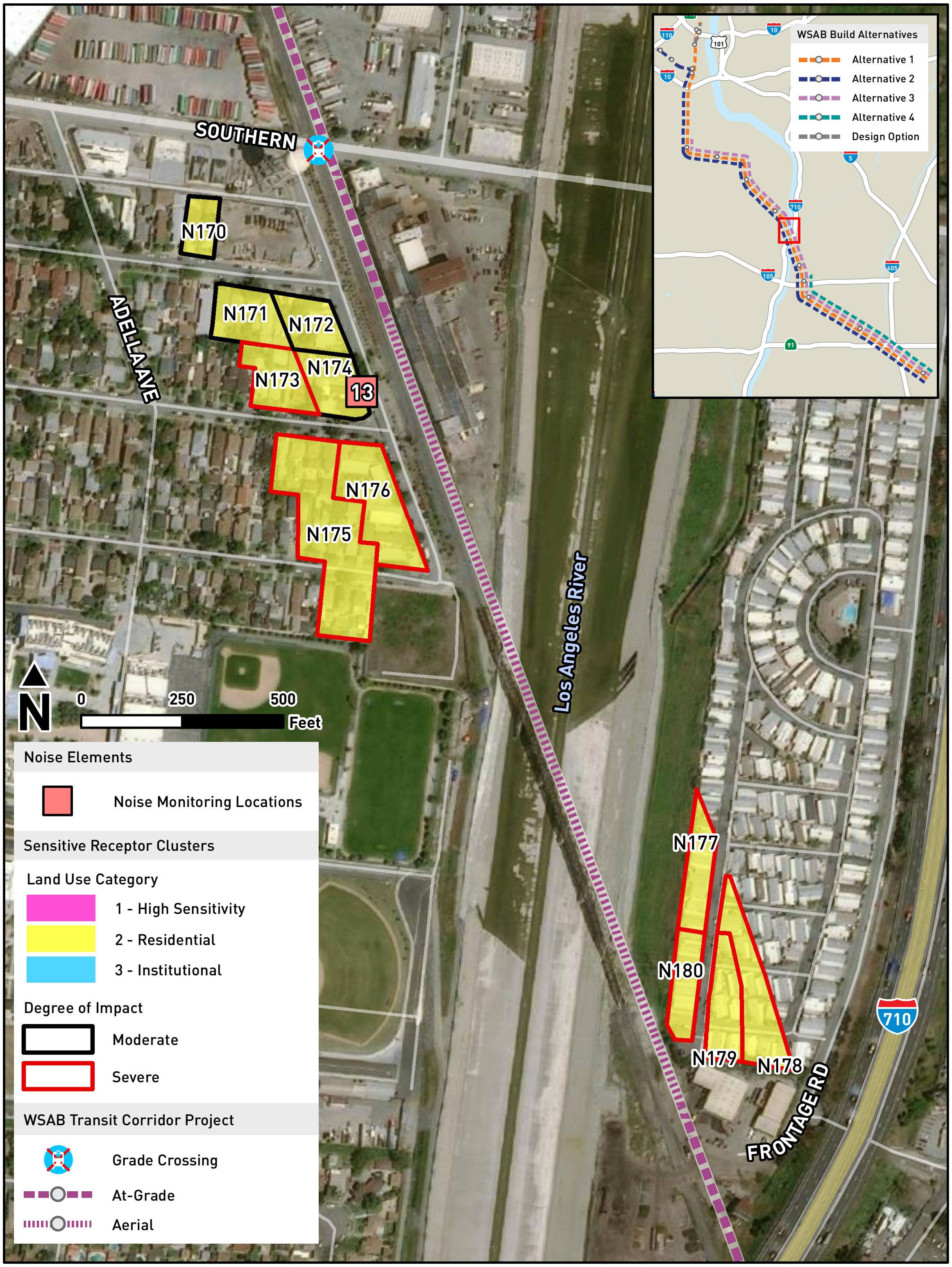

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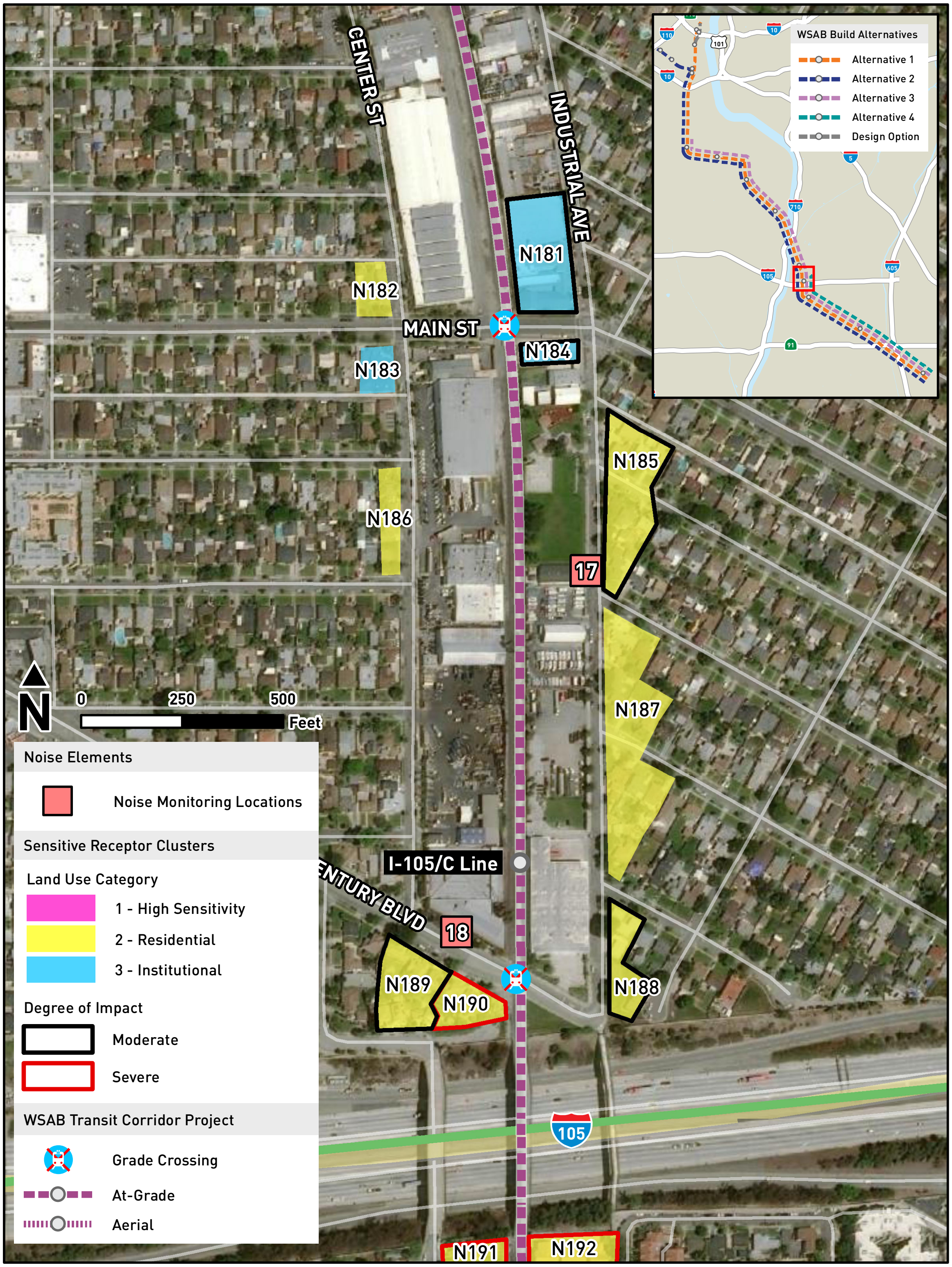

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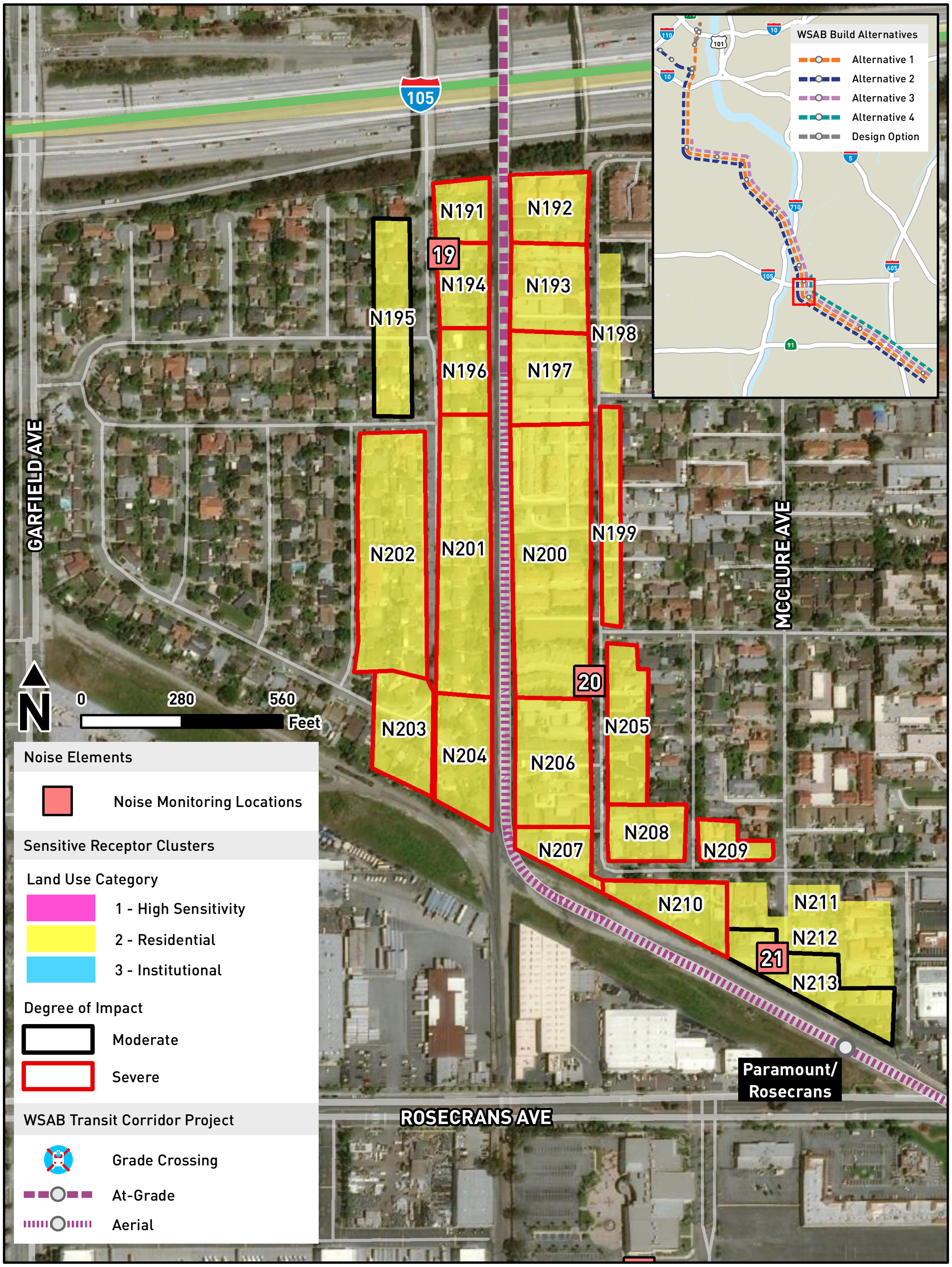

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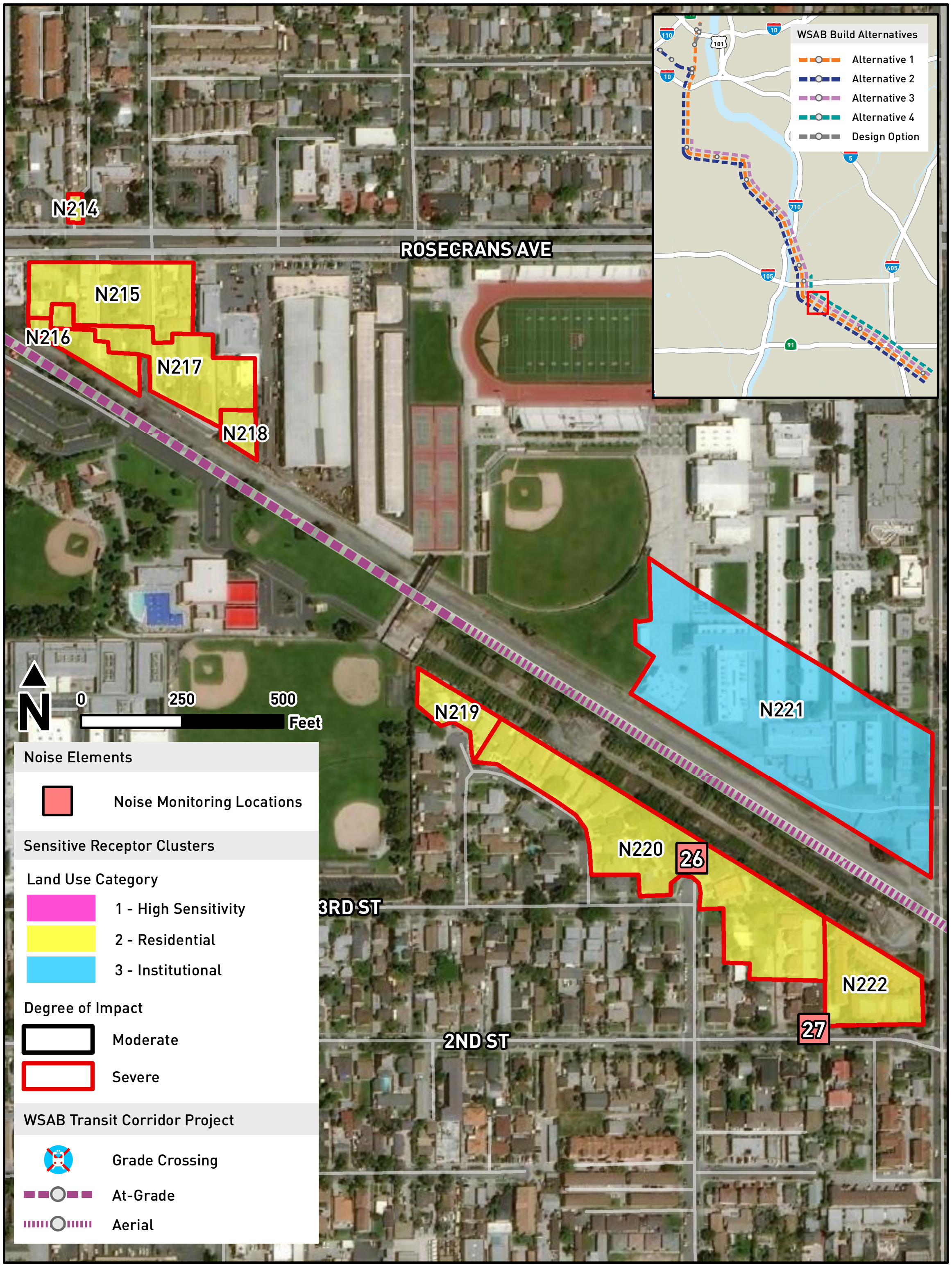

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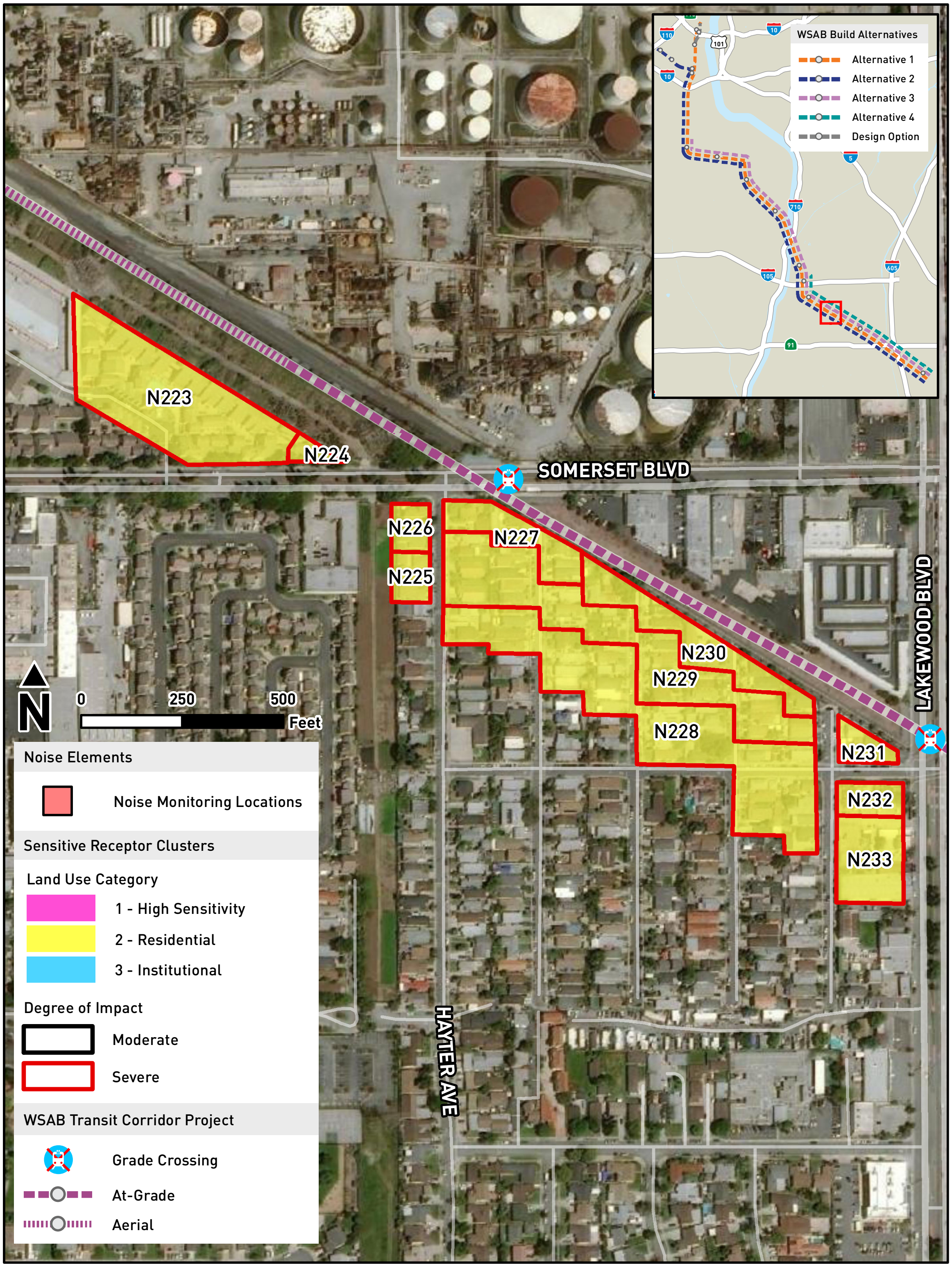

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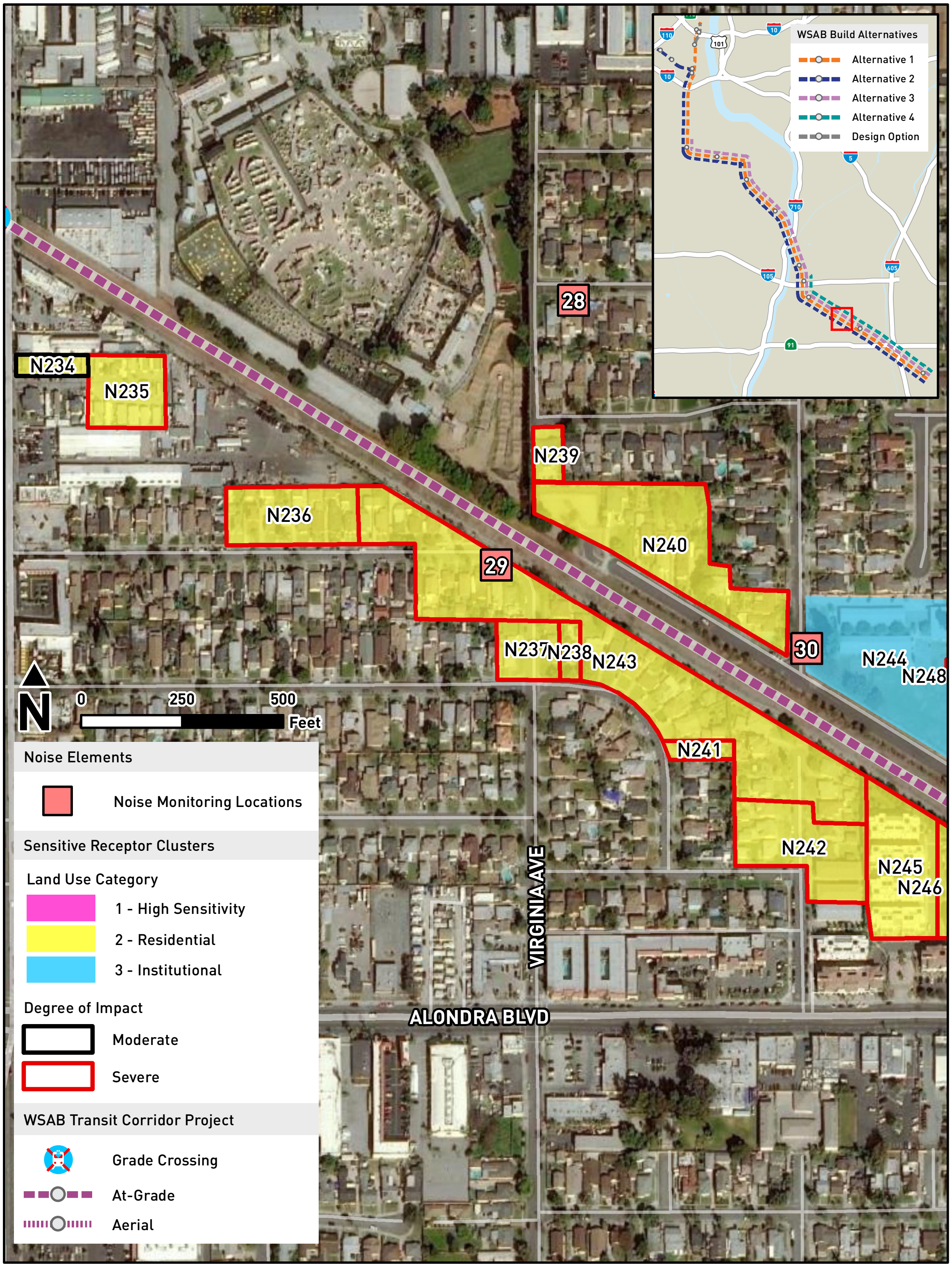

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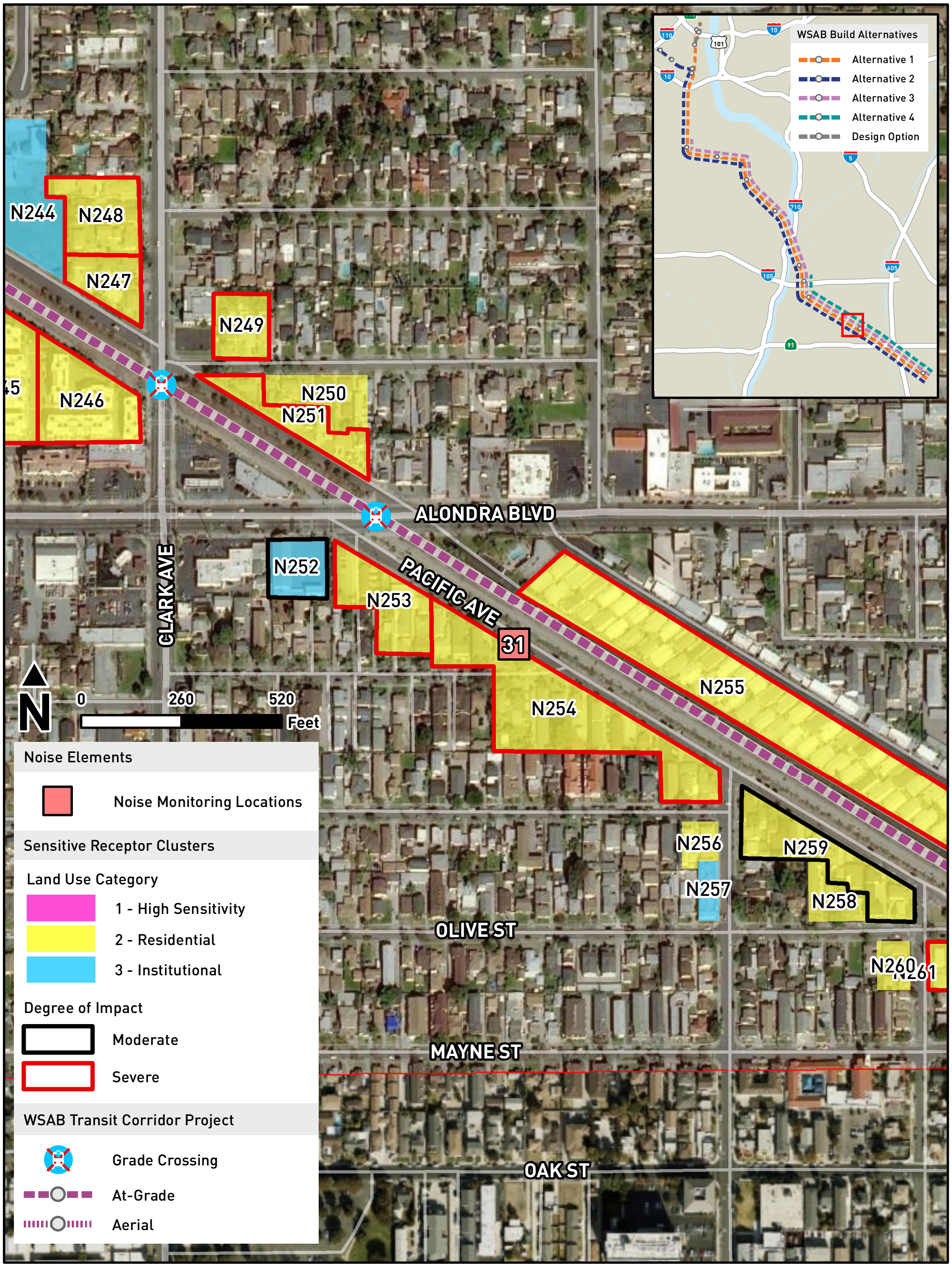

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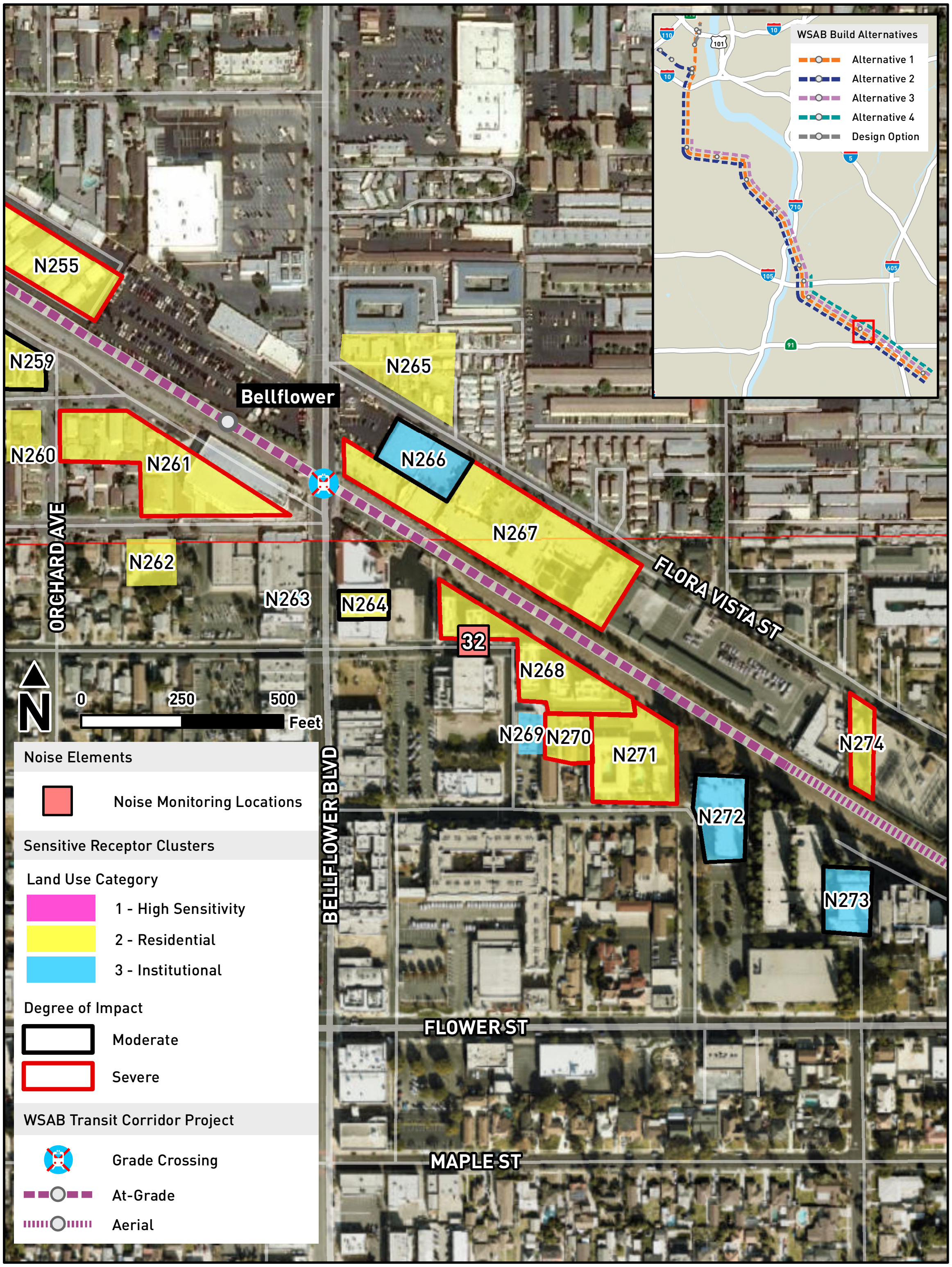
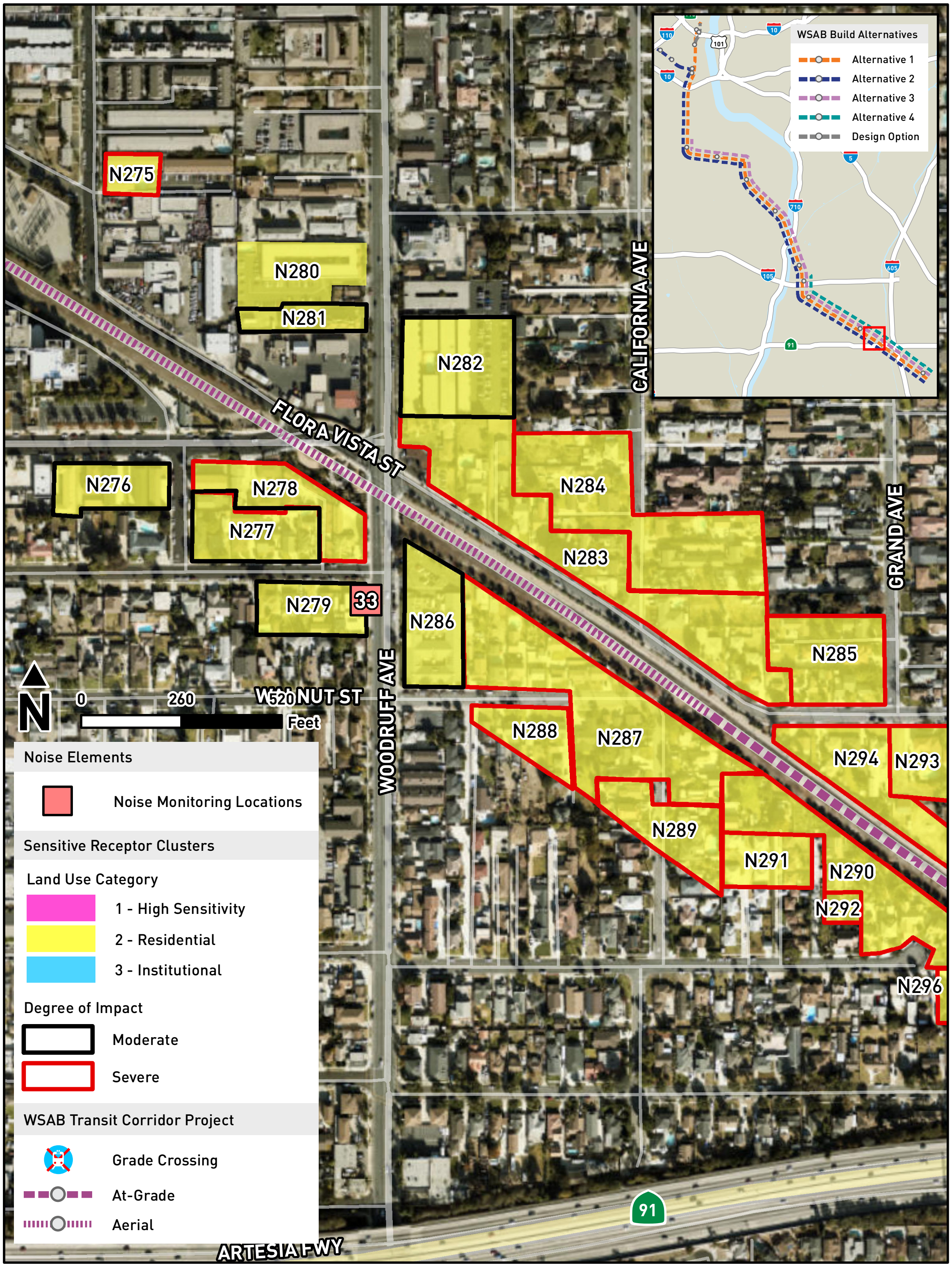


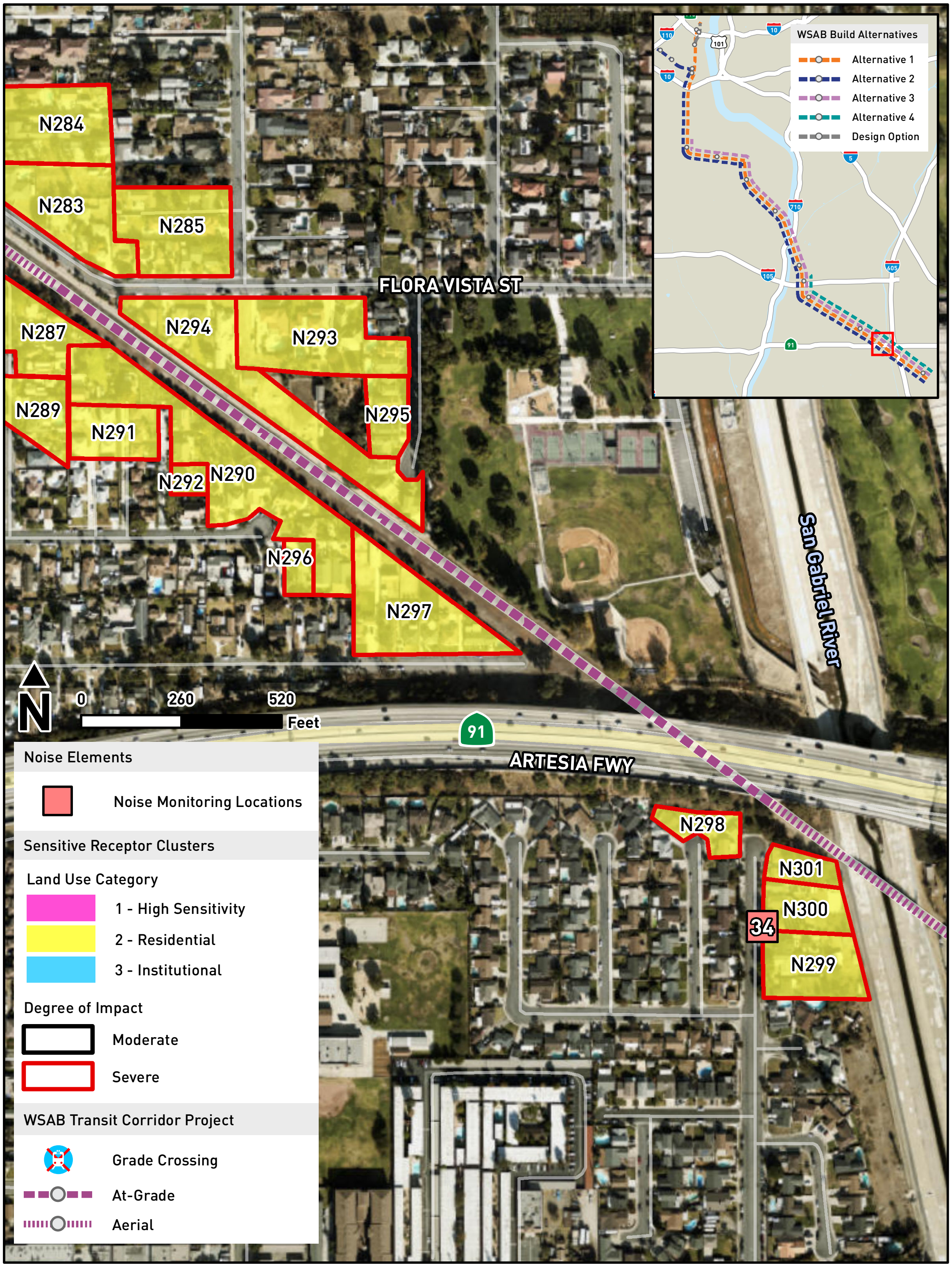
Appendix A

Unmitigated LRT Noise Clusters, Noise Monitoring Locations and Impacts



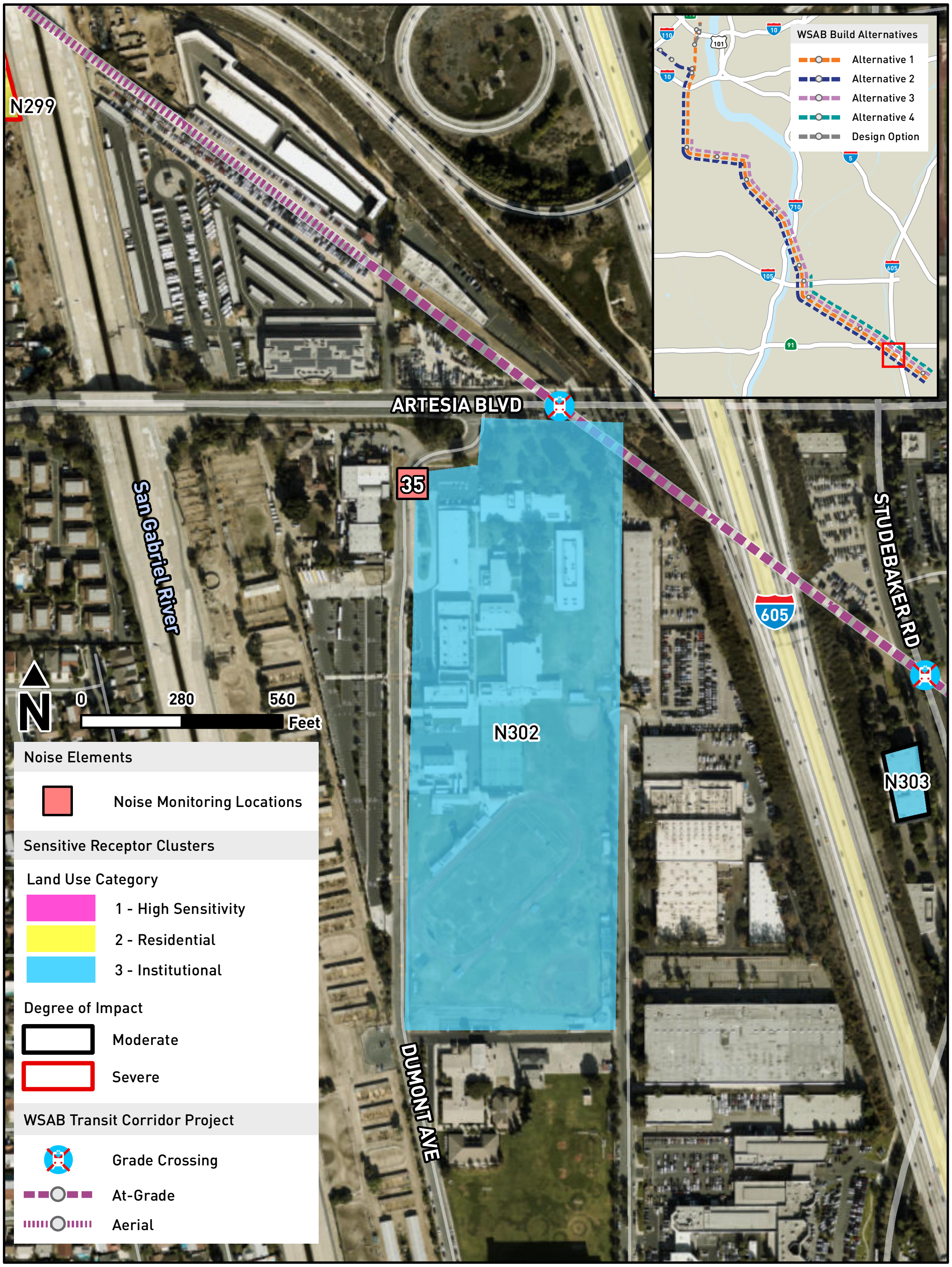
Appendix A

Unmitigated LRT Noise Clusters, Noise Monitoring Locations and Impacts



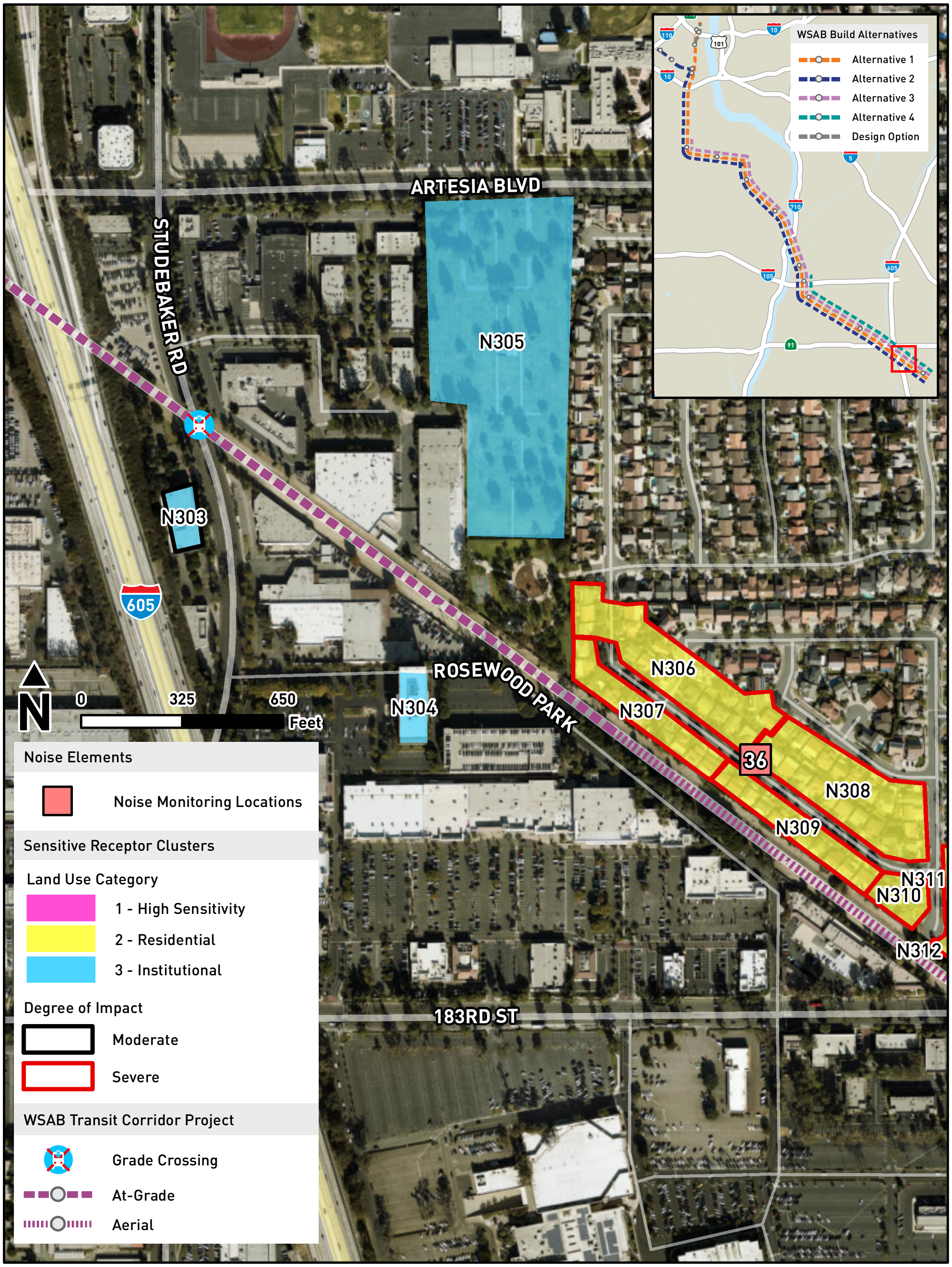
Appendix A

Unmitigated LRT Noise Clusters, Noise Monitoring Locations and Impacts



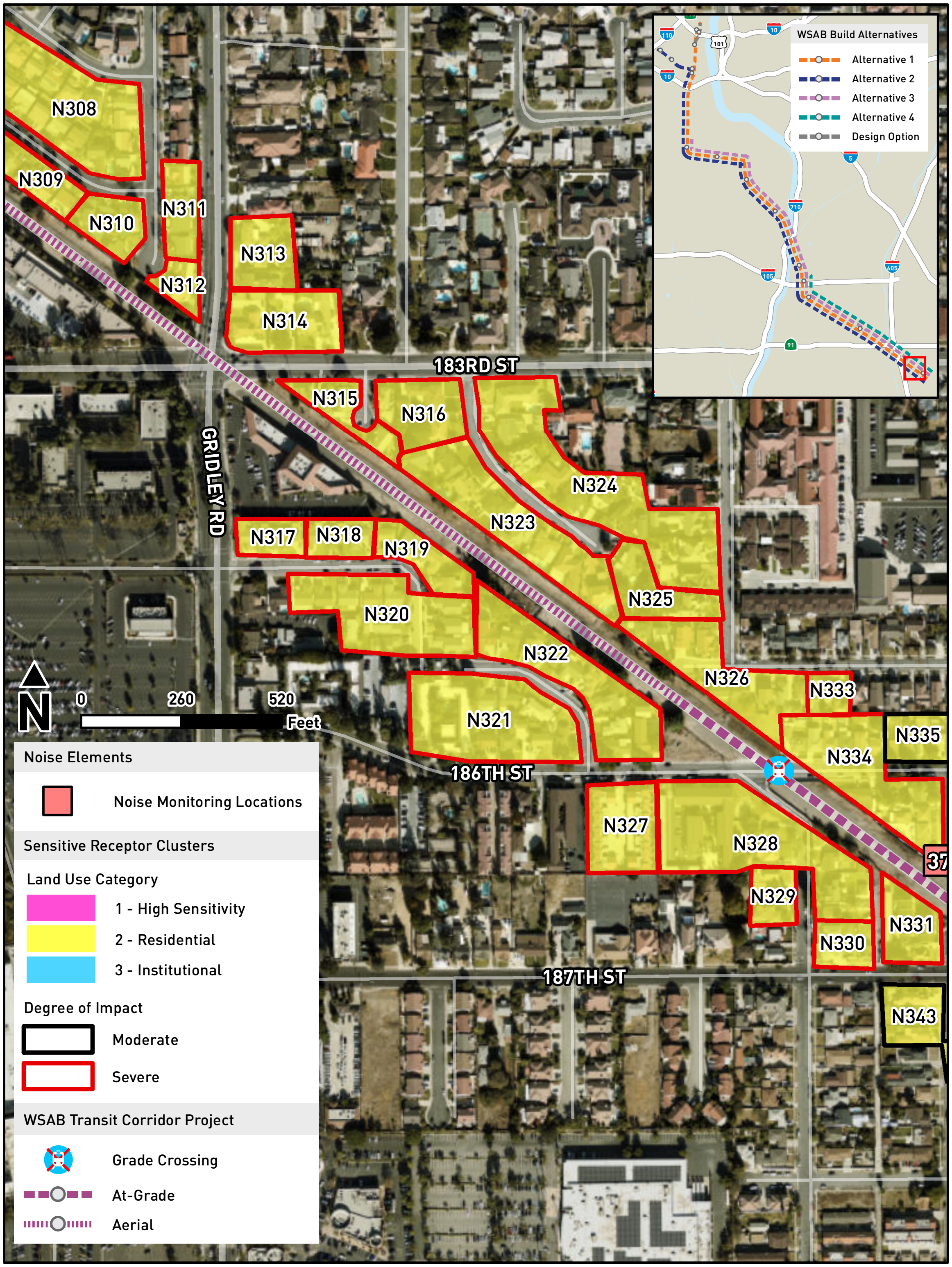
Appendix A

Unmitigated LRT Noise Clusters, Noise Monitoring Locations and Impacts



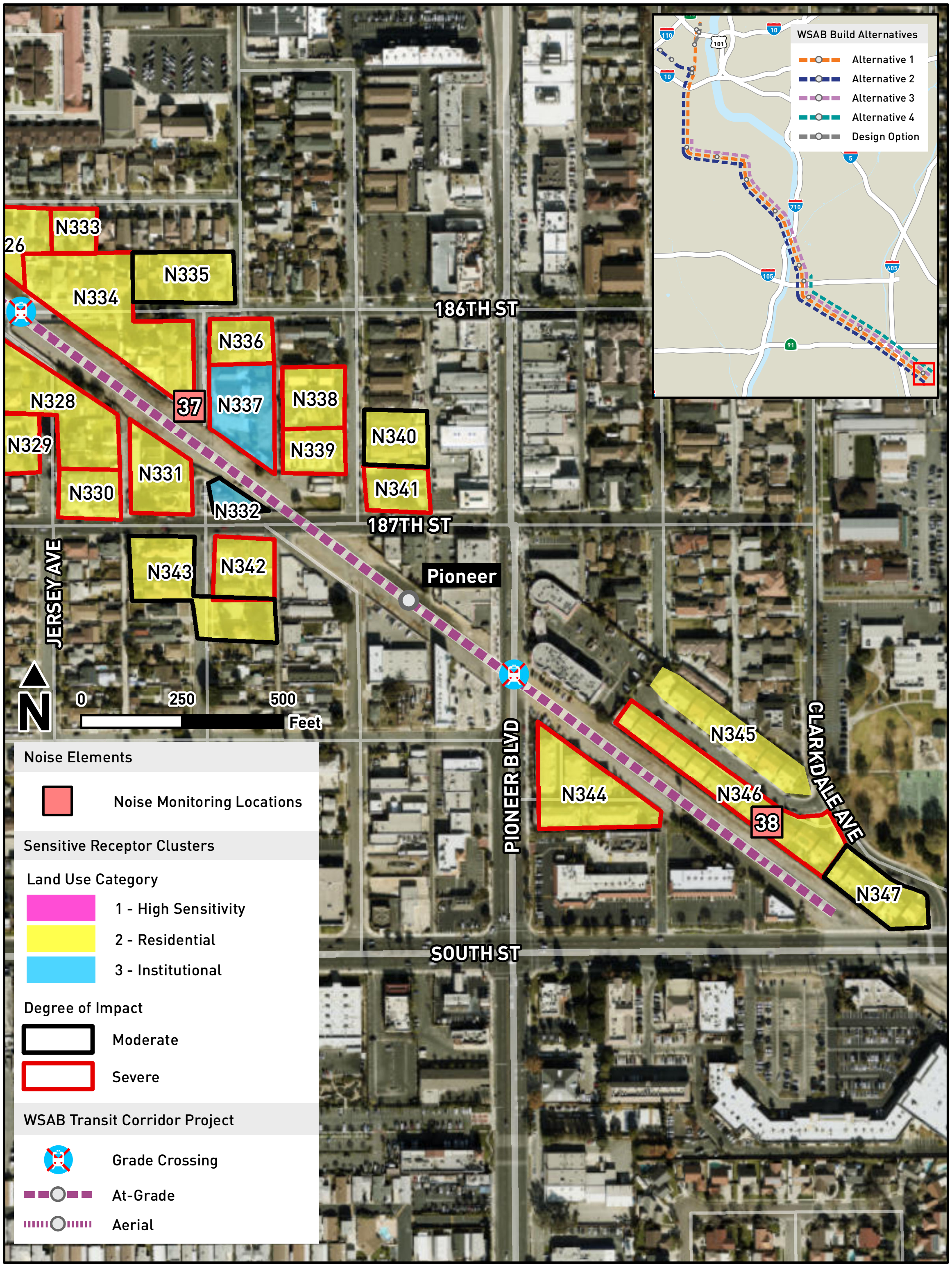
Appendix A

Unmitigated LRT Noise Clusters, Noise Monitoring Locations and Impacts



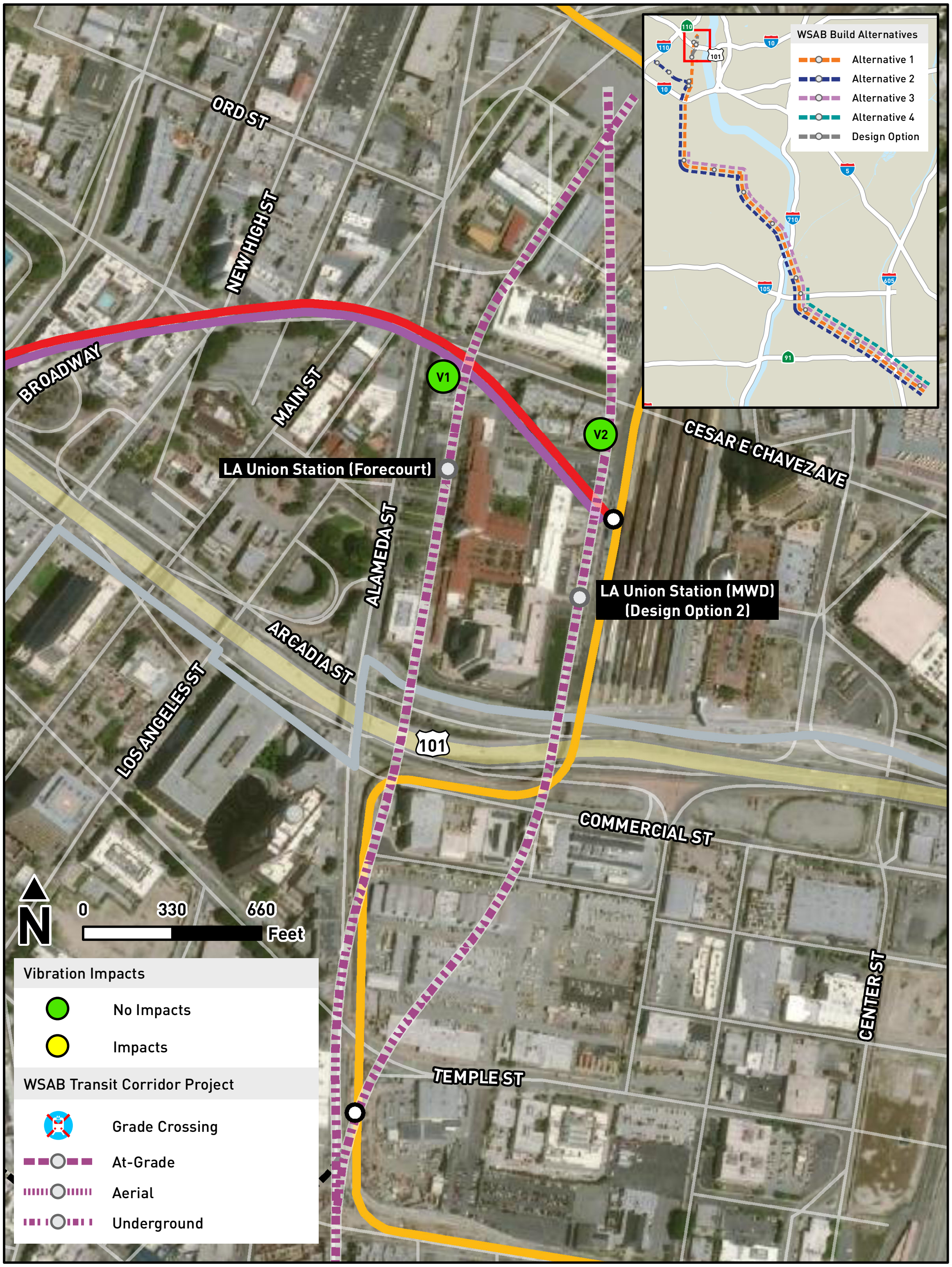
Appendix A

Unmitigated LRT Noise Clusters, Noise Monitoring Locations and Impacts

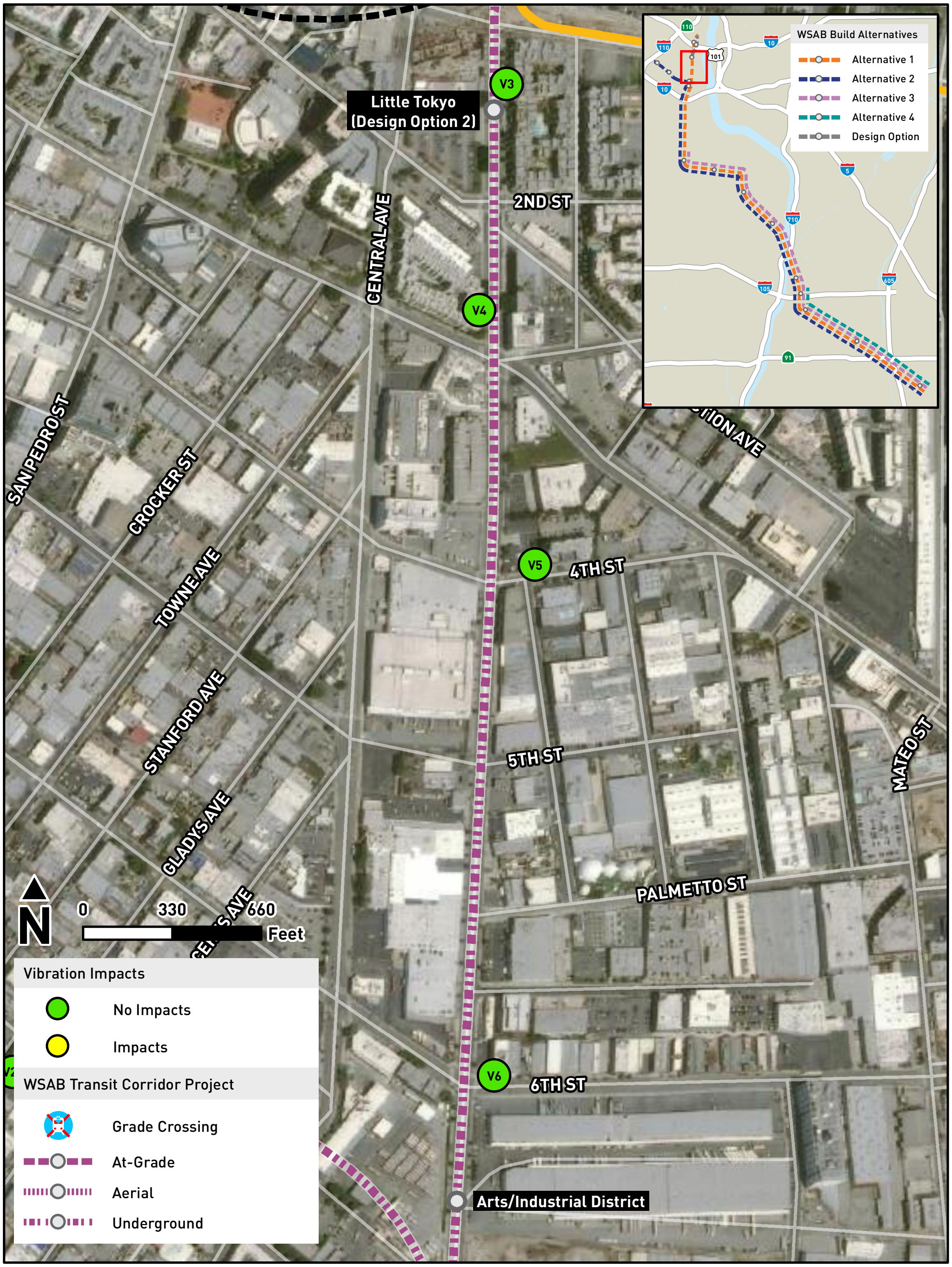


APPENDIX B UNMITIGATED VIBRATION CLUSTERS

Appendix B
Unmitigated Vibration Clusters



Appendix B
Unmitigated Vibration Clusters



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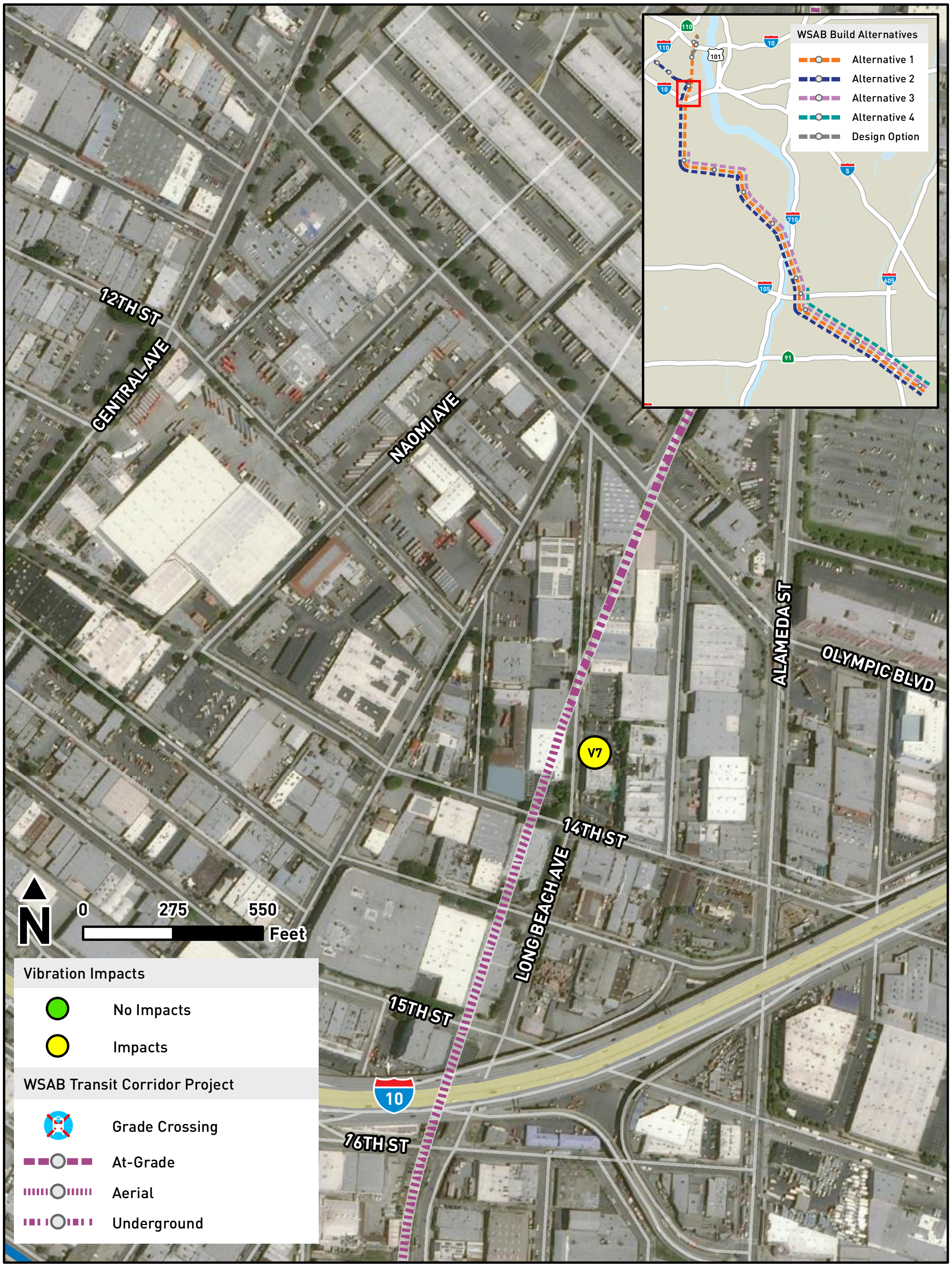
Unmitigated Vibration Clusters



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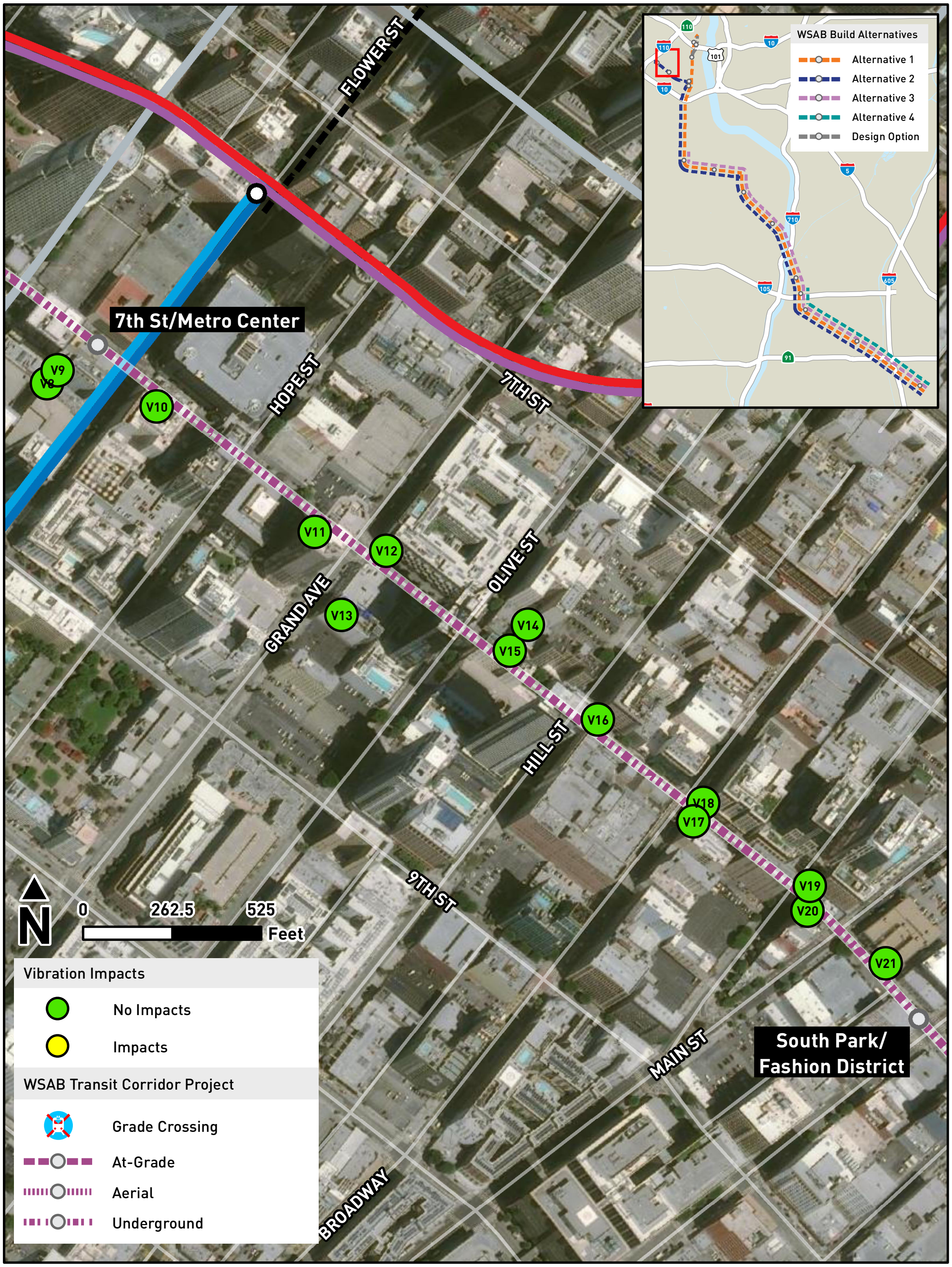
Unmitigated Vibration Clusters



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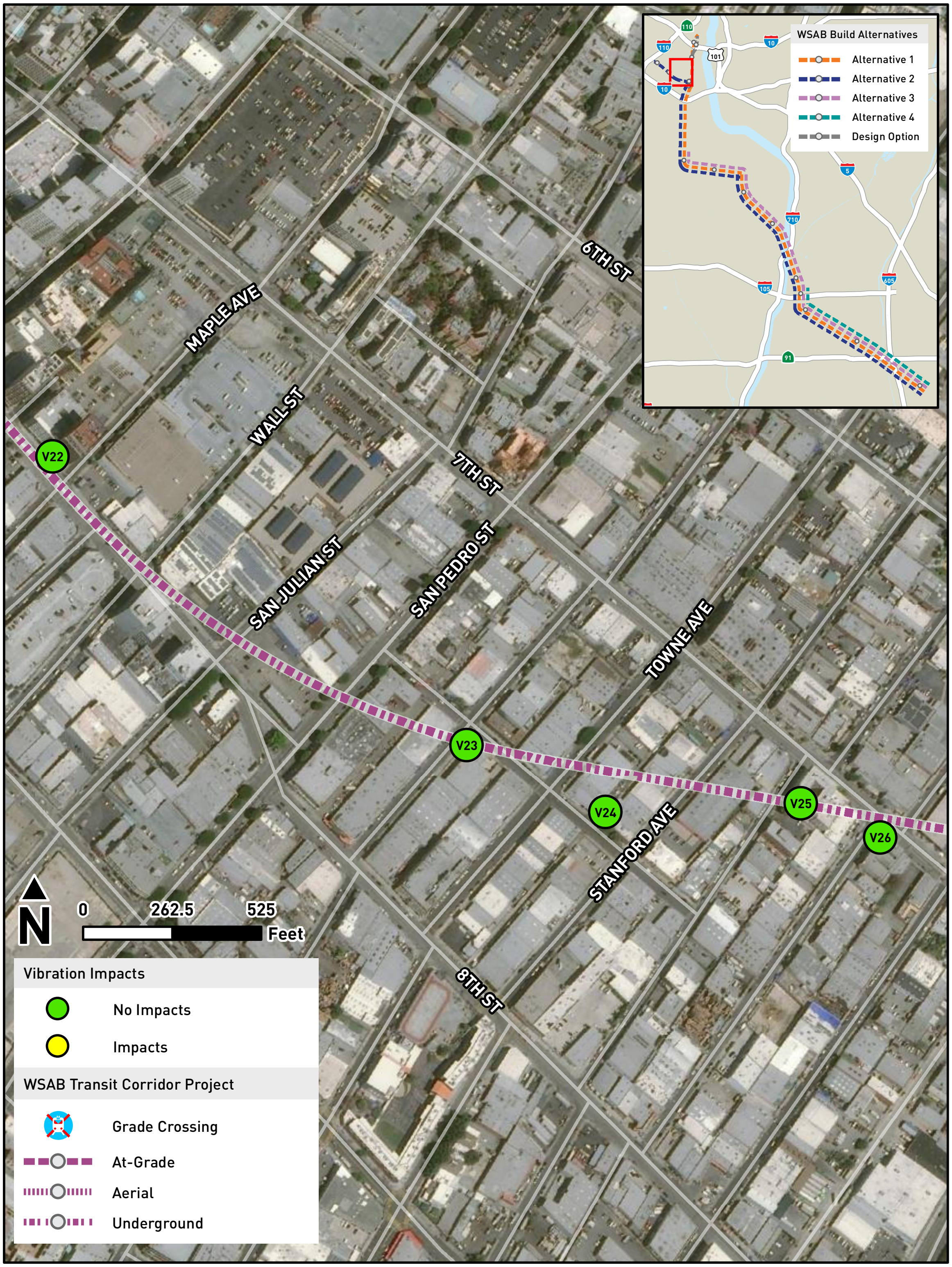

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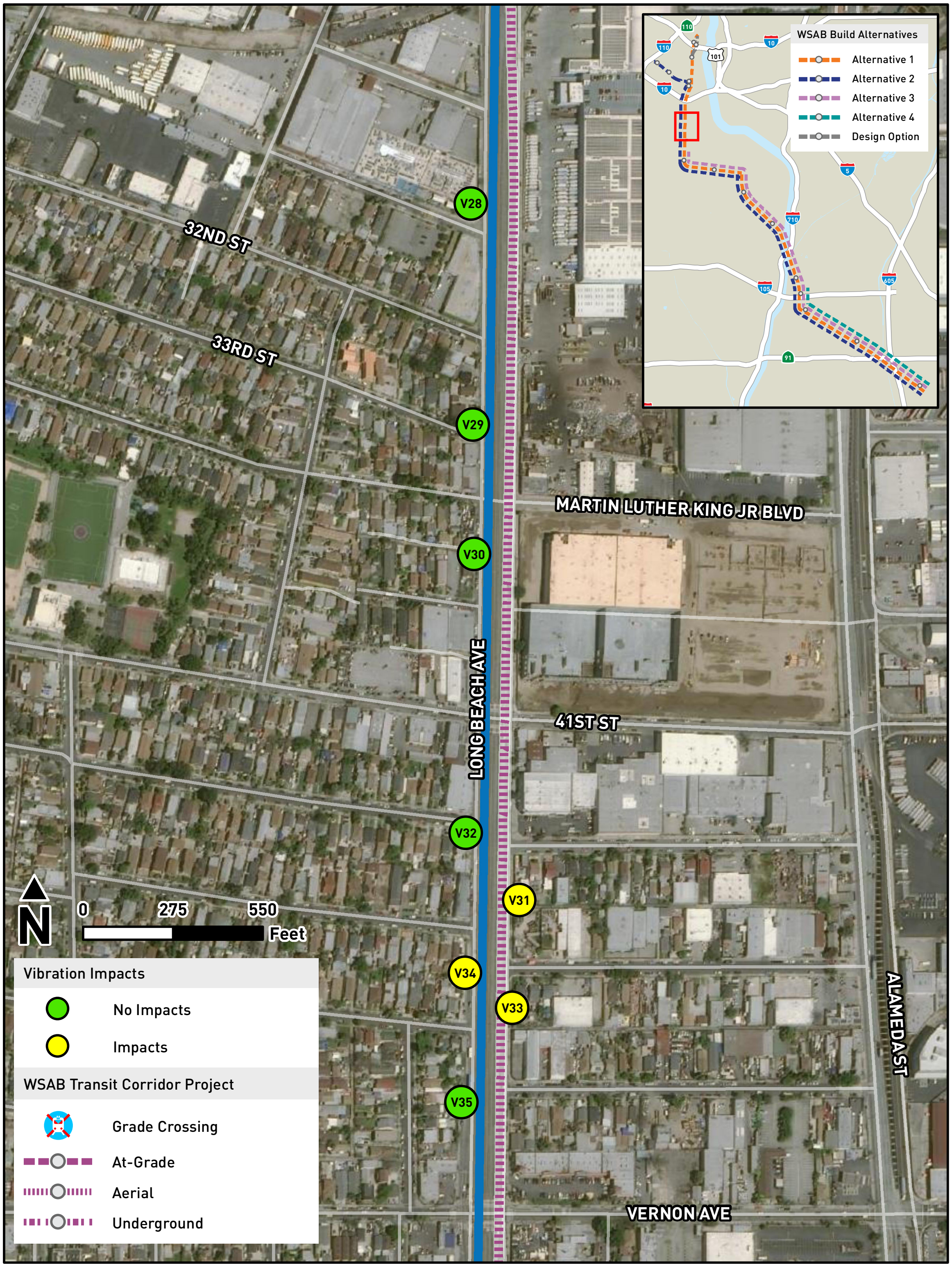
Unmitigated Vibration Clusters



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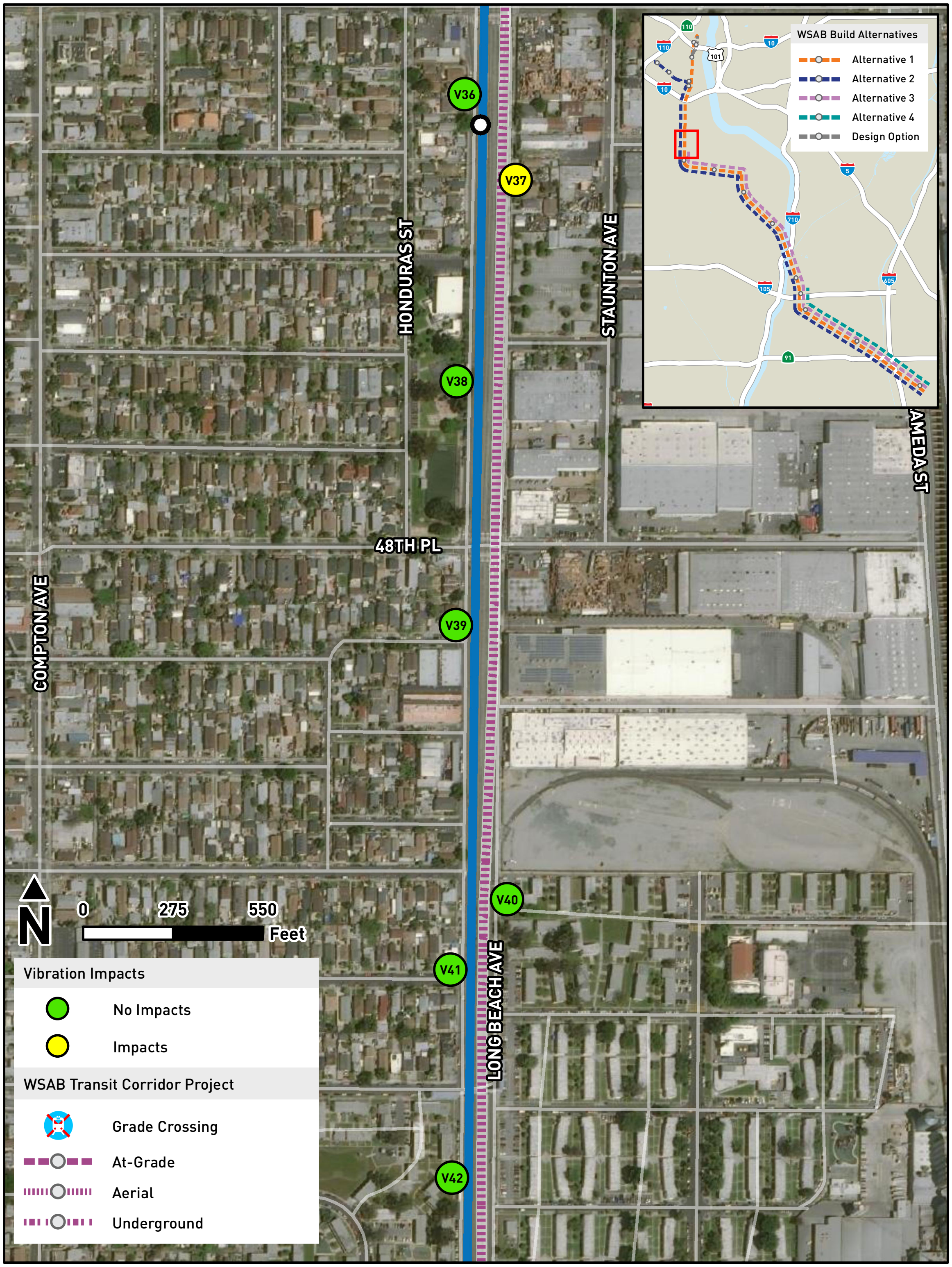

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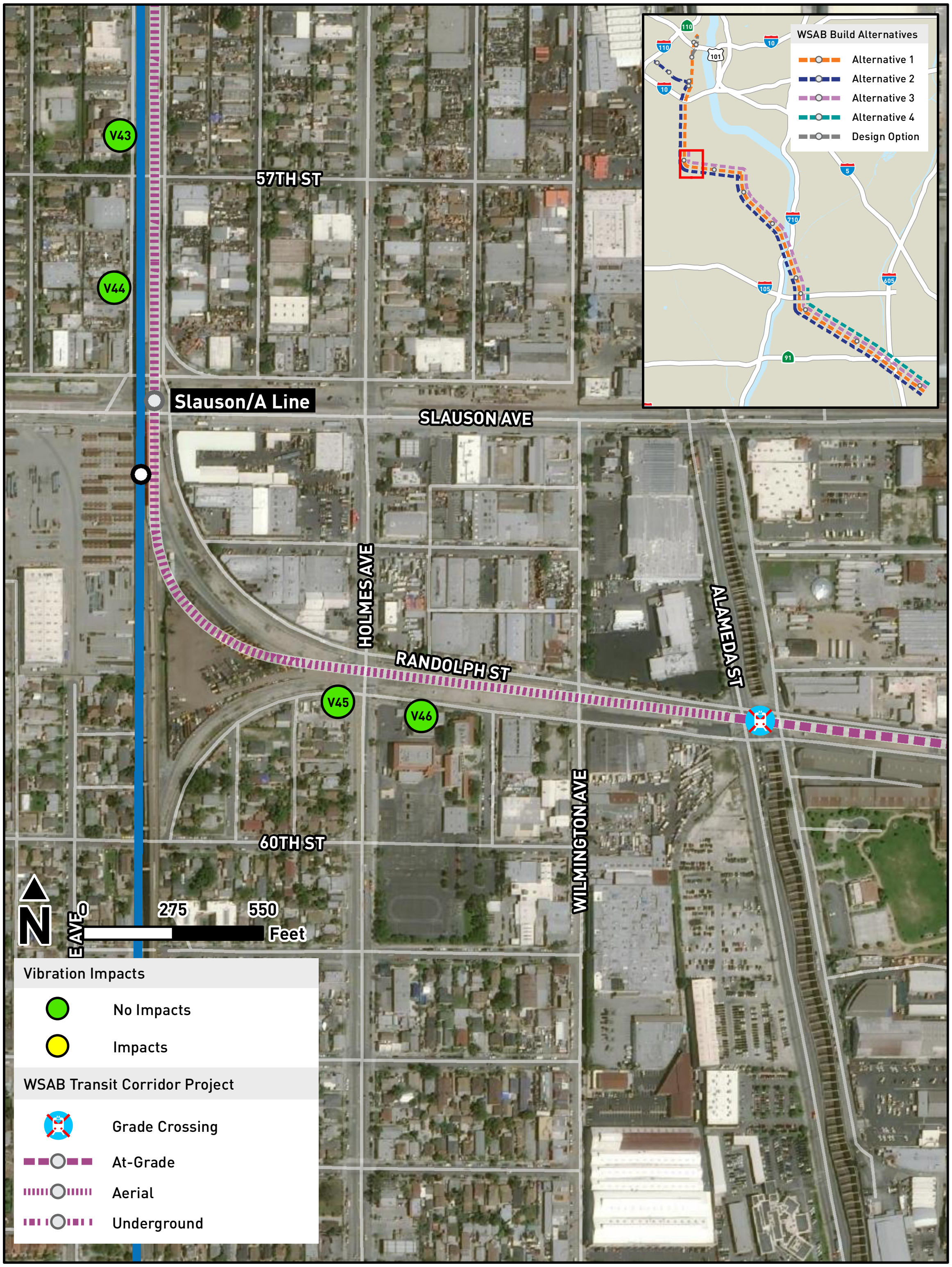

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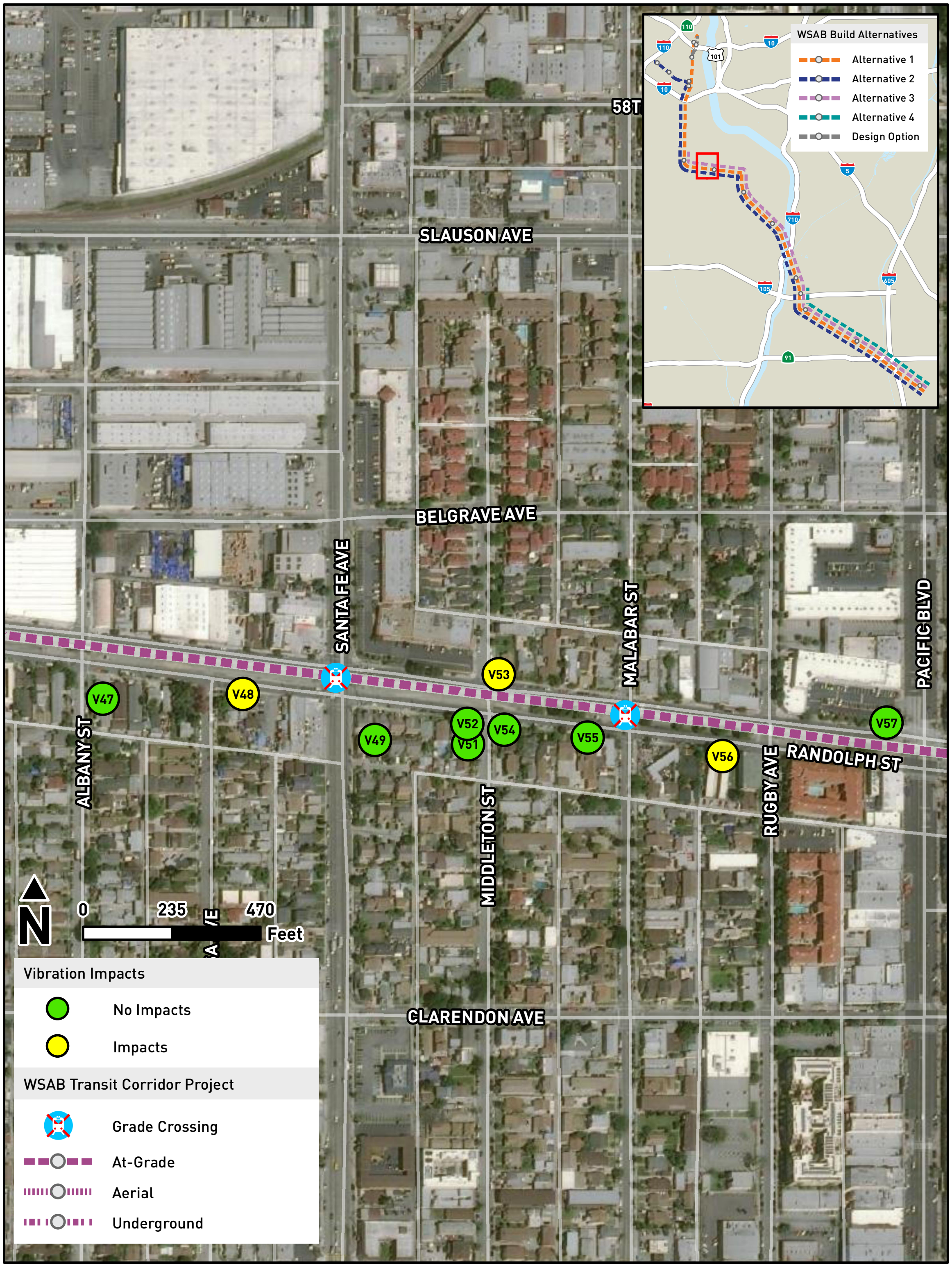

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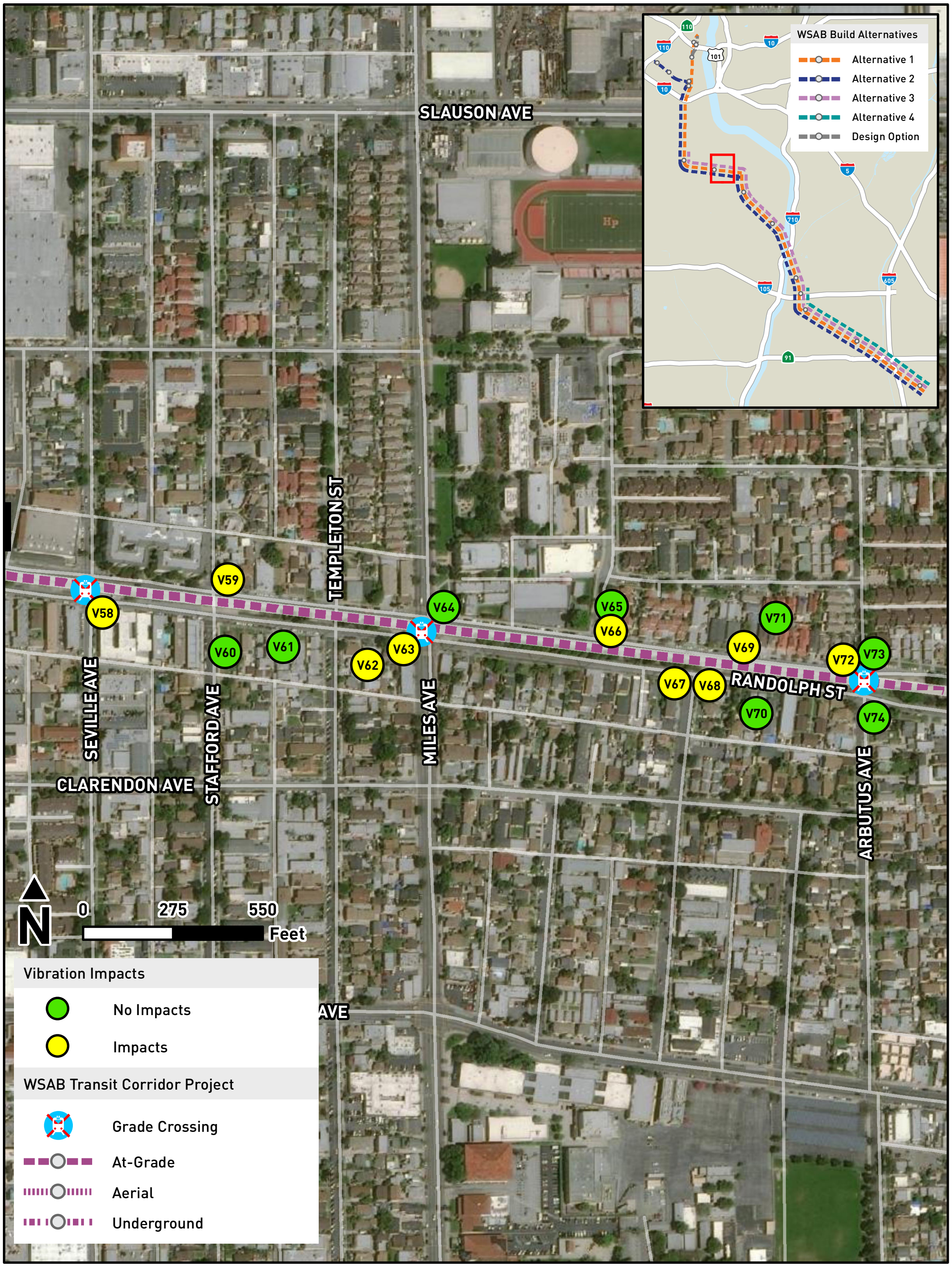

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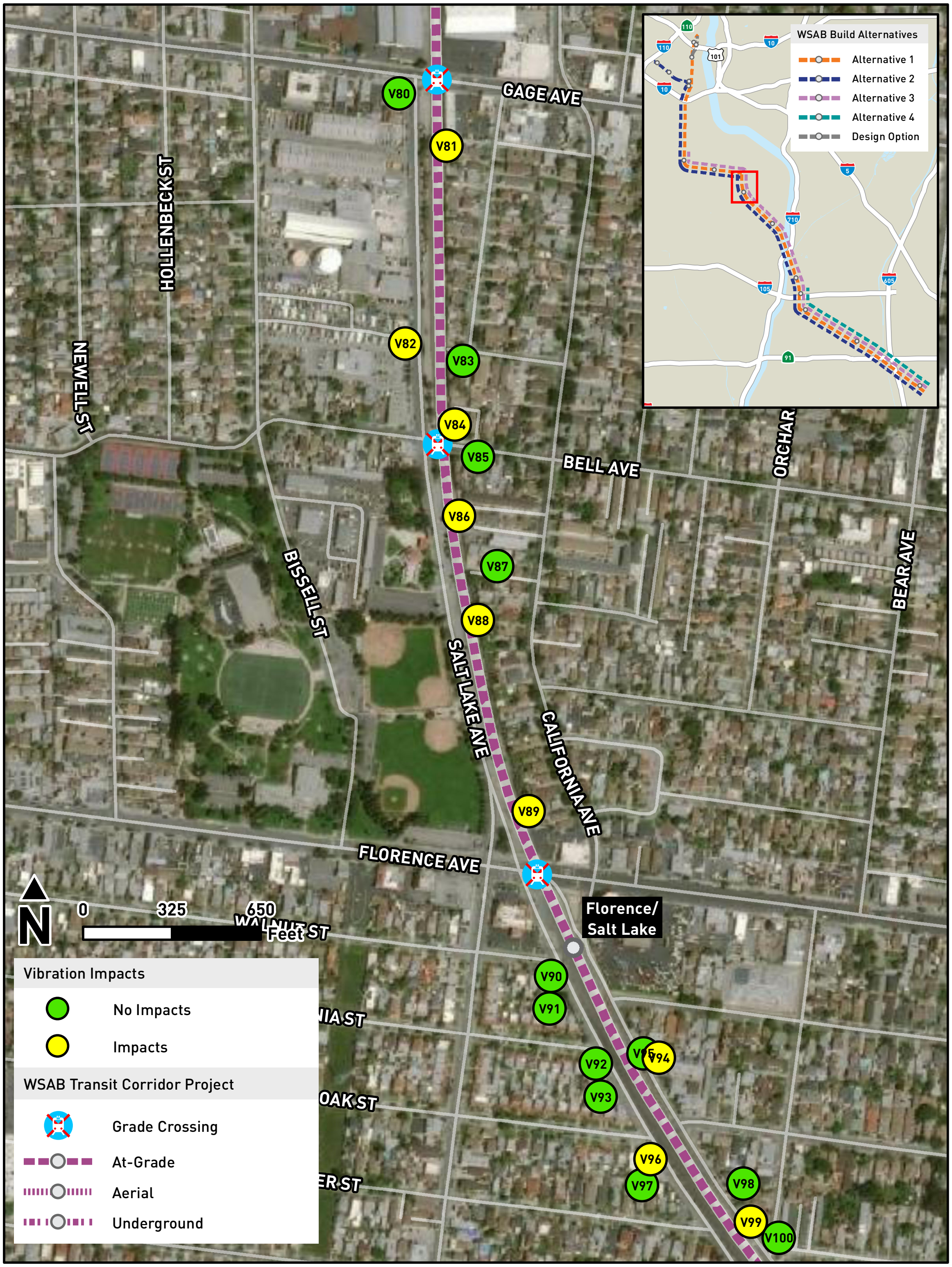

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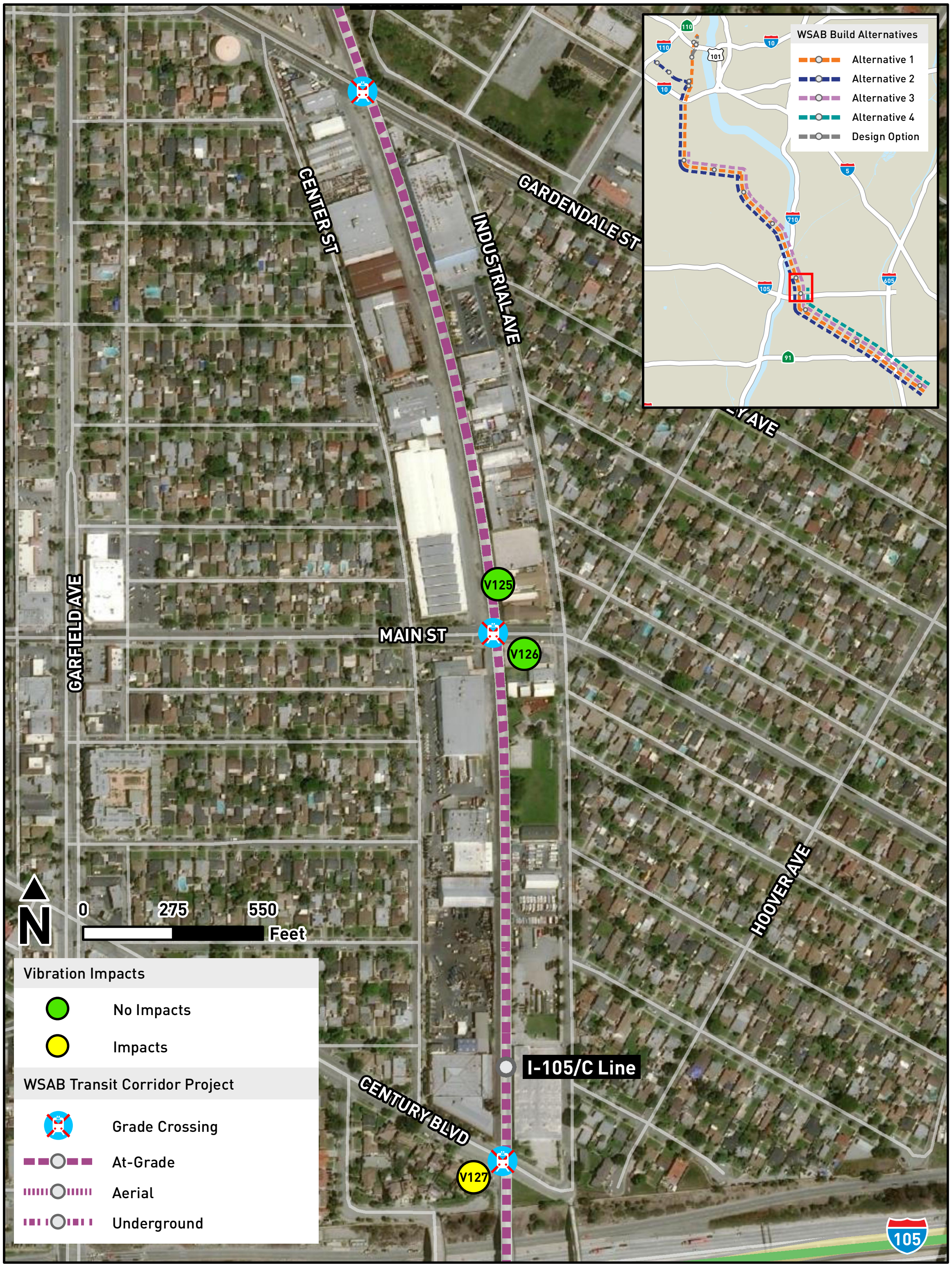

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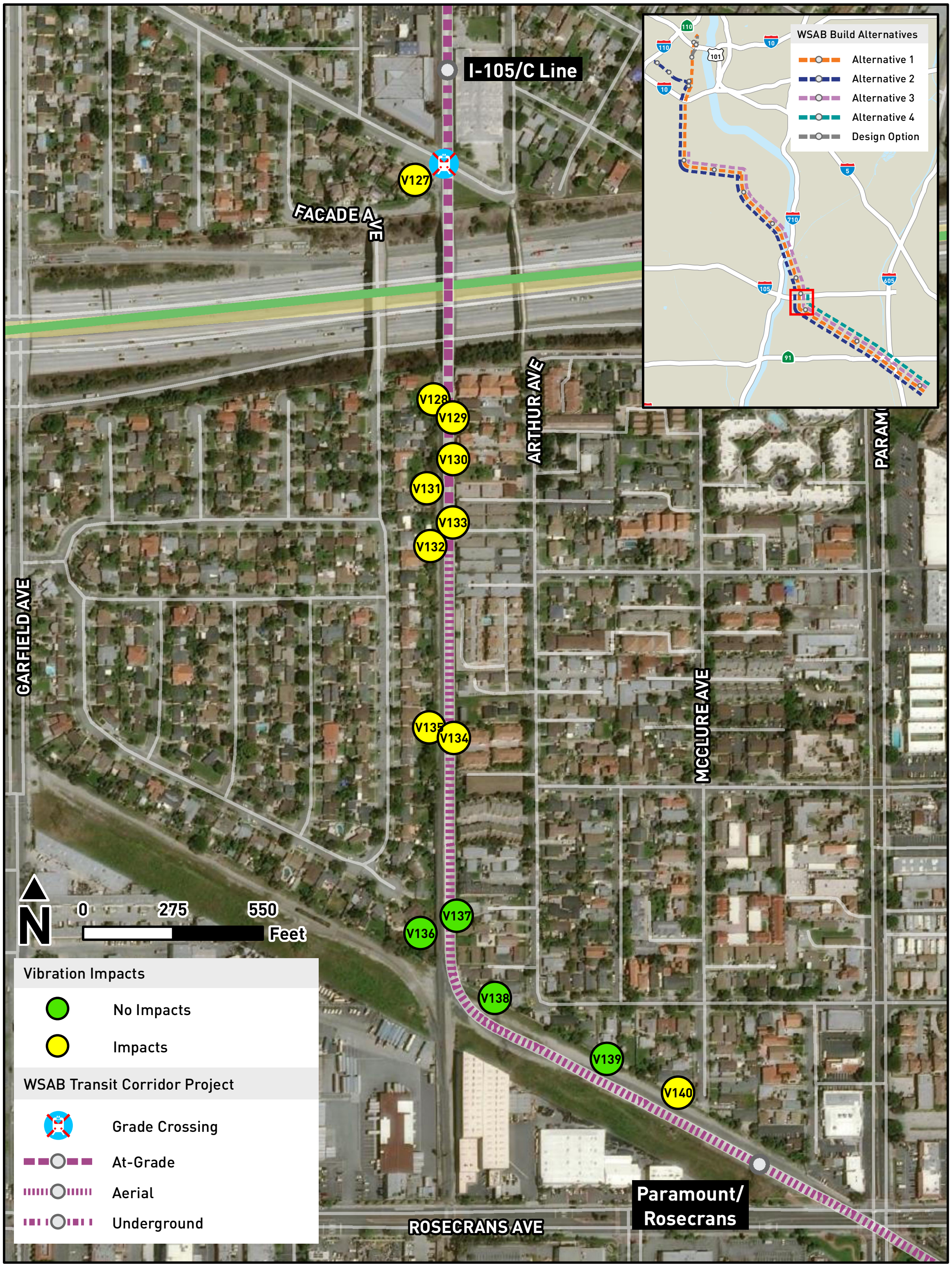

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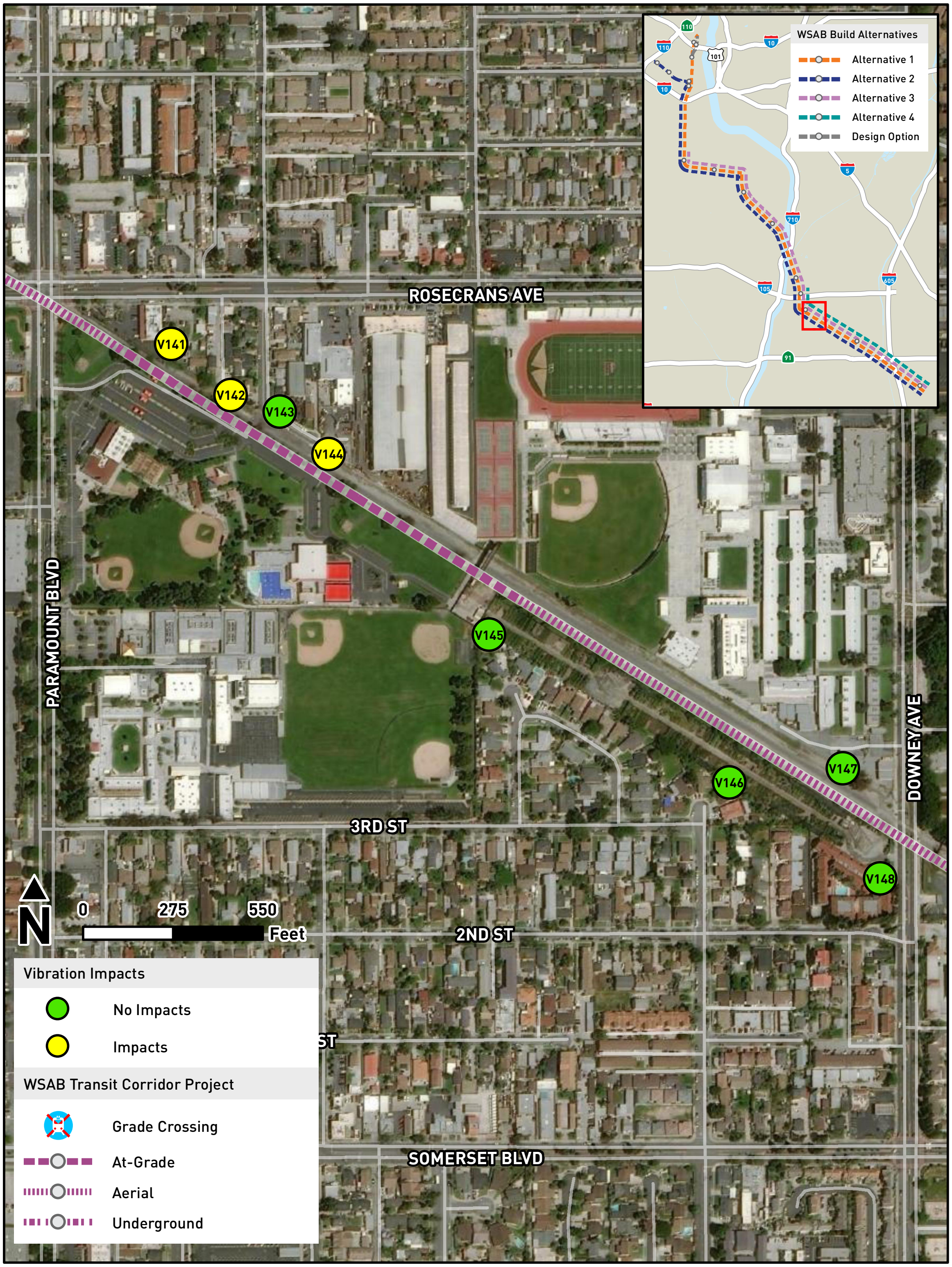

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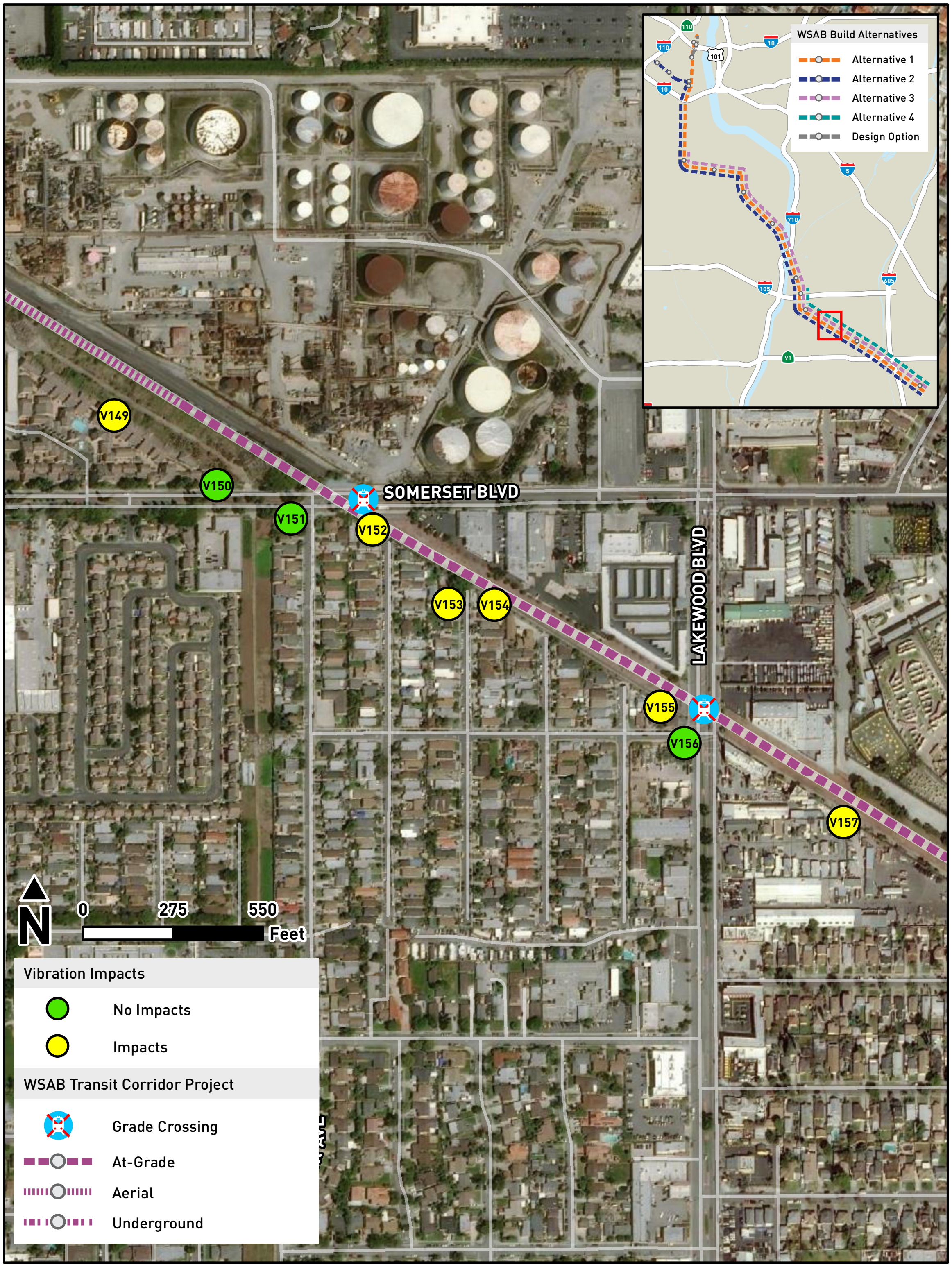

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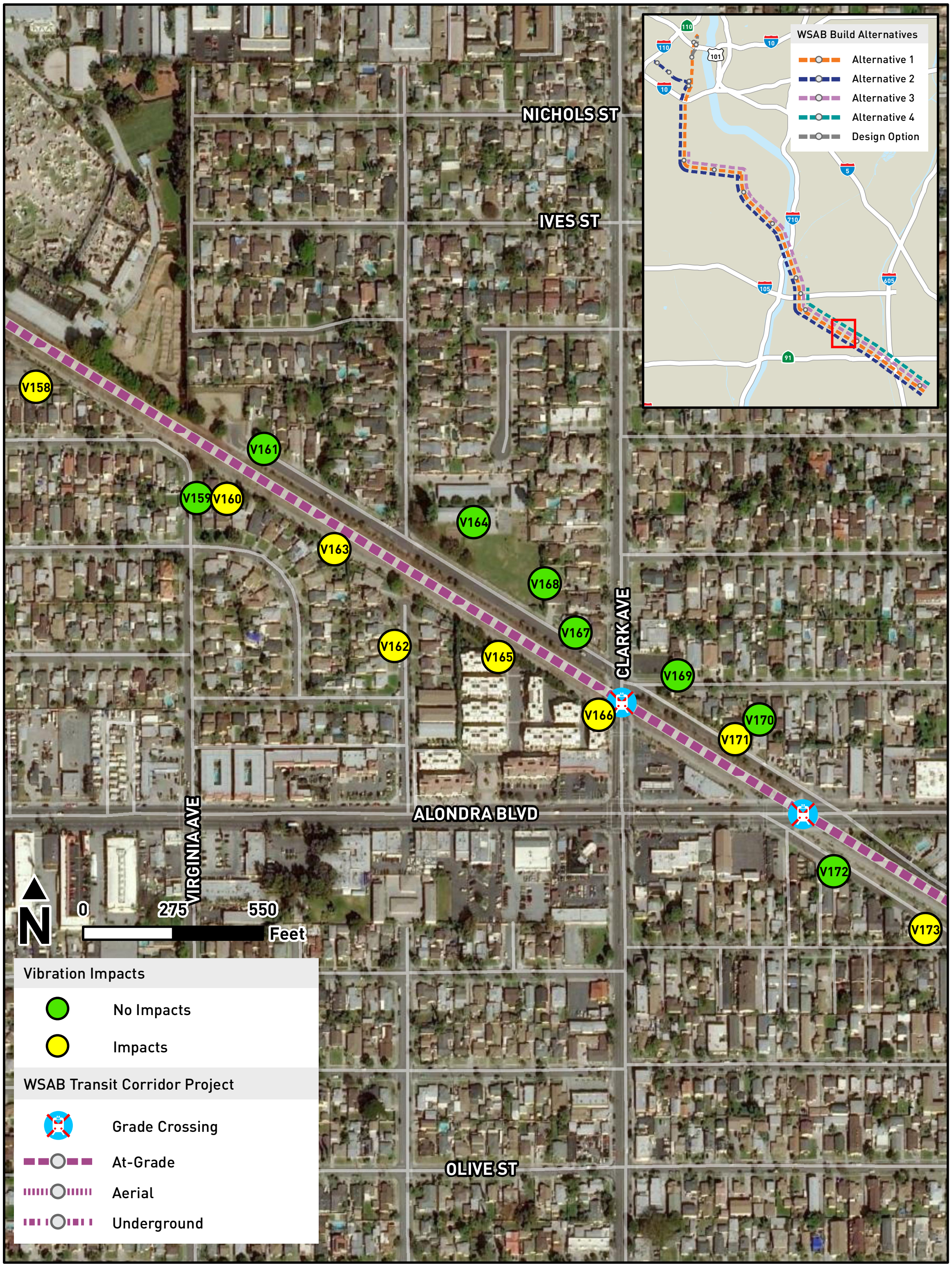

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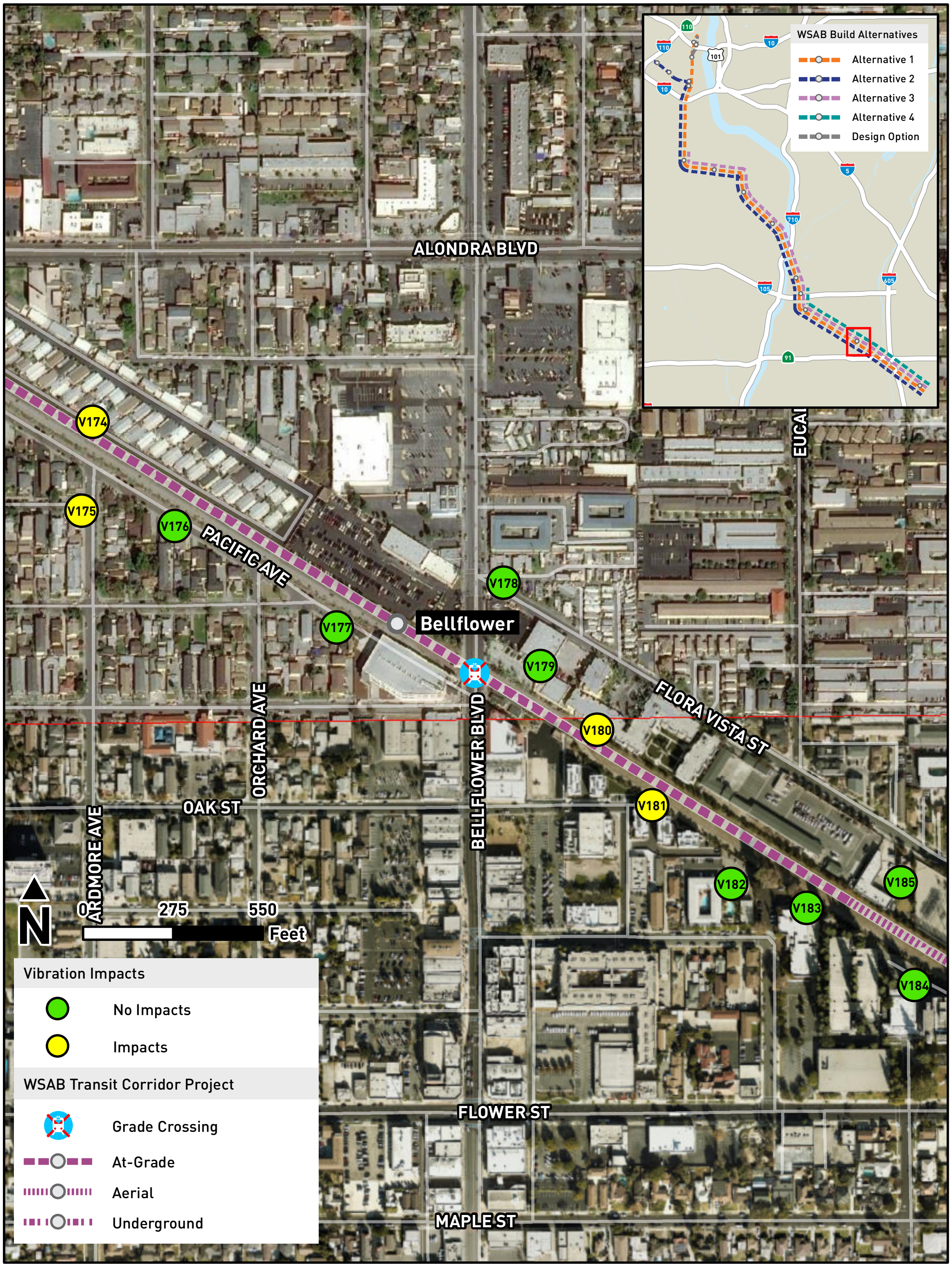

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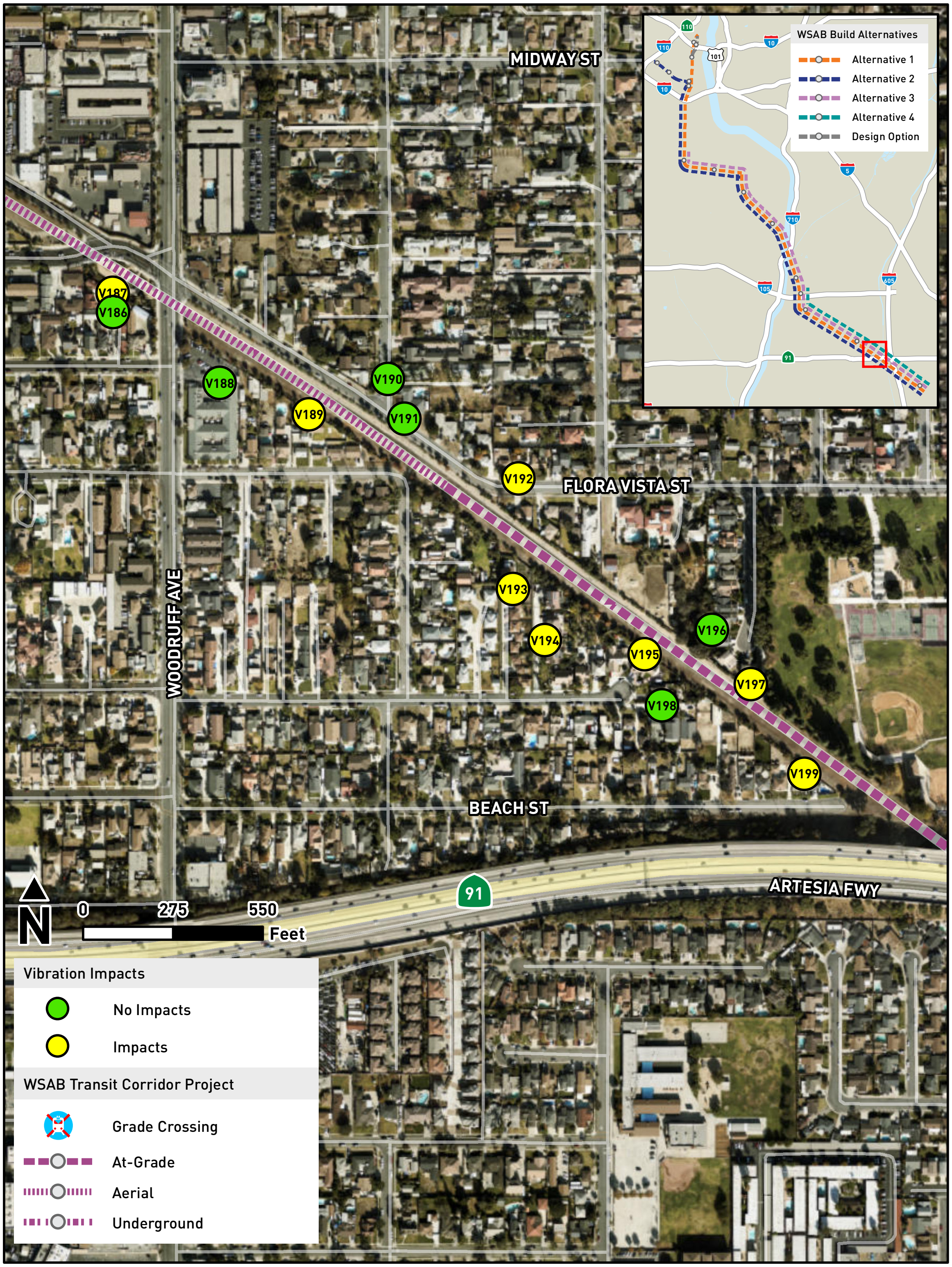

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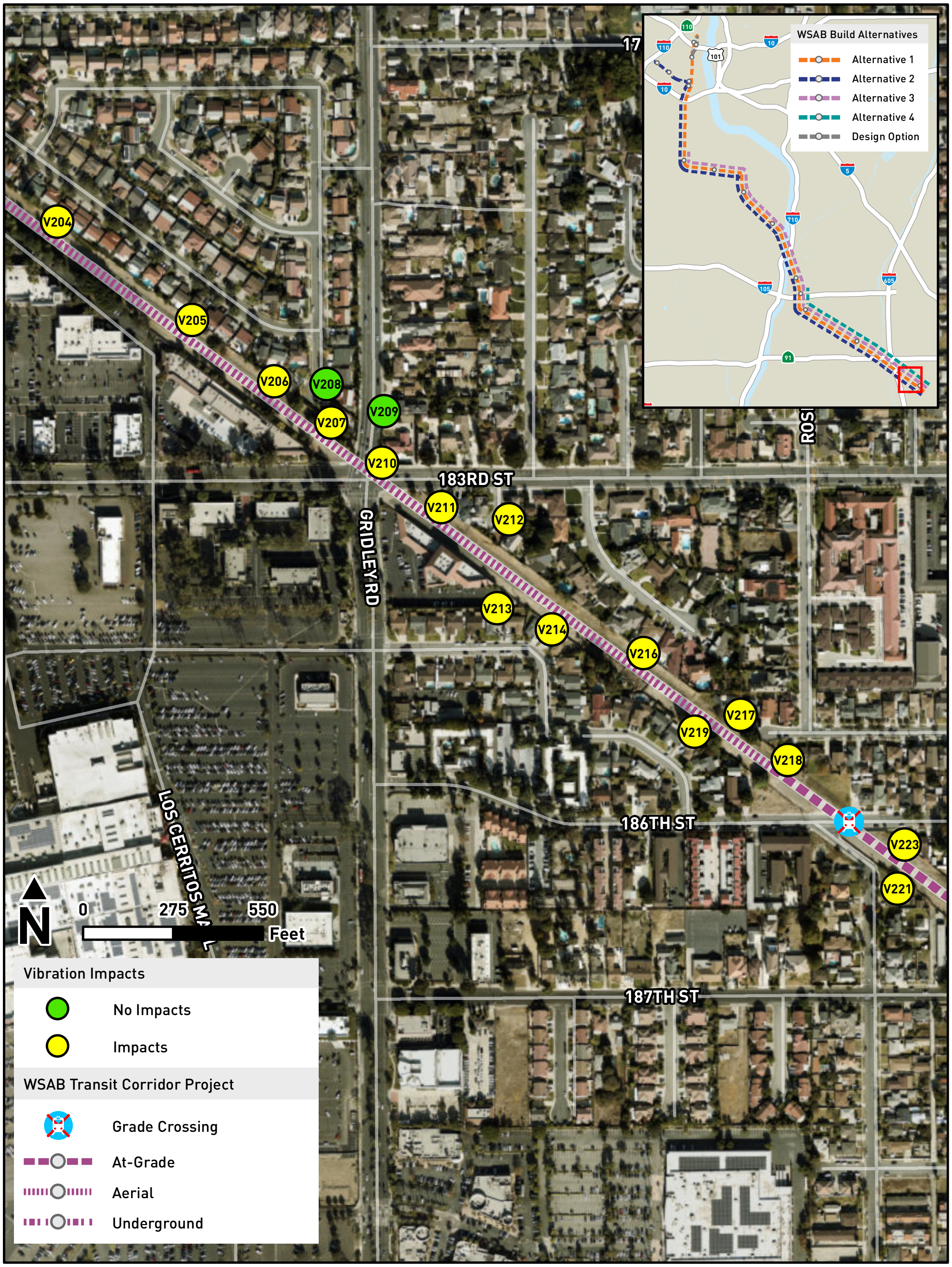

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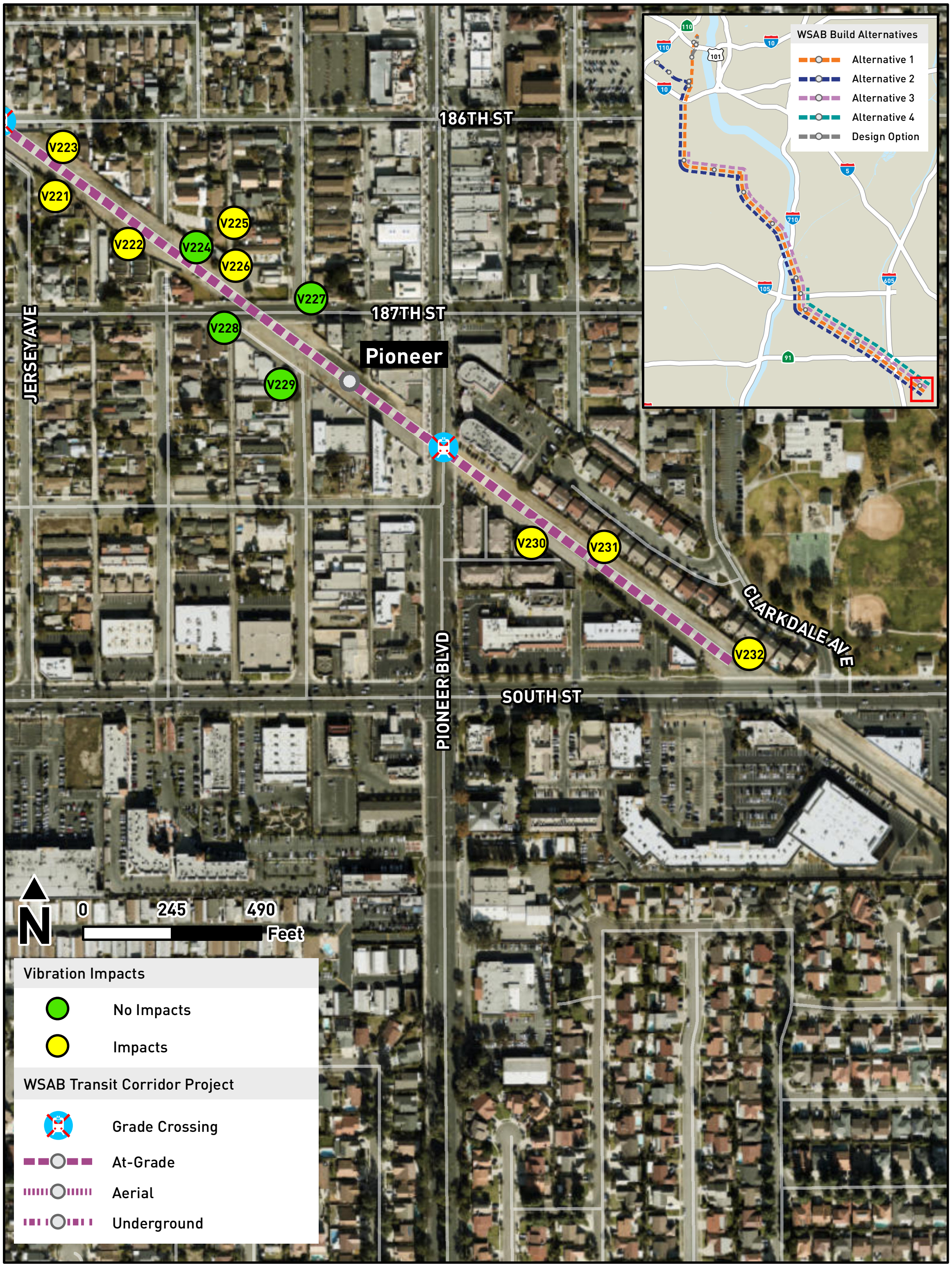
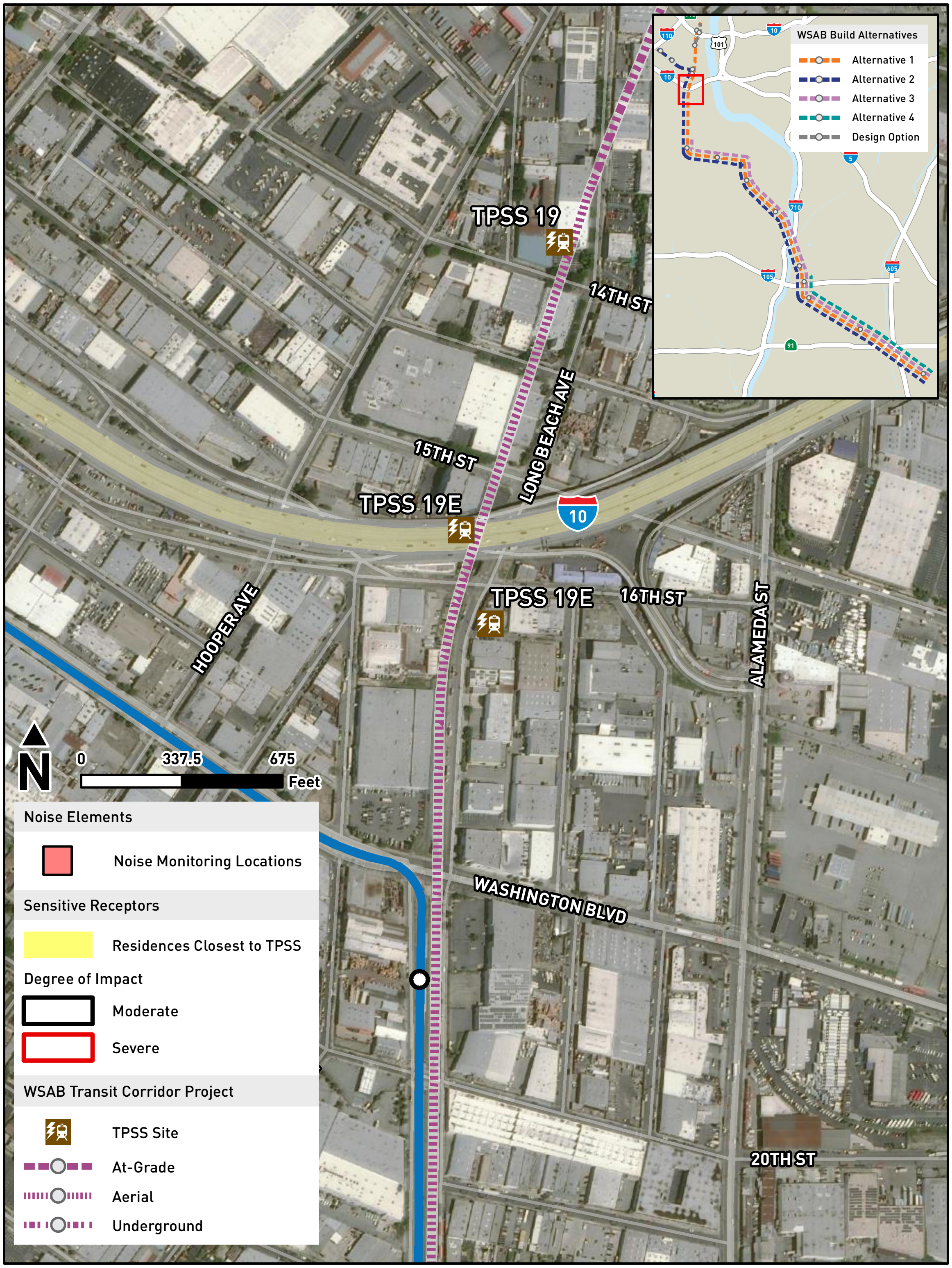
Unmitigated Vibration Clusters



APPENDIX C UNMITIGATED ANCILLARY FACILITIES CLUSTERS AND IMPACTS

Appendix C
Unmitigated Ancillary Equipment Clusters and Impacts



Appendix C
Unmitigated Ancillary Equipment Clusters and Impacts

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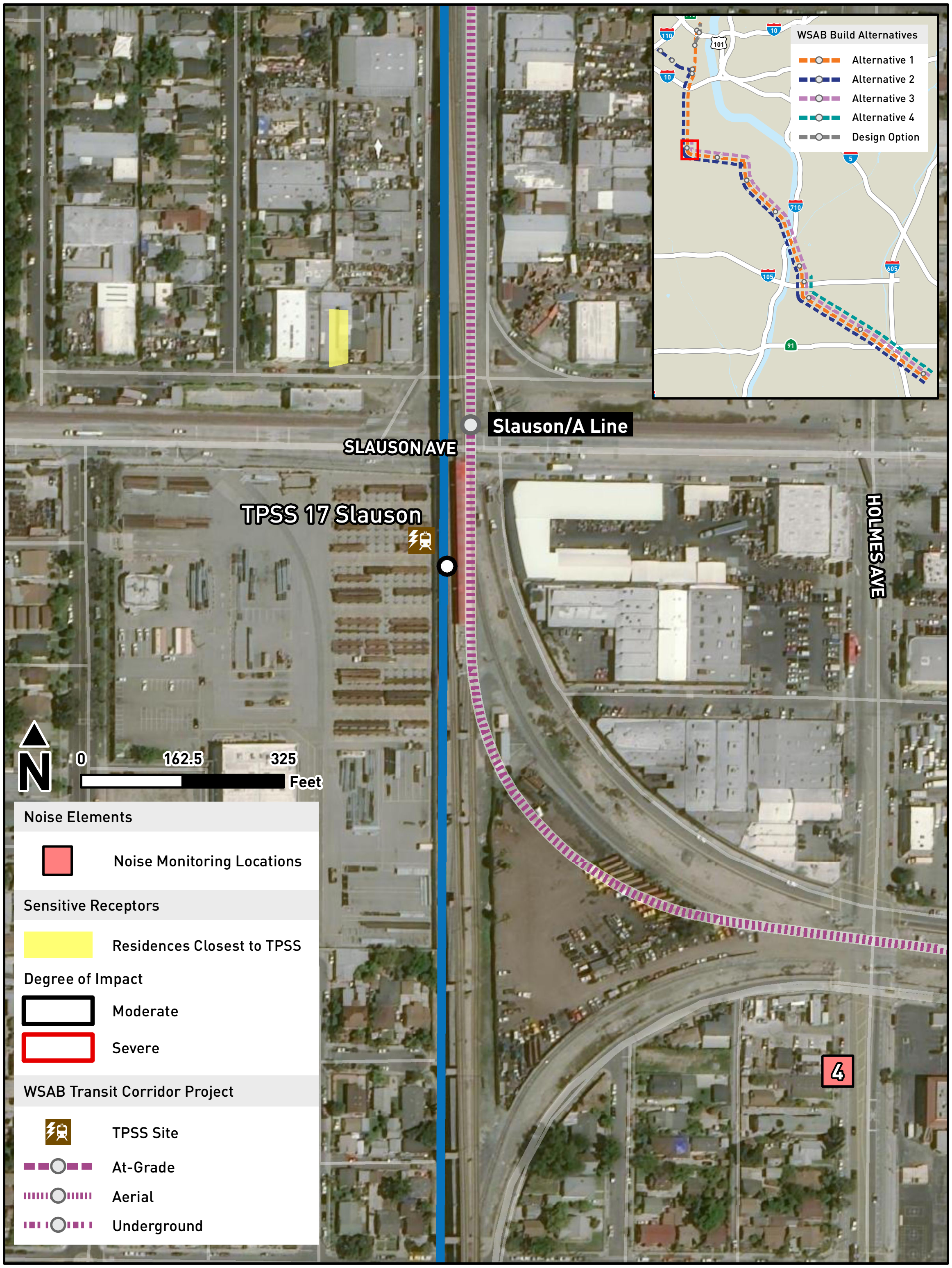

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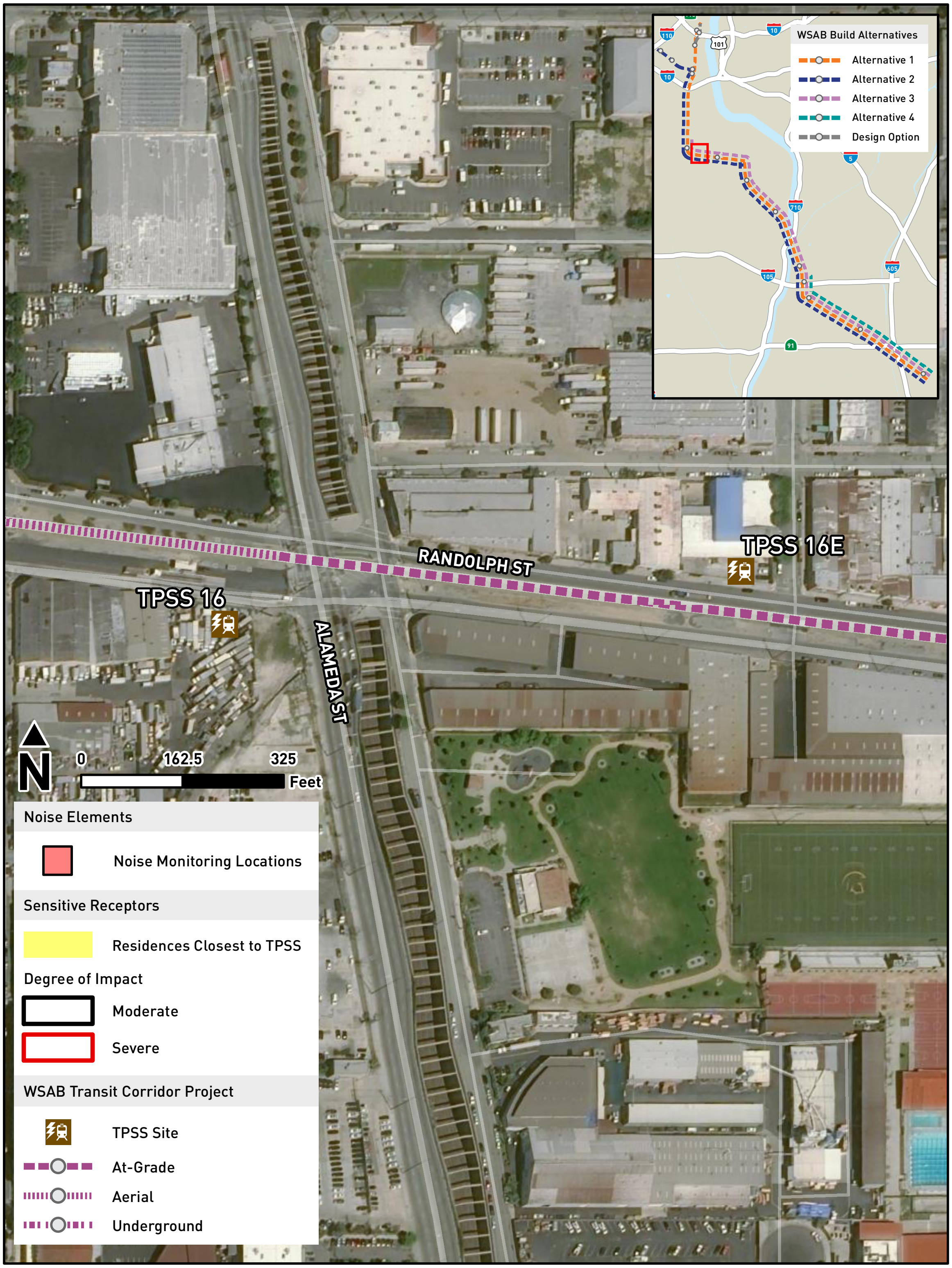
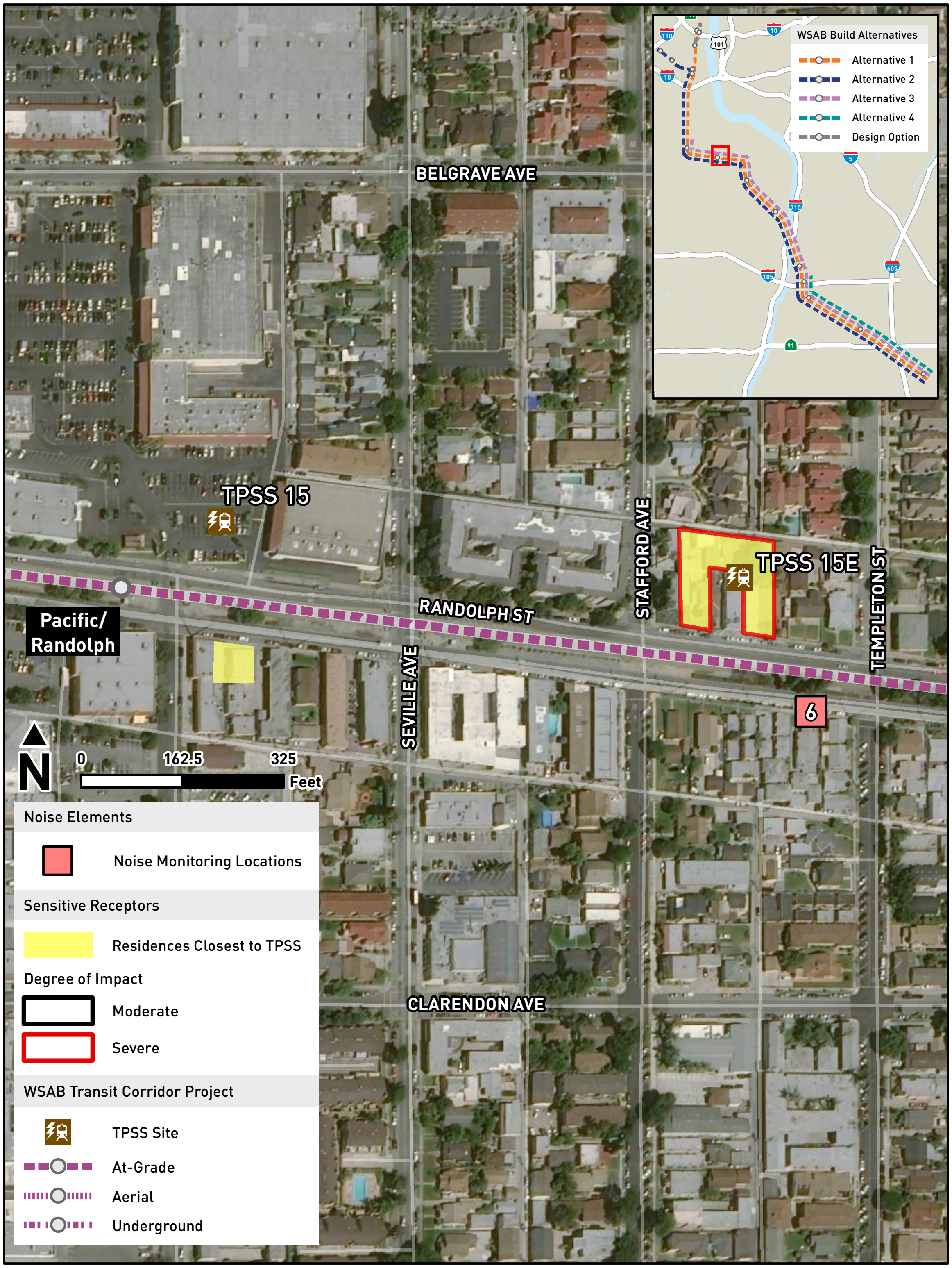
Unmitigated Ancillary Equipment Clusters and Impacts



Appendix C
Unmitigated Ancillary Equipment Clusters and Impacts



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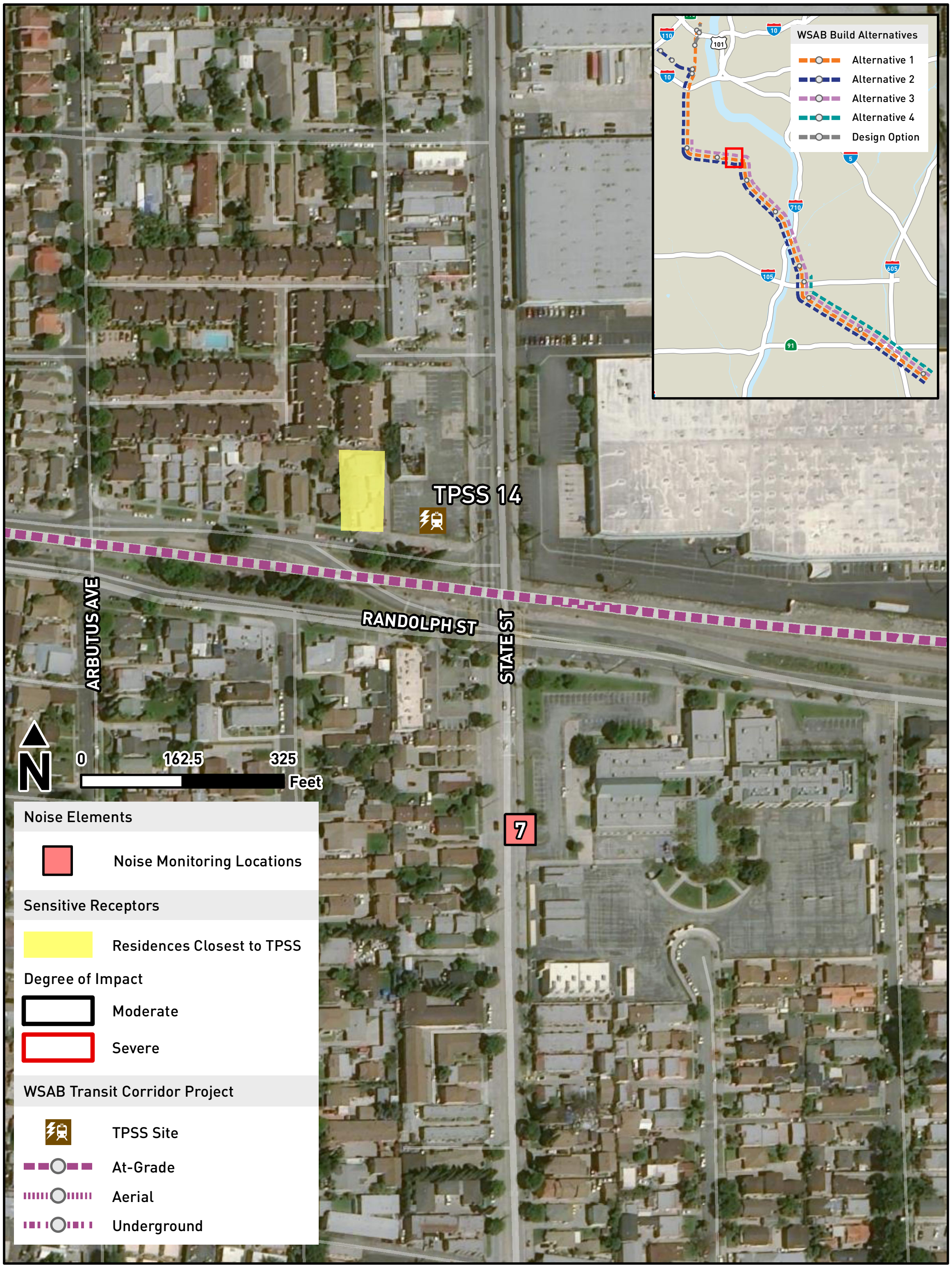
Unmitigated Ancillary Equipment Clusters and Impacts



Appendix C
Unmitigated Ancillary Equipment Clusters and Impacts

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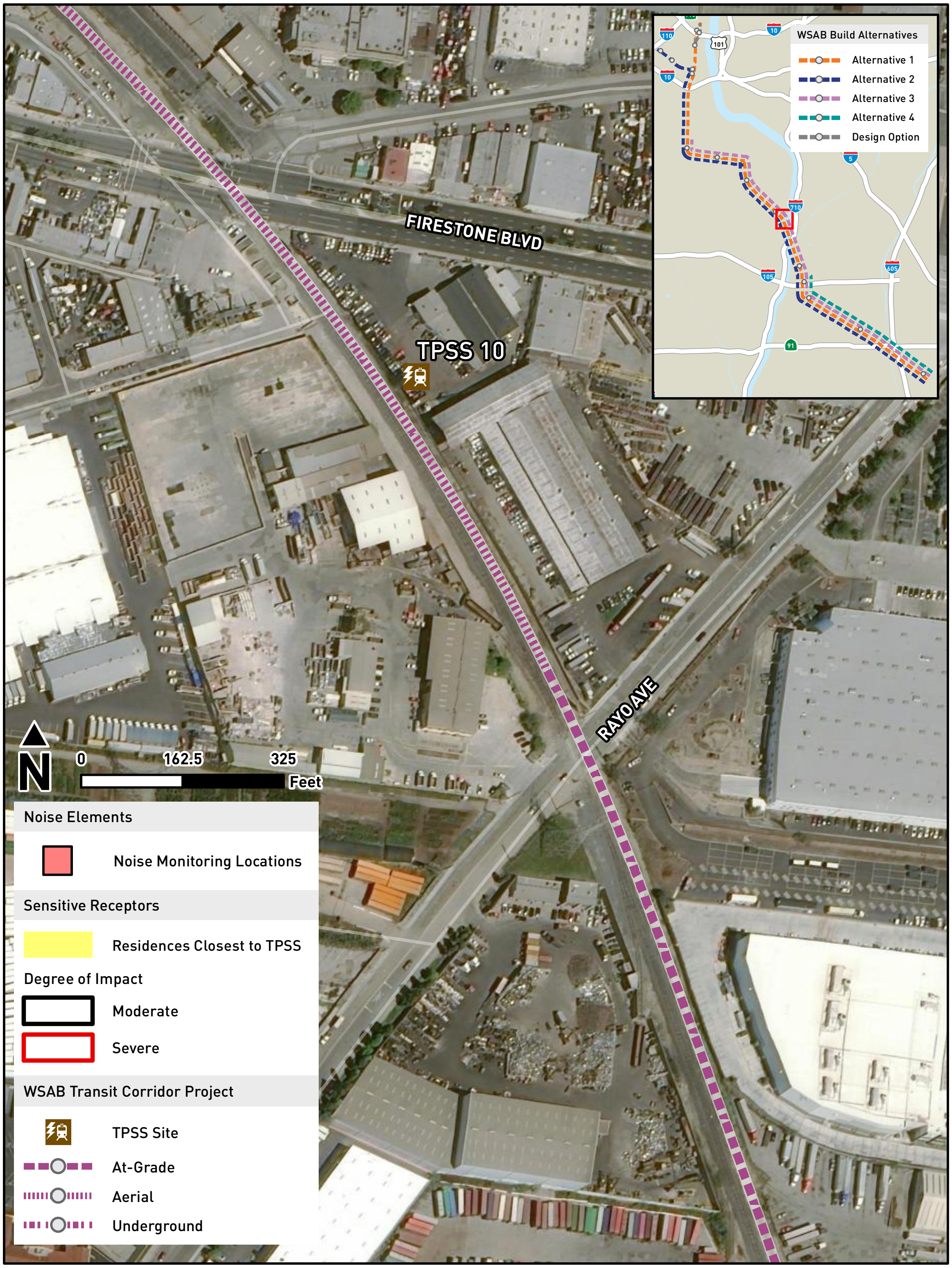

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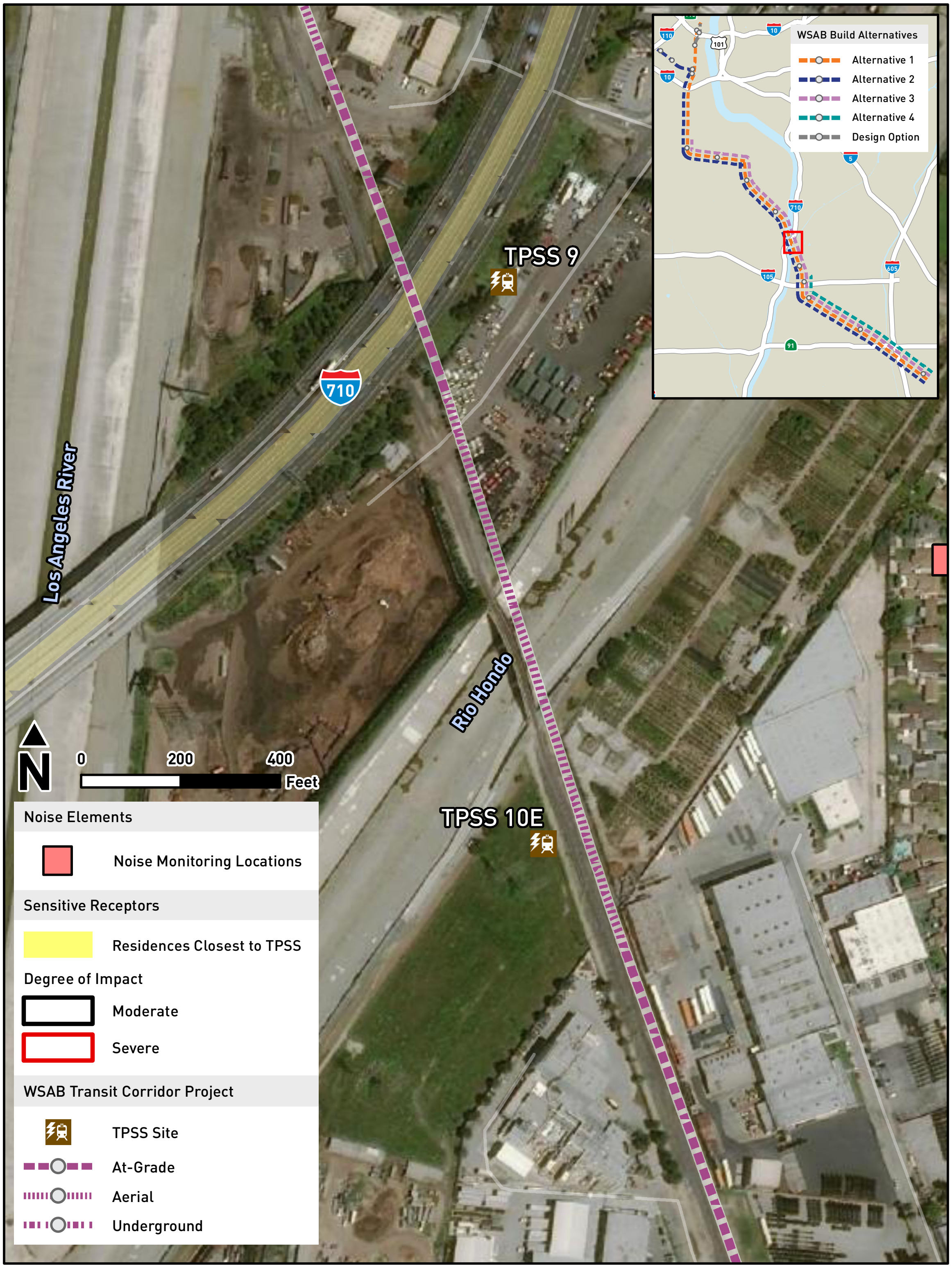
Unmitigated Ancillary Equipment Clusters and Impacts



Appendix C
Unmitigated Ancillary Equipment Clusters and Impacts

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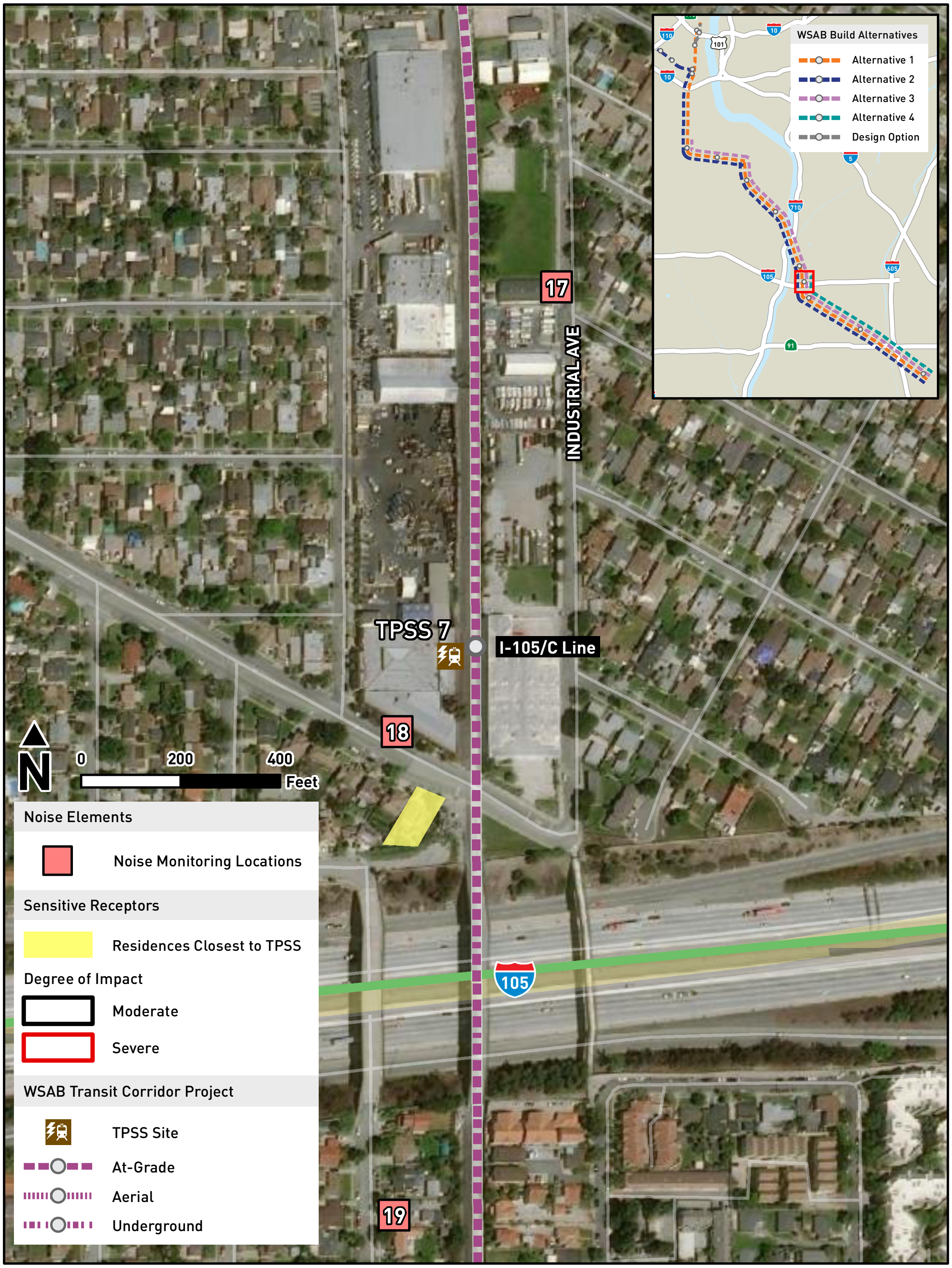

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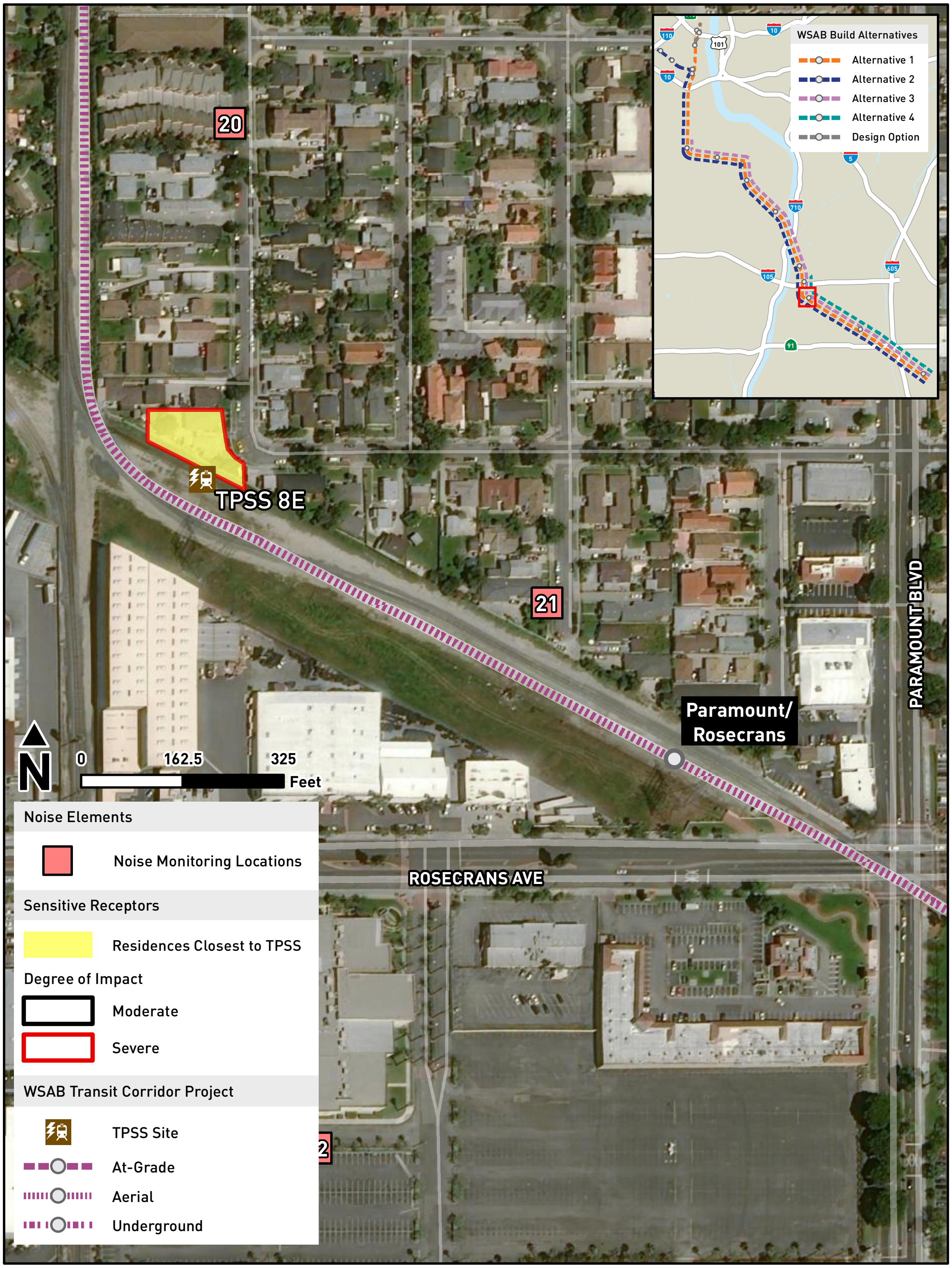
Unmitigated Ancillary Equipment Clusters and Impacts



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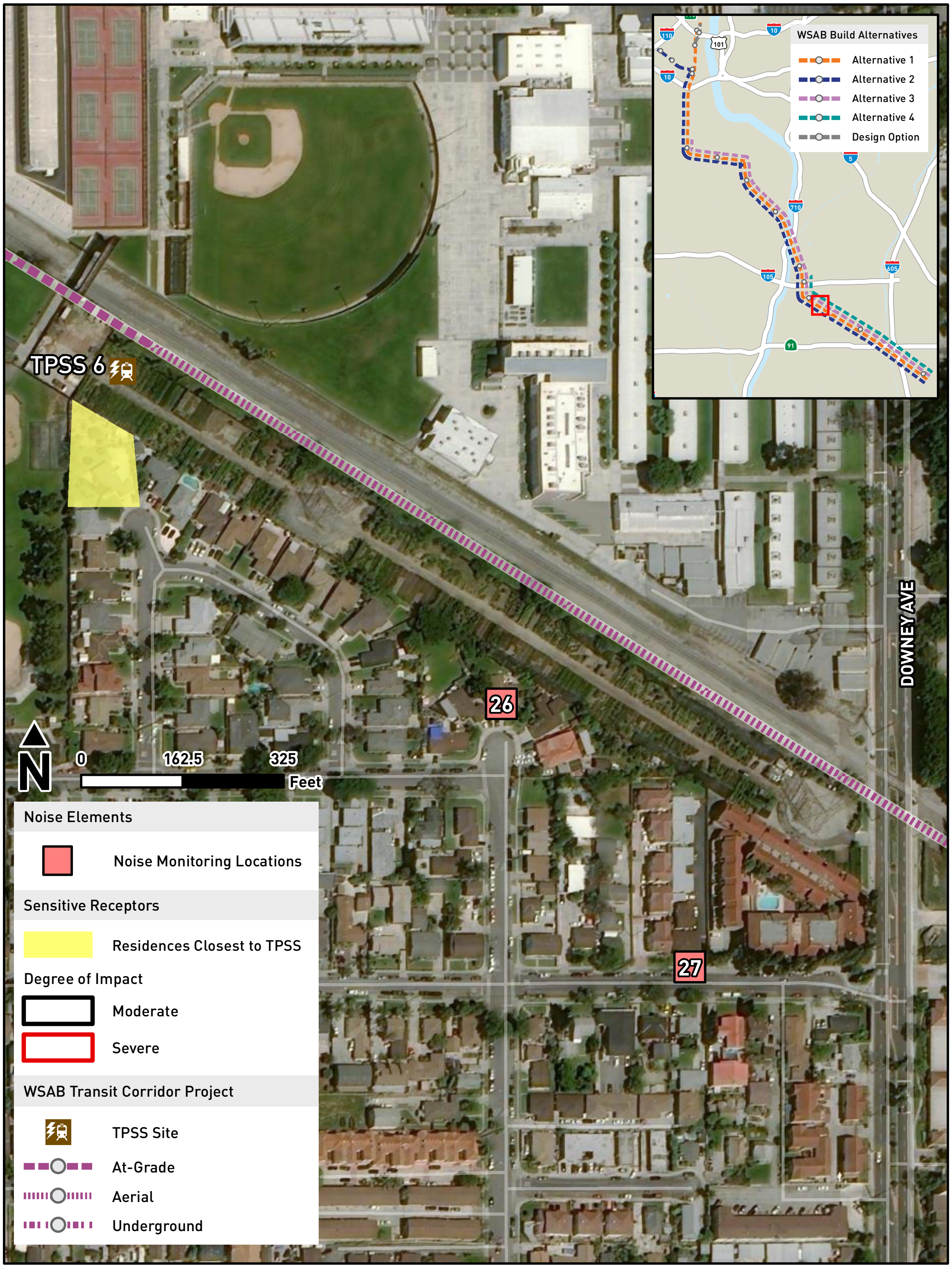
Unmitigated Ancillary Equipment Clusters and Impacts



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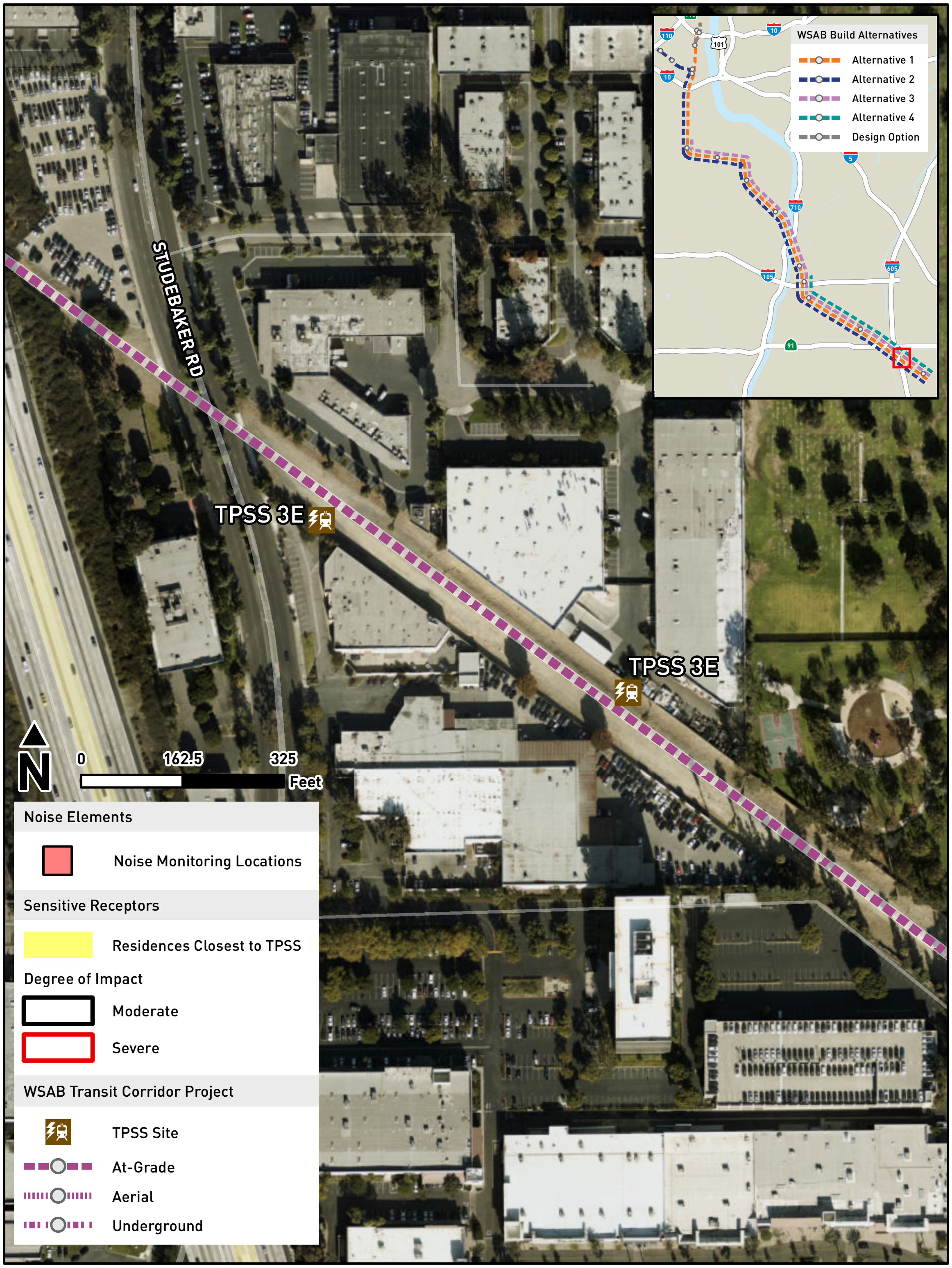

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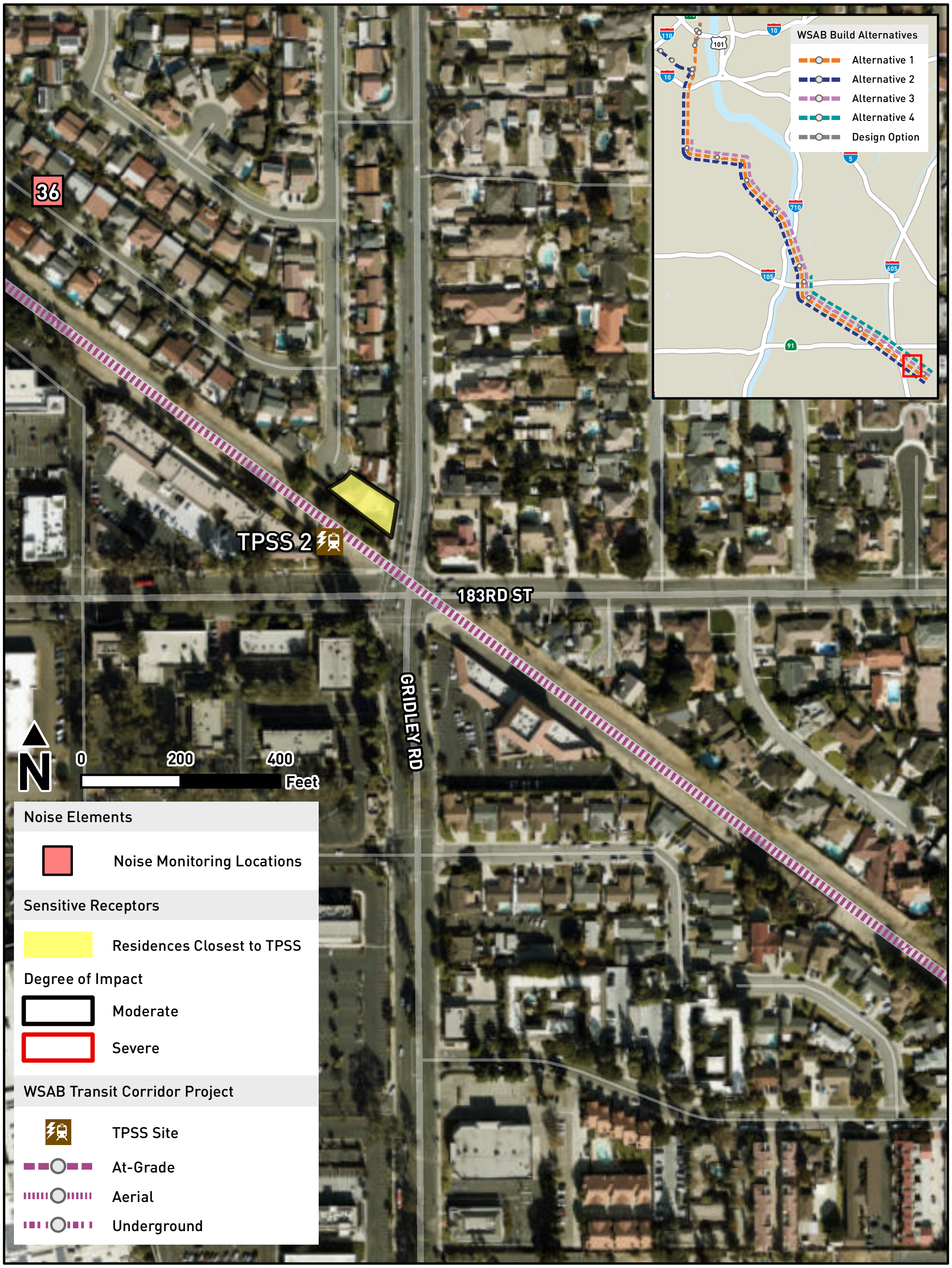
Unmitigated Ancillary Equipment Clusters and Impacts



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Unmitigated Ancillary Equipment Clusters and Impacts