

Appendix L Noise and Vibration Impacts Report

GOLD LINE EASTSIDE TRANSIT CORRIDOR PHASE 2



Metro

Prepared for
Los Angeles Metropolitan
Transportation Authority
One Gateway Plaza
Los Angeles, CA 90012

June 2022

Appendix L

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Prepared for:
Los Angeles County Metropolitan Transportation Authority
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Attachments

Attachment A – Noise and Vibration Impacts

Acronyms

μips	micro-inch per second
2020 RTP/SCS	Connect SoCal 2020-2045 Regional Transportation Plan/Sustainable Communities Strategy
ANSI	American National Standards Institute
API	area of potential impact
AT&SF	Atchison, Topeka and Santa Fe Railway
BMP	Best Management Practice
BNSF	Burlington Northern Santa Fe
CEQA	California Environmental Quality Act
CIDH	cast-in-drilled hole-piles
CWR	continuous welded rail
dB	decibels
dBA	A-weighted decibel
DSA	detailed study area
EIS	Environmental Impact Statement
FTA	Federal Transit Administration
GBN	ground-borne noise
GBV	ground-borne vibration
GSA	general study area
HVAC	heating, ventilation, and air conditioning
I	Interstate
IOS	Initial Operating Segment
ips	inches per second
Ldn	day-night noise level

Leq(h)	average hourly equivalent noise level
Lmax	maximum noise level
LRT	light rail transit
L RTP	Long Range Transportation Plan
LRVs	light rail vehicles
Metro	Los Angeles County Metropolitan Transportation Authority
mph	miles per hour
MRDC	Metro Rail Design Criteria
MSE	mechanically stabilized earth
MSF	Maintenance and Storage Facility
MUTCD	Manual of Uniform Traffic Control Devices
OCS	overhead catenary system
PIH	Presbyterian Intercommunity Hospital
Project	Eastside Transit Corridor Phase 2 Project
RMS	Root Mean Square
ROP	Regional Occupational Program
ROW	right-of-way
RTP	Regional Transportation Plan
SCAG	Southern California Association of Governments
SEL	sound exposure level
SR	State Route
TBM	tunnel boring machine
TPSS	Traction Power Substations
VdB	vibration decibels
VMT	vehicle miles traveled

1.0 INTRODUCTION

This impacts report discusses the Eastside Transit Corridor Phase 2 Project (Project) setting in relation to noise and vibration. It describes existing conditions, current applicable regulatory setting, and potential impacts from operation and construction of the Build Alternatives and the No Project Alternative. This study was conducted in compliance with the California Environmental Quality Act (CEQA) and the State CEQA Guidelines, California Code of Regulations Section 15000 et seq.

The Project would extend the Los Angeles County Metropolitan Transportation Authority (Metro) L (Gold) Line, a light rail transit (LRT) line, from its current terminus at the Atlantic Station in the unincorporated community of East Los Angeles to the city of Whittier. It would extend the existing Metro L (Gold) Line approximately 3.2 to 9.0 miles, depending on the Build Alternative.

The Project area of analysis includes a general study area (GSA) that is regional in scope and scale, and a detailed study area (DSA) that encompasses an approximately two-mile area from the Project alignment in eastern Los Angeles County. Additionally, specialized study areas were developed for certain environmental impact categories where the potential impacts would occur within an area that varies from the GSA or DSA. All specialized study areas are contained within the GSA.

A diverse mix of land uses are located within the GSA and DSA, including single- and multi-family residences, commercial and retail uses, industrial development, parks and recreational, health and medical uses, educational institutions, and vacant land. The Project would traverse densely populated, low-income, and heavily transit-dependent communities with major activity centers within the Gateway Cities subregion of Los Angeles County.

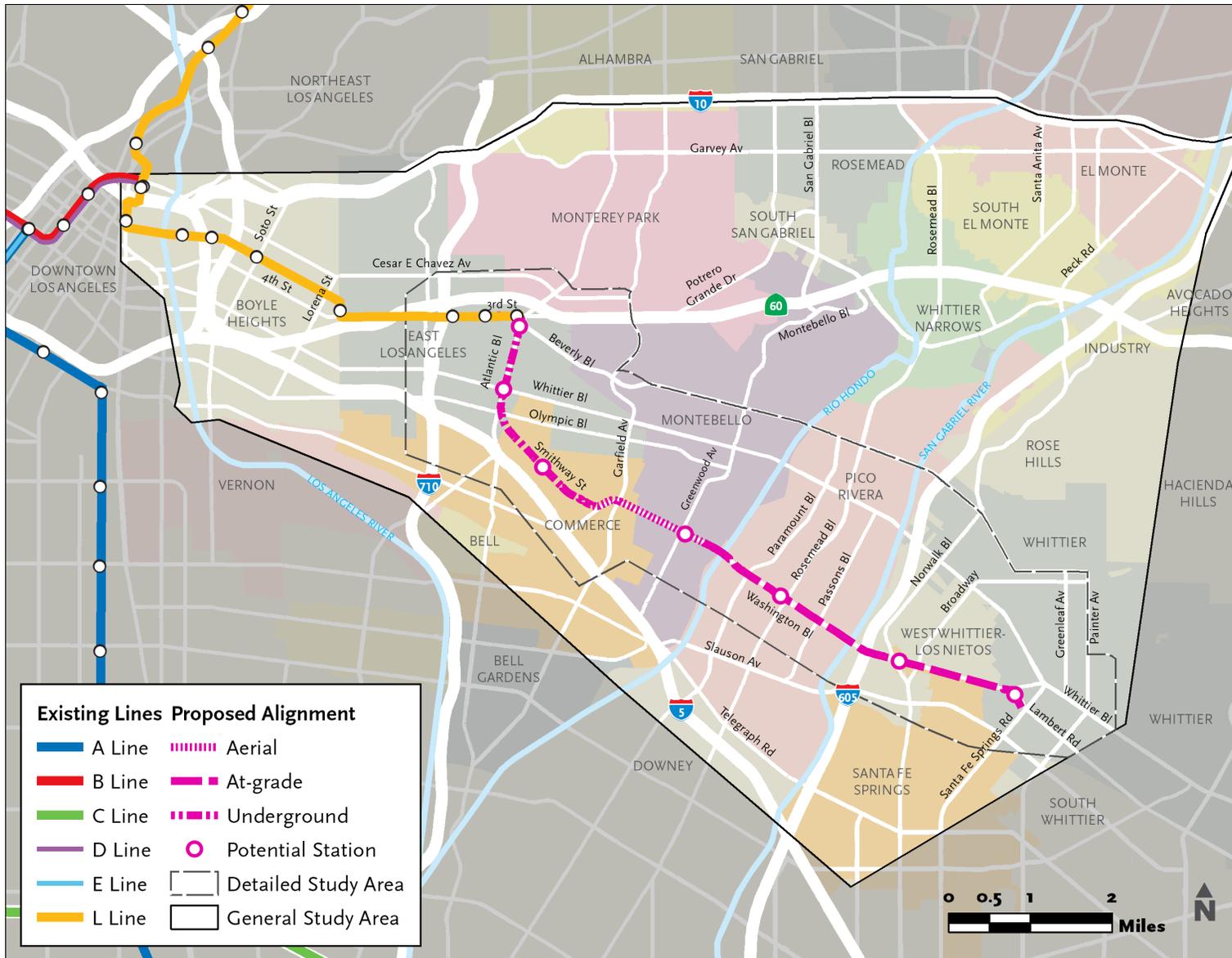
2.0 PROPOSED PROJECT AND ALTERNATIVES

2.1 Project Setting and Description

This impacts report evaluates potential environmental impacts of three Build Alternatives and a No Project Alternative. The Build Alternatives are: Alternative 1 Washington (Alternative 1), Alternative 2 Atlantic to Commerce/Citadel Initial Operating Segment (IOS) (Alternative 2), and Alternative 3 Atlantic to Greenwood IOS (Alternative 3).

For purposes of describing the Project, two study areas have been defined. The GSA is regional in scope and scale, whereas the DSA encompasses an approximately two-mile area from the Project alignment's centerline. The GSA is the same for all three of the Build Alternatives. The purpose of the GSA is to establish the study area for environmental resources that are regional in scope and scale, such as regional transportation, including vehicle miles traveled (VMT) and regional travel demands, population, housing, or employment. The GSA consists of several jurisdictions within Los Angeles County including the cities of Bell, Commerce, El Monte, Industry, Los Angeles, Montebello, Monterey Park, Pico Rivera, Rosemead, South El Monte, Santa Fe Springs, Whittier, unincorporated areas of Los Angeles County, which includes East Los Angeles and West Whittier-Los Nietos, and other cities within the San Gabriel Valley. It is generally bounded by Interstate (I) 10 to the north, Peck Road in South El Monte and Lambert Road in Whittier to the east, I-5 and Washington Boulevard to the south, and I-710 to the west. **Figure 2.1**, **Figure 2.2**, and **Figure 2.3** present the boundaries of the GSA for each of the three Build Alternatives.

The DSA establishes a study area to evaluate environmental resources that are more sensitive to the physical location of the Build Alternatives. The DSA for Alternative 1 Washington generally includes the area within a half-mile to two-mile distance from the guideway centerline, as shown in **Figure 2.1**. It encompasses five cities, Commerce, Montebello, Pico Rivera, Santa Fe Springs, and Whittier, and communities of unincorporated East Los Angeles and Whittier-Los Nietos. The DSA for Alternative 2 Atlantic to Commerce/Citadel IOS and Alternative 3 Atlantic to Greenwood IOS, does not extend as far to the east. As shown in **Figure 2.2** and **Figure 2.3** for Alternative 2 and Alternative 3 respectively, the DSA extends to the Rio Hondo and includes Commerce, Montebello, and unincorporated East Los Angeles.



Source: Metro; CDM Smith/AECOM JV, 2021.

Figure 2.1. Alternative 1 Washington GSA and DSA



Source: Metro; CDM Smith/AECOM JV, 2021.

Figure 2.2. Alternative 2 Atlantic to Commerce/Citadel IOS GSA and DSA



Source: Metro; CDM Smith/AECOM JV, 2021.

Figure 2.3. Alternative 3 Atlantic to Greenwood IOS GSA and DSA

2.2 Build Alternatives

This impacts report evaluates the potential environmental impacts of three Build Alternatives which have the same guideway alignment east of the existing terminus at Atlantic Station but vary in length. Alternative 1 has the longest alignment at approximately 9.0 miles with seven stations (one relocated/reconfigured and six new), two maintenance and storage facility (MSF) site options and would terminate at Lambert station on Lambert Road in the city of Whittier. Alternative 2 is approximately 3.2 miles in length with three stations, one MSF site option, and would terminate at the Commerce/Citadel station in the city of Commerce, with non-revenue lead tracks extending further into the city of Commerce to connect to the Commerce MSF site option. Alternative 3 is approximately 4.6 miles in length with four stations, two MSF site options, and would terminate at Greenwood station in the city of Montebello.

There are also design options under consideration for each of the three Build Alternatives that consist of a variation in the design of the relocated/reconfigured Atlantic Station (applicable to Alternatives 1, 2, and 3) and a variation in the station and alignment profile in Montebello (applicable to Alternatives 1 and 3). Construction and operation of one or both design options are considered and evaluated for Alternative 1 and Alternative 3.

To differentiate the impacts evaluation of a Build Alternative with or without the design option(s) incorporated, a Build Alternative without the design option(s) is referred to as the “base Alternative” (i.e., base Alternative 1). A Build Alternative with a design option incorporated is referred to by using the design option name (e.g., Alternative 1 with the Atlantic/Pomona Station Option and/or the Montebello At-Grade Option). The three Build Alternatives and the design options are described in greater detail below.

2.2.1 Alternative 1 Washington

Alternative 1 would extend the Metro L (Gold) Line LRT approximately 9.0 miles east from the current at-grade station at Atlantic Boulevard to an at-grade terminus at Washington Boulevard/Lambert Road in the city of Whittier. This alternative would include a relocated/reconfigured Atlantic station in an underground configuration and six new stations: Atlantic/Whittier (underground), Commerce/Citadel (underground), Greenwood (aerial), Rosemead (at-grade), Norwalk (at-grade), and Lambert (at-grade). The base Alternative 1 alignment would transition from the existing at-grade alignment to an underground configuration and would transition to an aerial configuration in the city of Commerce before transitioning to at-grade at Montebello Boulevard. The alignment includes approximately 3.0 miles of tunnel, 1.5 miles of aerial, and 4.5 miles of at-grade alignment.

The Alternative 1 alignment crosses the Rio Hondo and San Gabriel River and the Rio Hondo Spreading Grounds. The existing San Gabriel River and Rio Hondo bridges would be replaced with new bridges designed to carry both the LRT facility and the four-lane roadway.

An MSF and other ancillary facilities would also be constructed as part of the Project, including overhead catenary system (OCS), cross passages, ventilation structures, traction power substation (TPSS) sites, crossovers, emergency generators, radio tower poles and equipment shelters, and other supporting facilities along the alignment.

Two design options for Alternative 1 are described below.

2.2.1.1 Guideway Alignment

Under Alternative 1, the guideway would begin at the eastern end of the existing East Los Angeles Civic Center Station, transitioning from at-grade to underground at the intersection of South La Verne Avenue and East 3rd Street. The guideway would turn south and run beneath Atlantic Boulevard to approximately Verona Street and Olympic Boulevard. The underground guideway would then curve southeast, running under Smithway Street near the Citadel Outlets in the city of Commerce. After crossing Saybrook Avenue, the guideway would daylight from underground to an aerial configuration. Depending on the MSF site option that is selected, the aerial guideway would continue parallel to Washington Boulevard, east of Garfield Avenue, and merge into the center median of Washington Boulevard (Commerce MSF site option) or merge into the center median of Washington Boulevard at Gayhart Street (Montebello MSF site option). The alignment would maintain an aerial configuration then transition to an at-grade configuration east of Carob Way and would remain at-grade in the center of Washington Boulevard. The at-grade alignment would terminate at Lambert station in the city of Whittier.

2.2.1.1.1 Design Options

The following design options are being considered for Alternative 1:

Atlantic/Pomona Station Option – The Atlantic/Pomona Station Option would relocate the existing Atlantic Station to a shallow open air underground station with two side platforms and a canopy (**Figure 2.4**). This station design option would be located beneath the existing triangular parcel bounded by Atlantic Boulevard, Pomona Boulevard, and Beverly Boulevard. The excavation depth of the station invert would be approximately 20 to 25 feet from the existing ground elevation.

This option would also impact the guideway alignment and location of the tunnel boring machine (TBM) extraction pit. The underground guideway would be located east of Atlantic Boulevard and require full property acquisitions at its footprint between Beverly Boulevard and 4th Street. The alignment would connect with the base Alternative 2 alignment just north of the proposed Atlantic/Whittier station. The TBM extraction pit would be east of Atlantic Boulevard between Repetto Street and 4th Street. Limits for the excavation would occur between the TBM extraction pit and the intersection of Pomona Boulevard and Beverly Boulevard.

Montebello At-Grade Option – This design option consists of approximately one mile of at-grade guideway along Washington Boulevard between Yates Avenue and Carob Way in the city of Montebello. In this design option, after crossing Saybrook Avenue, the LRT guideway would daylight from underground to an aerial configuration to avoid disrupting existing Burlington Northern Santa Fe (BNSF) Railway tracks. The aerial guideway would continue parallel to Washington Boulevard, then merge into the center median east of Garfield Avenue. At Yates Avenue, the guideway would transition from aerial to an at-grade configuration and remain at-grade until terminating near Lambert Road in the city of Whittier. This design option includes an at-grade Greenwood station located west of Greenwood Avenue. The lead tracks to the MSF site option would also be at-grade. Alternative 1 with the Montebello At-Grade Option would have approximately 3.0 miles of underground, 0.5 miles of aerial, and 5.5 miles of at-grade alignment.



Source: Metro; ACE Team, June 2022.

Figure 2.4. Atlantic/Pomona Station Option

2.2.2 Alternative 2 Atlantic to Commerce/Citadel IOS

Alternative 2 would extend the Metro L (Gold) Line approximately 3.2 miles from the current terminus at Atlantic Boulevard to an underground terminal station at the Commerce/Citadel station in the city of Commerce with lead tracks connecting to the Commerce MSF site option. Alternative 2 would include a relocated/reconfigured Atlantic station and two new stations: Atlantic/Whittier (underground), and Commerce/Citadel (underground). The base Alternative 2 alignment includes approximately 3.0 miles of underground, 0.1 miles of aerial, and 0.1 miles of at-grade alignment.

An MSF and other ancillary facilities would also be constructed as part of the Project, including OCS, tracks, cross passages, ventilation structures, TPSSs, track crossovers, emergency generators, radio tower poles and equipment shelters, and other facilities along the alignment.

2.2.2.1 Guideway Alignment

Under Alternative 2, the guideway would follow the same alignment as under Alternative 1. The guideway would begin at the eastern end of the existing East Los Angeles Civic Center Station, transitioning from at-grade to underground at the intersection of South La Verne Avenue and East 3rd Street. The guideway would turn south and run beneath Atlantic Boulevard to approximately Verona Street and Olympic Boulevard. The underground guideway would then curve southeast, running under Smithway Street near the Citadel Outlets in the city of Commerce. The alignment would terminate at the Commerce/Citadel station with non-revenue lead tracks connecting to the Commerce MSF site option.

2.2.2.1.1 Design Option

One design option, the Atlantic/Pomona Station Option described in **Section 2.2.1.1.1** and shown on **Figure 2.4** is being considered for Alternative 2

2.2.3 Alternative 3 Atlantic to Greenwood IOS

Alternative 3 would extend the Metro L (Gold) Line approximately 4.6 miles east from the current terminus at Atlantic Boulevard to an aerial terminal station at the Greenwood station in the city of Montebello. This alternative would include a relocated/reconfigured Atlantic station and three new stations: Atlantic/Whittier (underground), Commerce/Citadel (underground), and Greenwood (aerial). The base Alternative 3 alignment includes approximately 3.0 miles of underground, 1.5 miles of aerial, and 0.1 miles of at-grade alignment.

An MSF and other ancillary facilities would also be constructed as part of the Project, including OCS, tracks, cross passages, ventilation structures, TPSSs, track crossovers, emergency generators, radio tower poles and equipment shelters, and other facilities along the alignment.

Two design options for Alternative 3 are described below.

2.2.3.1 Guideway Alignment

Under Alternative 3, the guideway would follow the same alignment as under Alternative 1. The guideway would begin at the eastern end of the existing East Los Angeles Civic Center Station, transitioning from at-grade to underground at the intersection of South La Verne Avenue and East 3rd Street. The guideway would then turn south and run beneath Atlantic Boulevard to approximately Verona Street and Olympic Boulevard. The underground guideway would then curve southeast, running under Smithway Street near the Citadel Outlets in the city of Commerce. After crossing Saybrook Avenue, the guideway would daylight from underground to an aerial configuration. Depending on the MSF site option that is selected, the aerial guideway would continue parallel to Washington Boulevard, east of Garfield Avenue, and merge into the center median of Washington Boulevard (Commerce MSF site option) or merge into the center media of Washington Boulevard at Gayhart Street (Montebello MSF site option). The aerial guideway would terminate at the Greenwood station in the city of Montebello.

2.2.3.1.1 Design Option

Two design options described in **Section 2.2.1.1.1**, the Atlantic/Pomona Station Option and the Montebello At-Grade Option are being considered for Alternative 3. Alternative 3 with the Montebello At-Grade Option would have approximately 3.0 miles of underground, 0.5 miles of aerial, and 1.1 miles of at-grade alignment.

2.3 Maintenance and Storage Facilities

The Project has two MSF site options: the Commerce MSF site option and the Montebello MSF site option. One MSF site option would be constructed. The MSF would provide equipment and facilities to clean, maintain, and repair rail cars, vehicles, tracks, and other components of the system. The MSF would enable storage of light rail vehicles (LRVs) that are not in service and would connect to the mainline with one lead track. The MSF would also provide office space for Metro rail operation staff, administrative staff, and communications support staff. The MSF would be the primary physical employment centers for rail operation employees, including train operators, maintenance workers, supervisors, administrative, security personnel and other roles.

The Commerce MSF site option is located in the city of Commerce, and the Montebello MSF site option is located in the city of Montebello. The Commerce MSF site option is located where it could support any of the three Build Alternatives. The Montebello MSF site option is located where it could support either Alternative 1 or Alternative 3.

2.3.1 Commerce MSF

The Commerce MSF site option is located in the city of Commerce, west of Washington Boulevard and north of Gayhart Street. The site is approximately 24 acres and is bounded by Davie Avenue to the east, Fleet Street to the north, Saybrook Avenue to the west, and an unnamed street to the south. Additional acreage would be needed to accommodate the lead track and construction staging. As shown in a dashed line on **Figure 2.5**, the guideway alignment with the Commerce MSF site option would daylight from an underground to aerial configuration west of the intersection of Gayhart Street

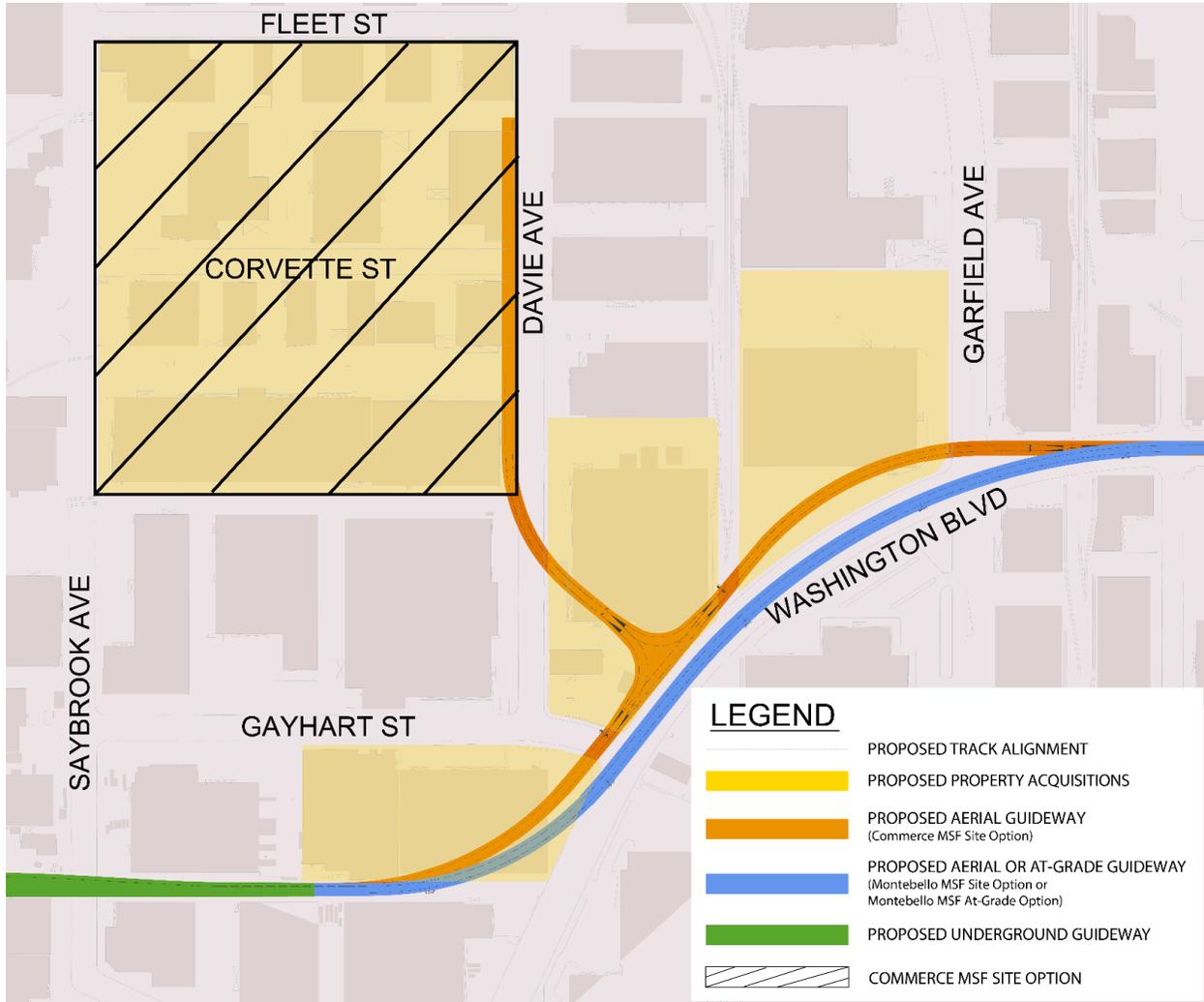
and Washington Boulevard and would run parallel to Washington Boulevard from Gayhart Street to Yates Avenue. The lead tracks to the Commerce MSF site option would be located northeast of the intersection of Gayhart Street and Washington Boulevard and extend in an aerial configuration and then would transition to at-grade within the MSF after crossing Davie Avenue. To construct and operate the Commerce MSF site option, Corvette Street would be permanently closed between Saybrook Avenue and Davie Avenue. Corvette Street is an undivided two-lane road and is functionally classified as a local street under the California Road System. The facility would accommodate storage for approximately 100 LRVs.

2.3.2 Montebello MSF

The Montebello MSF site option is located in the city of Montebello, north of Washington Boulevard and south of Flotilla Street between Yates Avenue and S. Vail Avenue. The site is approximately 30 acres in size and is bounded by S. Vail Avenue to the east, a warehouse structure along the south side of Flotilla Street to the north, Yates Avenue to the west, and a warehouse rail line to the south. Additional acreage would be needed to accommodate the lead track and construction staging. As shown on in a solid line on **Figure 2.5**, as with the Commerce MSF site option, the guideway alignment with the Montebello MSF site option would daylight from an underground to an aerial configuration west of intersection of Gayhart Street and Washington Boulevard. The alignment would be located further east than the alignment with the Commerce MSF site option. The aerial guideway for the Montebello MSF site option would transition to the median of Washington Boulevard at Gayhart Street. Columns that would provide structural support for the aerial guideway would be installed in the median of Washington Boulevard and would require roadway reconfiguration and striping on Washington Boulevard.

The lead tracks would be in an aerial configuration from Washington Boulevard, parallel S. Vail Avenue, and then transition to at-grade as it approaches the MSF. The facility would accommodate storage for approximately 120 LRVs.

The Montebello MSF At-Grade Option includes an at-grade configuration for the lead tracks to the Montebello MSF. This design option would be necessary if the Montebello At-Grade Option is selected under Alternative 1 or Alternative 3. In this design option, the lead tracks would be in an at-grade configuration from Washington Boulevard, paralleling S. Vail Avenue and remain at-grade to connect to the Montebello MSF site option. For this design option, through access on Acco Street to Vail Avenue would be eliminated and cul-de-sacs would be provided on each side of the lead tracks to ensure that access to businesses in this area is maintained. Acco Street is an undivided two-lane road and is functionally classified as a local street under the California Road System.



Source: Metro; ACE Team, June 2022.

Figure 2.5. Montebello MSF S-Curve Alignment

2.4 Ancillary Facilities

The Build Alternatives would require a number of additional elements to support vehicle operations, including but not limited to the OCS, tracks, crossovers, cross passages, ventilation structures, TPSS, train control houses, electric power switches and auxiliary power rooms, communications rooms, radio tower poles and equipment shelters, and an MSF. Alternatives 1, 2, and 3 would have an underground alignment of approximately 3 miles in length between La Verne and Saybrook Avenue. Per Metro's Fire Life Safety Criteria, ventilation shafts and emergency fire exits would be installed along the tunnel portion of the alignment. These would be located at the underground stations or public right-of-way (ROW). The alignment for Alternative 1 and Alternative 3 would travel along the median of the roadway for most of the route. The precise location of ancillary facilities would be determined in a subsequent design phase.

2.5 Proposed Stations

The following stations would be constructed under Alternative 1:

- Atlantic (Relocated/Reconfigured) – The existing Atlantic Station would be relocated and reconfigured to an underground center platform station located beneath Atlantic Boulevard south of Beverly Boulevard in East Los Angeles. The existing parking structure located north of the 3rd Street and Atlantic Boulevard intersection would continue to serve this station.
- Atlantic Pomona Station Option – The Atlantic/Pomona Station Option would relocate the existing Atlantic Station to a shallow underground open-air station with two side platforms and a canopy. This station design option would be located beneath the existing triangular parcel bounded by Atlantic Boulevard, Pomona Boulevard, and Beverly Boulevard. The existing parking structure located north of the 3rd Street and Atlantic Boulevard intersection would continue to serve this station.
- Atlantic/Whittier – This station would be underground with a center platform located beneath the intersection of Atlantic and Whittier Boulevards in East Los Angeles. Parking would not be provided at this station.
- Commerce/Citadel – This station would be underground with a center platform located beneath Smithway Street near the Citadel Outlets in the city of Commerce. Parking would not be provided at this station.
- Greenwood – This station would be aerial with a side platform located in the median of Washington Boulevard east of Greenwood Avenue in the city of Montebello. This station would provide a surface parking facility near the intersection of Greenwood Avenue and Washington Boulevard.
 - Under the Montebello At-Grade Option, Greenwood station would be an at-grade station located west of the intersection at Greenwood and Washington Boulevard.
- Rosemead – This station would be at-grade with a center platform located in the center of Washington Boulevard west of Rosemead Boulevard in the city of Pico Rivera. This station would provide a surface parking facility near the intersection of Rosemead and Washington Boulevards.
- Norwalk – This station would be at-grade with a center platform located in the median of Washington Boulevard east of Norwalk Boulevard in the city of Santa Fe Springs. This station would provide a surface parking facility near the intersection of Norwalk and Washington Boulevards.
- Lambert – This station would be at-grade with a center platform located south of Washington Boulevard just west of Lambert Road in the city of Whittier. This station would provide a surface parking facility near the intersection of Lambert Road and Washington Boulevard.

Alternative 2 would include Atlantic (Relocated/Reconfigured), Atlantic/Whittier, and Commerce/Citadel stations as described above.

Alternative 3 would include Atlantic (Relocated/Reconfigured), Atlantic/Whittier, Commerce/Citadel, and Greenwood stations as described above.

Station amenities would include items in the Metro Systemwide Station Standards Policy (Metro 2018) such as station pin signs, security cameras, bus shelters, benches, emergency/information telephones, stairs, map cases, fare collection, pedestrian and street lighting, hand railing, station landscaping, trash receptacles, bike racks and lockers, emergency generators, power boxes, fire hydrants, and artwork. Escalators and elevators would be located in aerial and underground stations. Station entry portals would be implemented at underground stations. Station access would be ADA-compliant and also have bicycle and pedestrian connections. Details regarding most of these items, including station area planning and urban design, would be determined at a later phase.

2.6 Description of Construction

Construction of the Project would include a combination of elements dependent upon the locally preferred alternative. The major construction activities include guideway construction (at-grade, aerial, underground); decking and tunnel boring for the underground guideway; station construction; demolition; utility relocation and installation work; street improvements including sidewalk reconstruction and traffic signal installation; retaining walls; LRT operating systems installation including TPSS and OCS; parking facilities; an MSF; and construction of other ancillary facilities. Alternative 1 would include construction of bridge replacements over the San Gabriel and Rio Hondo Rivers.

In addition to adhering to regulatory compliance, the development of the Project would employ conventional construction methods, techniques, and equipment. All work for development of the LRT system would conform to accepted industry specifications and standards, including Best Management Practices (BMP). Project engineering and construction would, at minimum, be completed in conformance with the regulations, guidelines, and criteria, including, but not limited to, Metro Rail Design Criteria (MRDC) (Metro 2018), California Building Code, Metro Operating Rules, and Metro Sustainability Principles.

The construction of the Project is expected to last approximately 60 to 84 months. Construction activities would shift along the corridor so that overall construction activities should be relatively short in duration at any one point. Most construction activities would occur during daytime hours. For specialized construction tasks, it may be necessary to work during nighttime hours to minimize traffic disruptions. Traffic control and pedestrian control during construction would follow local jurisdiction guidelines and the Manual of Uniform Traffic Control Devices (MUTCD) standards. Typical roadway construction traffic control methods and devices would be followed including the use of signage, roadway markings, flagging, and barricades to regulate, warn, or guide road users. Properties adjacent to the Project's alignment would be used for construction staging. The laydown and storage areas for construction equipment and materials would be established in the vicinity of the Project within parking facilities, and/or on parcels that would be acquired for the proposed stations and MSF site options. Construction staging areas would be used to store building materials, construction equipment, assemble the TBM, temporary storage of excavated materials, and serve as temporary field offices for the contractor.

2.7 Description of Operations

The operating hours and schedules for Alternatives 1, 2, and 3 would be comparable to the weekday, Saturday and Sunday, and holiday schedules for the Metro L (Gold) Line (effective 2019). It is anticipated that trains would operate every day from 4:00 am to 1:30 am. On weekdays, trains would operate approximately every 5 to 10 minutes during peak hours, every 10 minutes mid-day and until 8:00 pm, and every 15 minutes in the early morning and after 8:00 pm. On weekends, trains would operate every 10 minutes from 9:00 am to 6:30 pm, every 15 minutes from 7:00 am to 9:00 am and from 6:30 pm to 7:30 pm, and every 20 minutes before 7:00 am and after 7:30 pm. These operational headways are consistent with Metro design requirements for future rail services.

2.8 No Project Alternative

The No Project Alternative establishes impacts that would reasonably be expected to occur in the foreseeable future if the Project were not approved. The No Project Alternative would maintain existing transit service through the year 2042. No new transportation infrastructure would be built within the GSA aside from projects currently under construction or funded for construction and operation by 2042 via the 2008 Measure R or 2016 Measure M sales taxes. The No Project Alternative would include highway and transit projects identified for funding in Metro's 2020 Long Range Transportation Plan (LRTP) and Southern California Association of Governments (SCAG) *Connect SoCal 2020-2045 Regional Transportation Plan/Sustainable Communities Strategy* (2020 RTP/SCS). The No Project Alternative includes existing projects from the regional base year (2019) and planned regional projects in operation in the horizon year (2042).

3.0 REGULATORY FRAMEWORK

3.1 Definitions

3.1.1 Noise

Noise is defined as unwanted sound. Several factors affect the actual level and quality of sound (or noise) as perceived by the human ear: loudness, pitch (or frequency), and time variation. The loudness, or magnitude, of noise determines its intensity and is measured in decibels (dB) that can range from below 40 dB (the rustling of leaves) to over 100 dB (a rock concert). Pitch describes the character and frequency content of noise, such as the very low “rumbling” noise of stereo subwoofers or the very high-pitched noise of a piercing whistle. Finally, the time variation of noise sources can be characterized as continuous, such as a building ventilation fan; intermittent, such as the passing of trains; or impulsive, such as pile-driving activities during construction. From this point forward in the document, the word “noise” means “sound.”

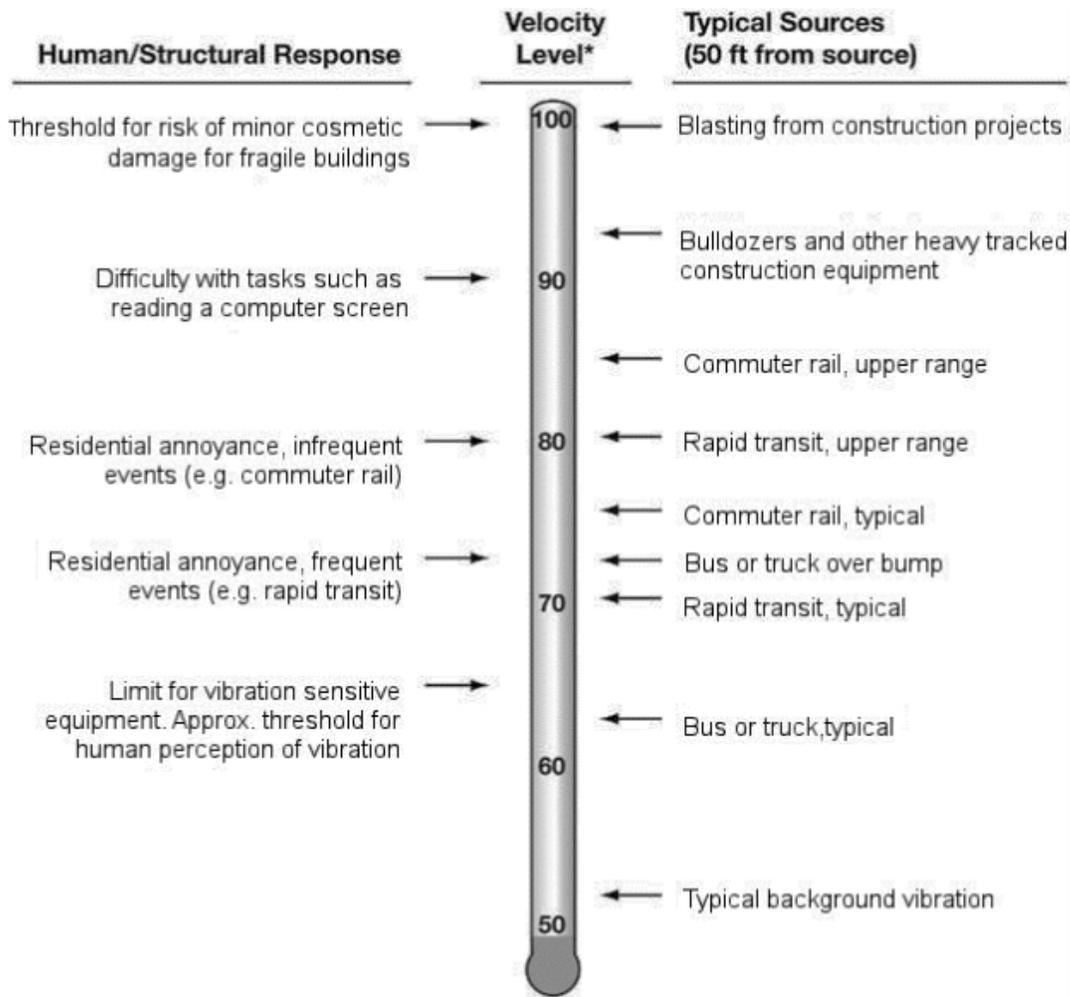
Various sound levels are used to quantify noise from transit sources, including a sound’s loudness and tonal character. For example, the A-weighted decibel (dBA) is commonly used to describe the overall noise level because it more closely matches the human ear’s response to audible frequencies. See **Table 3-1**.

Table 3-1. A-Weighted Noise Descriptors

Noise Metric	Description
L _{max}	Represents the maximum noise level that occurs during an event such as a bus or train passing by.
L _{eq} (h)	Represents a level of constant noise with the same acoustical energy as the fluctuating noise levels observed during a given interval, such as one hour.
L _{dn}	The 24-hour day-night noise level that includes a 10-dBA penalty for all nighttime activity between 10 pm and 7 am. The 10-dBA penalty is an adjustment factor added to all nighttime noise events to reflect the heightened sensitivity of residents who are sleeping.

Source: Transit Noise and Vibration Impact Assessment Manual, Federal Transit Administration (FTA), Washington DC, Sept 2018.
 Key: L_{max} = maximum noise level; L_{eq}(h) = average hourly equivalent noise level; L_{dn} = average day-night noise level

Since human hearing is less responsive to low frequency noise, the tonal character of A-weighted noise levels reflects mid- to high-frequency sounds, which are more audible to most listeners. Since the A-weighted decibel scale is logarithmic, a 10 dBA increase in a noise level is generally perceived as a doubling of loudness, while a 3 dBA increase in a noise level is just barely perceptible to the human ear. Typical A-weighted noise levels from transit and other common sources are summarized below in **Figure 3.1**. The noise thermometer is intended to show the different levels as measured from a reference distance of 50 feet from the source.



* RMS Vibration Velocity Level in VdB relative to 10^{-6} inches/second

Source: Transit Noise and Vibration Impact Assessment Manual, FTA, Washington DC, Sept 2018.

Figure 3.2. Typical Levels of Ground-Borne Vibration

Unlike noise, which travels in air, transit vibration typically travels along the surface of the ground. Depending on the geological properties of the surrounding terrain and the type of building structure exposed to transit vibration, vibration propagation (i.e., the method by which vibration waves travel through a medium, such as the ground or building structures) can be more or less efficient. Buildings with a solid foundation set in bedrock are “coupled” more efficiently to the surrounding ground and experience relatively higher vibration levels than buildings located in sandier soil. On the other hand, heavier buildings (such as masonry structures) are less susceptible to GBV than wood-frame buildings because they absorb more of the vibration.

Vibration induced by passing vehicles can generally be discussed in terms of displacement, velocity, or acceleration. However, human responses and responses by monitoring instruments and other objects are most accurately described with velocity. Therefore, the vibration velocity level is used to assess vibration impacts from transit projects.

To describe the human response to vibration, the average vibration amplitude (called the root mean squared, [RMS], amplitude) is used to assess impacts. The RMS velocity level is expressed in inches per second (ips) or VdB. All VdB vibration levels are referenced to 1 micro-inch per second (μ ips). Similar to noise dB, vibration dBs are dimensionless because they are referenced to (i.e., divided by) a standard level (such as 1×10^{-6} ips in the U.S.). This convention allows compression of the scale over which vibration occurs, such as 40-100 VdB rather than 0.0001 ips to 0.1 ips.

The FTA has established noise and vibration assessment methodologies and criteria for transit projects. These are applied here. For future construction, Metro would make every effort to be consistent with local noise ordinances based on Metro baseline specifications Section 015619, Construction Noise and Vibration Control, although as a state-chartered transportation agency it is not required to do so.

3.2 Federal

3.2.1 Noise

3.2.1.1 Operational Noise

The FTA's guidance manual, the *Transit Noise and Vibration Impact Assessment Manual*, September 2018, presents the basic concepts, methods, and procedures for evaluating the extent and severity of noise impacts from transit projects and is used in this analysis. Federal guidance from FTA is relevant to this CEQA assessment as the State of California does not provide a specific assessment methodology; therefore, the FTA guidance is applied to assess noise and vibration. Transit noise impacts are assessed based on land use categories and sensitivity to noise from transit sources under the FTA guidelines. As summarized in **Figure 3.3**, the FTA noise impact criteria are defined by two curves that allow project noise levels to increase as existing noise increases up to a point, beyond which impact is determined to occur based on project noise alone. The FTA land use categories and applicable noise metrics are described in **Table 3-2**.

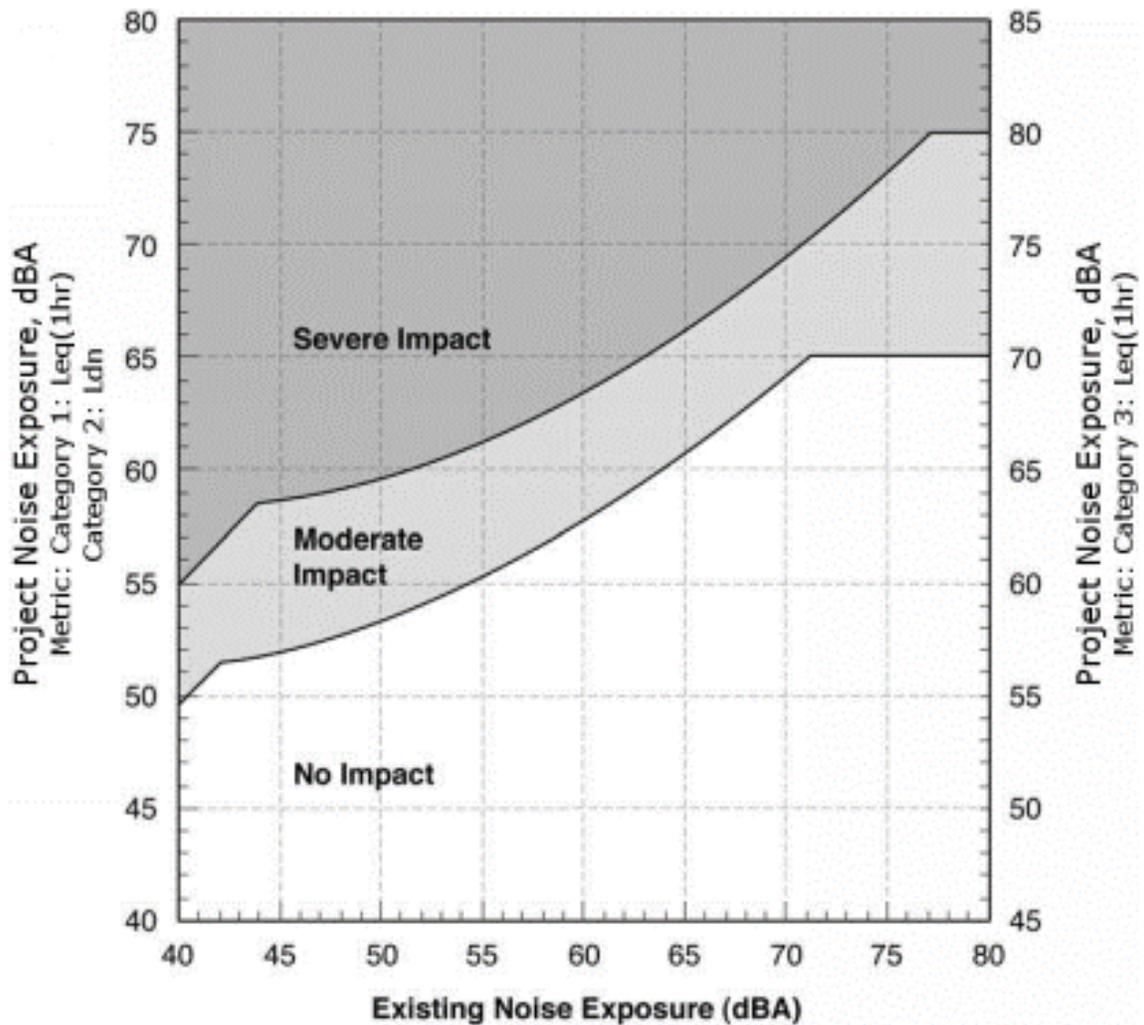
Table 3-2. FTA Land Use Categories and Noise Metrics

Land Use Category	Noise Metric	Description
1	Leq(h)	Tracts of land set aside for serenity and quiet, such as outdoor amphitheaters, concert pavilions, and historic landmarks.
2	Ldn	Buildings used for sleeping, such as residences, hospitals, hotels, and other areas where nighttime sensitivity to noise is of utmost importance.
3	Leq(h)	Institutional land uses with primarily daytime and evening uses, including schools, libraries, churches, museums, cemeteries, historic sites, parks, and certain recreational facilities used for study or meditation.

Source: Transit Noise and Vibration Impact Assessment Manual, FTA, Washington DC, Sept 2018.

The FTA noise criteria create two categories of impact: moderate and severe impact. The moderate impact threshold defines areas where the change in noise is noticeable, but may not be sufficient to cause a strong, adverse community reaction. The severe impact threshold defines the noise limits above which a significant percentage of the population would be highly annoyed by new noise. The level of impact at any specific site can be established by comparing the predicted future project noise level at the site to the existing noise level there. For example, for residences and other FTA Category 2 land uses with an existing noise level of 65 dBA, a moderate impact would occur with a future project noise level in the range from 61 to 66 dBA, while a severe impact would occur with a future project noise level greater than 66 dBA.

The FTA noise impact criteria for all three land use categories are summarized in **Figure 3.3**.



Source: Transit Noise and Vibration Impact Assessment Manual, FTA, Washington DC, Sept 2018.

Figure 3.3. Noise Impact Criteria for Transit Projects

The average day-night noise level (Ldn) over a 24-hour period is used to characterize noise exposure for residential areas (FTA Category 2). The Ldn descriptor describes a receptor's cumulative noise exposure from all events over a full 24 hours, with events between 10 pm and 7 am increased by 10 dB to account for greater nighttime sensitivity to noise. Similarly, the average hourly equivalent noise level (Leq(h)) during the facility's peak operating period is used to characterize noise exposure at all other noise-sensitive land uses, such as schools and libraries (FTA Category 3) or outdoor amphitheaters (FTA Category 1).

3.2.1.2 Construction Noise

During the environmental analysis phase of a project, construction details are limited. Therefore, the FTA guidelines suggest evaluating prototypical construction scenarios against local ordinances or the FTA one-hour Leq thresholds summarized in **Table 3-3** (FTA Recommended Construction Noise Limits [dBA]) if no other applicable criteria are available. The FTA design guidelines, for example, are evaluated against noise levels from the two loudest pieces of equipment (such as a crane and a dump truck) that, under worst-case conditions, are assumed to operate continuously for one hour during both the daytime (7 am to 10 pm) and nighttime (10 pm to 7 am) periods.

Table 3-3. FTA Recommended Construction Noise Limits (dBA)¹

Land Use Category	Construction Period	
	Daytime (7 am – 10 pm)	Nighttime (10 pm – 7 am)
Residential	90	80
Commercial (non-residential)	100	100
Industrial	100	100

Source: Transit Noise and Vibration Impact Assessment Manual, FTA, Washington DC, Sept 2018

Note:

¹ The recommended construction evaluation criteria are evaluated against the one-hour equivalent noise level from the two loudest pieces of equipment.

3.2.2 Vibration

3.2.2.1 Operational and Construction Vibration

The FTA vibration criteria for evaluating GBV impacts from transit operations (such as train passbys) and construction at nearby sensitive receptors are summarized in **Table 3-4**. These vibration criteria are related to RMS GBV levels that are expected to result in human annoyance. The FTA's experience with community response to GBV indicates that when there are fewer vibration events per day, it would take higher vibration levels to evoke the same community response that would be expected from more frequent events. This is taken into account in the FTA criteria to distinguish projects with frequent, occasional, and infrequent events, where a frequent event category is defined as more than 70 events per day. Similarly, the occasional event category is defined as 30 to 70 events per day and the infrequent category as fewer than 30 events per day. The FTA frequent criteria were used to assess operational GBV impacts along the Build Alternatives. The FTA infrequent criteria were used to assess construction GBV along the Build Alternatives.

The vibration criteria levels summarized in **Table 3-4** are defined in terms of human annoyance for land use categories such as high sensitivity (Category 1), residential (Category 2), and institutional (Category 3). In general, the vibration threshold of human perceptibility is approximately 65 VdB.

For above-grade (i.e., at-grade or elevated) sections of transit systems, LRT operations are typically not a significant source of vibration-induced ground-borne noise (GBN), except for buildings that have sensitive interior spaces and that are well insulated from exterior noise. Airborne noise often masks GBN for above ground transit system sections.

GBN from underground sections of transit systems may be audible and the FTA's guidance manual, the *Transit Noise and Vibration Impact Assessment Manual*, September 2018, provides procedures for evaluating the extent and severity of noise impacts from below grade transit alignments. The FTA vibration criteria for evaluating GBN impacts from transit operations (such as train passbys) and construction at nearby sensitive receptors are summarized in **Table 3-4**. The frequent event category is applied for train passbys.

Table 3-4. Ground-Borne RMS Vibration Impact Criteria for Annoyance During Transit Operations and Construction (VdB)

Receptor Land Use		GBV Impact Levels RMS Vibration Levels (VdB) ¹			GBN Impact Levels dB re 20 micro Pascals		
Category	Description	Frequent Events ²	Occasional Events ²	Infrequent Events ²	Frequent Events ²	Occasional Events ²	Infrequent Events ²
1	Buildings where low vibration is essential for interior operations	65	65	65	N/A	N/A	N/A
2	Residences and buildings where people normally sleep	72	75	80	35 dBA	38 dBA	43 dBA
3	Daytime institutional and office use	75	78	83	40 dBA	43 dBA	48 dBA
Specific Buildings	TV/Recording Studios/Concert Halls	65	65	65	25 dBA	25 dBA	25 dBA
	Auditoriums	72	80	80	30 dBA	38 dBA	38 dBA
	Theaters	72	80	80	35 dBA	43 dBA	43 dBA

Source: Transit Noise and Vibration Impact Assessment Manual, FTA, Washington DC, Sept 2018.

Notes:

¹ Ground-borne vibration levels are referenced to 1×10^{-6} inches per second (VdB re 1 micro-inch/sec).

² The frequent event category is defined as more than 70 events per day, the occasional event category as 30 to 70 events per day, and the infrequent category as fewer than 30 events per day.

Key: RMS = Root mean square; N/A = not applicable; dBA = A-weighted decibels; VdB = vibration decibels

3.3 State

The state of California does not have applicable limits for operational or construction noise, or for operational or construction vibration.

3.4 Local

Local ordinances regarding noise and vibration are typically “qualitative” in that they refer to noise “annoyance” from public disturbances. However, several local jurisdictions do limit the period of construction activities to the daytime period when ambient noise levels are typically higher, and most people are not sleeping. During construction, Metro’s contractor would conduct activities to be consistent with local noise ordinances whenever feasible and reasonable, although as a state-chartered transportation agency Metro is not required to do so.

4.0 METHODOLOGY

4.1 Screening Assessment

A screening assessment using screen distances identified in **Table 4-1** and **Table 4-2** was conducted to identify the location and land use category of noise- and vibration-sensitive receptors along the Build Alternatives. These include residential areas and buildings such as hospitals, schools, churches, parks, and noise-sensitive historic resources. The list of noise-sensitive community facilities and historic resources was obtained through analysis from the Eastside Transit Corridor Phase 2 Cultural Resources Impacts Report and the Community and Neighborhoods Impacts Report.

Table 4-1. Screening Distance for Noise Assessments (FTA)

Project Systems		Screening Distance, ft*	
		Unobstructed	Intervening Buildings
Fixed-Guideway Systems			
Commuter Rail Mainline		750	375
Commuter Rail Station	With Horn Blowing	1,600	1,200
	Without Horn Blowing	250	200
Commuter Rail Road Crossing with Horns and Bells		1,600	1,200
RRT		700	350
RRT Station		200	100
LRT		350	175
Streetcar		200	100
Access Roads to Stations		100	50
Low and Intermediate Capacity Transit	Steel Wheel	125	50
	Rubber Tire	90	40
	Monorail	175	70
Yards and Shops		1000	650
Parking Facilities		125	75
Access Roads to Parking		100	50
Ancillary Facilities: Ventilation Shafts		200	100
Ancillary Facilities: Power Substations		250	125
Bus Systems			
Busway		500	250
Bus Rapid Transit (BRT) on exclusive roadway		200	100
Bus Facilities	Access Roads	100	50
	Transit Mall	225	150
	Transit Center	225	150
	Storage & Maintenance	350	225
	Park & Ride Lots w/Buses	225	150
Ferry Boat Terminals		300	150

*Measured from centerline of guideway for fixed-guideway sources, from the ROW on both sides of the roadway for highway/transit sources, from the center of noise-generating activity for stationary sources, or from the outer boundary of the proposed project site for fixed facilities spread out over a large area.

Source: Transit Noise and Vibration Impact Assessment Manual, Table 4-7, FTA, Washington DC, Sept 2018.

Table 4-2. Assumptions for Screening Distances for Noise Assessments (FTA)

Type of Project		Operations	Speeds*	Metric**
Fixed-Guideway Systems				
Commuter Rail Mainline		66 day / 12 night; 1 loco, 6 cars	55 mph	L _{dn}
Commuter Rail Station	With Horn Blowing	22 day / 4 night	N/A	L _{dn}
	Without Horn Blowing	22 day / 4 night	N/A	L _{dn}
Commuter Rail-Highway Crossing with Horns and Bells		22 day / 4 night	55 mph	L _{dn}
RRT		220 day / 24 night; 6-car trains	50 mph	L _{dn}
RRT Station		220 day / 24 night	20 mph	L _{dn}
LRT		150 day / 18 night; 2 artic veh.	35 mph	L _{dn}
Streetcar		150 day / 18 night	25 mph	L _{dn}
Access Roads to Stations		1000 cars, 12 buses	35 mph	L _{eq(1hr)}
Low and Intermediate Capacity Transit	Steel Wheel	220 day / 24 night	30 mph	L _{dn}
	Rubber Tire	220 day / 24 night	30 mph	L _{dn}
	Monorail	220 day / 24 night	30 mph	L _{dn}
Yards and Shops		20 train movements	N/A	L _{eq(1hr)}
Parking Facilities		1000 cars	N/A	L _{eq(1hr)}
Access Roads to Parking		1000 cars	35 mph	L _{eq(1hr)}
Ancillary Facilities: Ventilation Shafts		Rapid Transit in Subway	50 mph	L _{dn}
Ancillary Facilities: Power Substations		Sealed shed, air conditioned	N / A	L _{dn}
Bus Systems				
Busway		30 buses, 120 automobiles	50 mph	L _{eq(1hr)}
BRT on exclusive roadway		30 buses	35 mph	L _{eq(1hr)}
Bus Facilities	Access Roads	1000 cars	35 mph	L _{eq(1hr)}
	Transit Mall	20 buses	N/A	L _{eq(1hr)}
	Transit Center	20 buses	N/A	L _{eq(1hr)}
	Storage & Maintenance	30 buses	N/A	L _{eq(1hr)}
	Park & Ride Lots w/Buses	1000 cars, 12 buses	N/A	L _{eq(1hr)}
Ferry Boat Terminals		8 boats with horns used in normal docking cycle	N/A	L _{eq(1hr)}

*N/A = not applicable

**L_{eq(1hr)} = the loudest hour of project related activity during hours of noise sensitivity.

Source: Transit Noise and Vibration Impact Assessment Manual, Table 4-8, FTA, Washington DC, Sept 2018.

To determine the existing background noise levels at sensitive receptors in the vicinity of the proposed transit rail corridor alignment, a noise monitoring program was conducted at 12 representative locations selected based on the FTA guidelines (shown in **Figure 6.1**). An average hourly equivalent noise level [or Leq(h) in dBA] was measured during the peak hour at non-residential or institutional sites (such as schools and parks) and continuously over a 24-hour period at residential sites to determine the average ambient conditions during a typical weekday. The noise measurements document existing noise sources along the DSA, such as existing aircraft traffic overhead and background traffic. At residences and other FTA Category 2 land uses (described in **Table 3-2**), 24-hour L_{dn} were reported in accordance with the FTA guidelines. Similarly, peak-hour equivalent noise levels were measured at non-residential or institutional receptors such as schools and parks.

Since the intent of the noise monitoring program was not to document the background noise level at every receptor, sites were strategically selected to document existing noise exposure at different residential clusters along the proposed alignments. The noise levels from these existing sources were adjusted to reflect distance propagation to other nearby clusters of residences and other noise-sensitive uses where appropriate. The measured noise levels were applied to these other noise-

sensitive receptor sites based on their similarities to nearby roadways and intersections, land use densities, and geographical distance from the monitoring sites.

The sound-level meters that were used to measure current noise conditions meet American National Standards Institute (ANSI) standards for Type I meters. The sound-level meters were calibrated before and after each measurement. All measurements were conducted according to ANSI Standard S1.13-2005, Measurement of Sound Pressure Levels in Air. All noise levels are reported in dBA, which approximate the sensitivity of human hearing.

4.2 Noise Evaluation

Noise impacts were evaluated using the FTA's "Detailed Assessment" guidelines to reflect the type of input data available more accurately. However, noise impacts from the stationary sources (such as the MSF site options) were evaluated using the FTA's "General Assessment" guidelines to reflect a single large stationary source (FTA 2018). Similarly, although baseline vibration measurements were not conducted, vibration impacts were evaluated using the FTA's "General Assessment" guidelines to reflect average or typical ground conditions.

4.3 Construction Noise Assumptions

Construction noise differs from transit noise in two ways.

- Construction noise lasts for the duration of the construction contract, and it is usually limited to daylight hours when most human activity occurs. Nighttime work is usually restricted to essential construction activities when it would be unsafe or impractical to carry out the work only through the day, or when other activities may be impacted (such as road closures). Construction activities are generally of a short duration and, depending on the nature of construction operations, could last from seconds (such as for a truck passing by) to months (such as when constructing a bridge at an overpass). Transit noise occurs during all periods of the day and night and is a permanent part of the acoustical environment, such as highway noise.
- Construction noise is also intermittent and depends on the type of operation, location, and function of the equipment as well as the equipment usage cycle. Transit noise, on the other hand, is present in a more continuous fashion after construction activities are completed.

An analysis was prepared to estimate the potential for noise impacts during temporary construction activities. Details of the proposed construction activities are normally developed in the later project stages after a transit agency retains the services of the construction contractor for the Project. Therefore, short-term construction impacts from the Project were evaluated based on prototypical construction tasks and equipment summarized in the Eastside Transit Corridor Phase 2 Construction Impacts Report. Typical construction activities could include, for example, aerial and surface trackwork, cut and cover excavation, utility relocation, station construction, and retaining wall construction.

Based on the FTA guidelines, the two loudest pieces of equipment (such as jack hammers and dump trucks) were selected to operate at full power over a period of one hour. The cumulative noise level at the closest noise-sensitive receptor was used to estimate the level of impact.

The resultant noise level was compared with the FTA recommended construction noise limits from **Table 3-3** to determine the onset of impact. Conservative assumptions (such as no shielding effects from existing structures or temporary noise barriers) were utilized to estimate the potential for impact.

The following construction scenarios were selected to be representative of the types of activities expected during construction of the Project:

- track-laying (at-grade)
- track-laying (aerial)
- excavation and boring
- station construction
- bridge construction
- parking facility construction
- MSF site option construction

The equipment types and the maximum FTA reference noise levels are summarized in **Table 4-3** for each of the selected prototypical construction scenarios using the loudest pieces of equipment. Although numerous equipment types would be used during each scenario as determined by the contractor, the FTA guidelines suggest using only the two loudest pieces during the preliminary noise impact assessment.

Table 4-3. Construction Scenario Equipment Noise Reference Lmax Levels¹ for the Two Loudest Pieces of Equipment for Each Scenario (dBA)

Equipment Type	Construction Scenario		Stations	Bridges	Parking	MSF
	At-grade	Aerial				
Crane, Derrick	--	88	--	--	88	--
Grader	85	--	85	85	85	--
Jack Hammer	--	--	--	88	--	--
Loader	--	--	--	--	--	85
Tie Inserter	85	--	--	--	--	--
Truck	--	88	88	--	--	88

Source: Morgner, 2019 and 2021.

Notes:

¹ Default FTA noise levels reported at a reference distance of 50 feet.

Key: -- = Equipment type not included in the selected construction scenario.

4.4 Operational Noise Assumptions

The reference noise levels for each of the proposed noise sources (such as train passbys and wheel squeal) and other operating characteristics (such as average dwell times and source heights), are summarized in **Table 4-4** and **Table 4-5**. These data are based on default FTA data, as well as

information included in other recent Metro studies, such as the *Crenshaw/LAX Transit Corridor Final Environmental Impact Statement (EIS)/EIR* (2011). Operations data is summarized for various peak and off-peak periods of the day. The assumptions used in this evaluation are listed after the tables.

Table 4-4. Summary of Noise Source Reference Data

Noise Source			Duration (sec)	Height(ft)	Noise Level (dBA) ¹	
Category	Name	Description			Lmax	SEL
LRT	Passbys	Passby operations	-- ²	2	78 ³	80
	Warning device	Onboard bell	5	10	76 ³	79 ³
	Switches/ crossovers	Special trackwork	--	0	86 ³	88
	Wheel squeal	Curves <65 feet	4	0	100	136
	Auxiliary equipment	Stations only	30 ⁴	10	70	106
Crossing bell	Grade crossing bell	Grade crossing	15 ³	10	72 ⁵	108
Parking	Park and ride	Parking facility	--	10	56	92
Yard	Maintenance yard	Yard	--	2	82	118

Source: Morgner, 2019/2020.

Notes:

1 All noise levels are reported in A-weighted decibels at a reference distance of 50 feet and a reference speed of 50 mph for passbys only.

Lmax represents the maximum noise level during an event and the sound exposure level (SEL) converts the cumulative noise energy of an event to one second. Default FTA reference levels are reported except where noted.

2 “—” means not applicable. Duration time is not used to compute passby and facility noise levels.

3 Noise levels and duration times are based on the *Metro Gold Line Phase II – Pasadena to Montclair Draft EIS/EIR Study* (April 2004).

4 The default dwell time is 30 seconds at all proposed stations.

5 The Lmax level for the crossing bell reflects a 5-dBA penalty to account for the intrusive character of the noise source.

Table 4-5. Build Alternatives Operating Characteristics

Time Period	Hours	Frequency of Service ¹	Consist Size ²
Early morning	4:00 am to 6:30 am	15	3
AM peak	6:30 am to 8:30 am	5	3
Midday	8:30 am to 4:00 pm	10	3
PM peak	4:00 pm to 7:00 pm	5	3
Early evening	7:00 pm to 8:00 pm	10	3
Late evening	8:00 pm to 1:30 am	15	3

Source: Metro, 2010/2020.

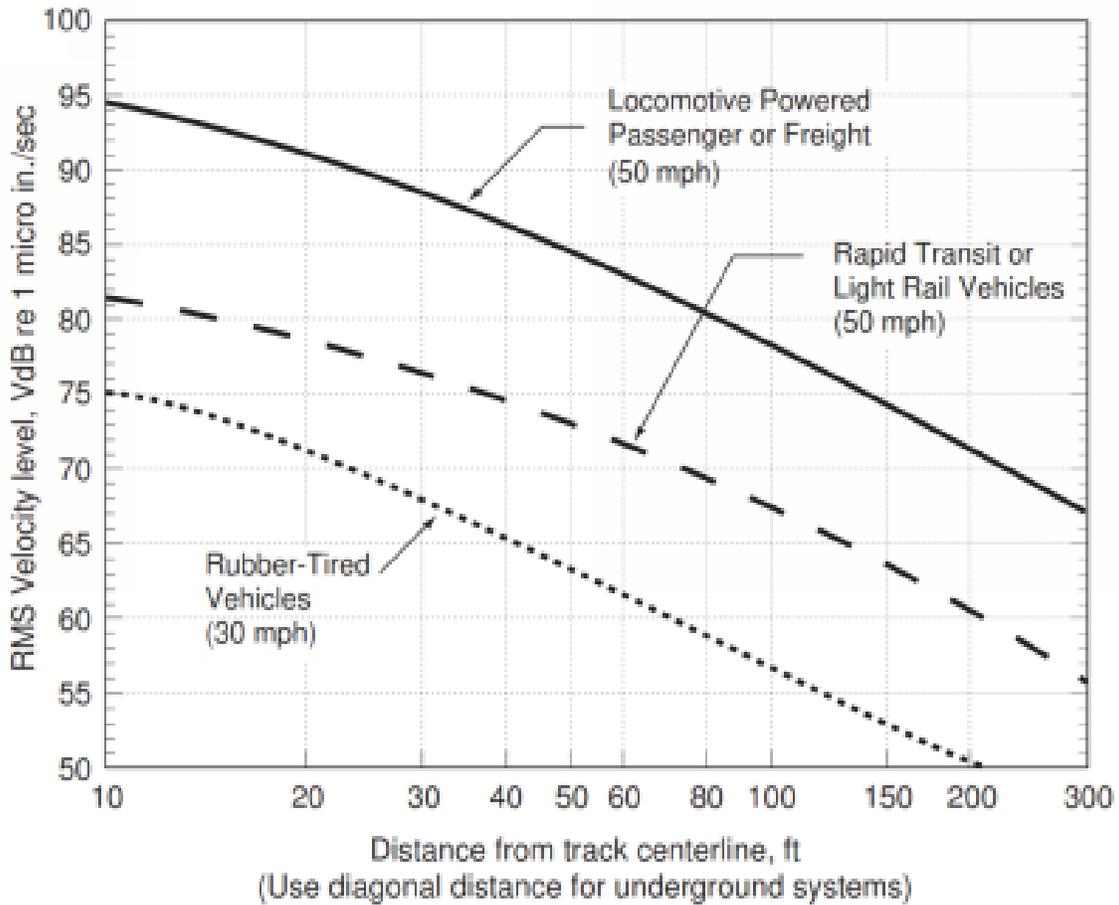
Notes:

1 The frequency of service (or headway time) is reported in minutes.

2 Consist size is the number of LRT vehicles coupled together into one train.



- Total daily operations were determined based on 5-minute headways during peak periods of the day, 10-minute headways during off-peak periods, and 15-minute headways during the late night and early morning periods.
- Operations data is summarized in **Table 4-5** for various peak and off-peak periods of the day. This service frequency is representative of a typical weekday, which includes an operating period between 4:00 am and 1:30 am.
- A three-vehicle train was assumed for all periods of the day and night.
- At stations, an average idling time of 30 seconds was used at each of the designated station stops to compute the noise contribution from stationary or auxiliary vehicle noise (such as rooftop mechanical equipment).
- Proposed train operating speeds were taken from speed profiles included in the track alignment designs, based on vehicle performance characteristics and system speed limits for the Project corridor, with a minimum speed of 20 mph and a maximum of 55 mph.
- Following Metro operating practices, train operators sound the 75 dBA warning device (i.e., the “quacker”) prior to all gate-protected crossings, starting approximately 300-feet prior to the crossing. At speeds greater than 35 mph, noise from the quacker adds less than 1 dB to the noise exposure caused by light-rail train operations. Because train speeds greater than 35 mph were assumed for all gate-protected crossings where the quacker would be sounded, the quacker was not included as a separate source in the noise analysis. It is assumed that emergency train horns would rarely be used and were not included in this analysis.
- The Project would operate on a concrete-embedded continuous welded rail (CWR) track at-grade.
- Wheel impacts at special trackwork are based on a Lmax of 86 dBA at 50 feet.
- Since all of the curves along revenue-service track are expected to be longer than 65 feet (the distance associated with the onset of wheel squeal), no wheel squeal is predicted anywhere along the Build Alternatives. Although there is a possibility of wheel squeal at the MSF due to the shorter-radius curves, these events are expected to occur infrequently.
- The vibration impacts from LRT vehicle operations were predicted using the default FTA ground surface vibration curves summarized in **Figure 4.1**. These curves were adjusted to reflect local conditions such as changes in train speed, special trackwork such as switches, and coupling to building foundations for residential wood-frame houses.
- In lieu of a solid transit barrier or parapet, open railings with no acoustical properties were used as part of the noise modeling analysis for all elevated or aerial sections of the Build Alternatives. However, the edge of the aerial structure (which is a solid footing for the railing and has an approximate height of six inches) was included in the noise modeling analysis to provide some acoustical benefits.
- Vehicular noise from the activities at the proposed parking facilities was also included in the modeling analysis using the FTA "General Assessment" guidelines.



Source: Transit Noise and Vibration Impact Assessment Manual, FTA, Washington DC, Sept 2018.

Figure 4.1. Generalized Ground Surface Vibration Curves

4.5 Vibration Monitoring Methodology

Since the Project is proposed along an alignment without an existing rail corridor, no existing vibration measurements were conducted. In general, rubber-tired vehicles with a soft suspension system, do not contribute to vibration impacts; therefore, since there are only rubber-tired vehicles in the area, no existing vibration measurements were conducted. Unlike noise, where the Project criteria are based on existing conditions, the vibration criteria are absolute, based on future service frequency alone.

The default FTA ground-surface vibration curves were used to predict future vibration levels from Metro LRT vehicles along the proposed Build Alternatives. The FTA "General Assessment" guidelines were used to determine future impacts from vibration under the proposed Build Alternatives.

4.6 Construction Vibration Assumptions

An analysis was prepared to estimate the potential for vibration impacts during temporary construction activities. Based on the FTA guidelines, the piece of equipment with the highest reference

level (such as pile drivers) was selected. The maximum vibration level at the closest vibration-sensitive receptor was used to estimate the level of impact. The resultant vibration levels were compared with the FTA ground-borne RMS vibration impact criteria for annoyance from **Table 3-4** to determine the onset of impact. Conservative assumptions (such as efficient ground propagation effects) were used to estimate the potential for impact.

4.7 Operational Vibration Assumptions

Future GBV levels from LRT passbys were predicted using the default FTA ground surface vibration curves summarized **Figure 4.1**. These curves were adjusted per the FTA methodology to reflect local conditions such as changes in train speed, special trackwork such as switches, aerial track structures, ground type and different building construction types (e.g., masonry versus timber).

4.8 Ground-Borne Noise

GBN can occur when a vibration source such as a train passby causes floors and walls to vibrate in nearby buildings, resulting in a low frequency rumble sound within the building. GBN is determined by applying adjustment factors to the predicted train vibration level that reflect the surrounding ground.

FTA has developed impact criteria to assess the potential for GBN due to transit project construction and operations (U.S. Department of Transportation 2006). Impacts of GBN typically occur from underground transit construction and operations. Where vibration impacts are predicted mitigation measures would be provided.

4.9 Roadway Traffic Noise Assumptions

Regarding traffic noise, there is a reduction in vehicle miles traveled (VMT) between the 2042 No Project Alternative and Build Alternatives. As discussed in the Eastside Transit Corridor Phase 2 Transportation and Traffic Impacts Report, VMT decreases for all Build Alternatives. Since noise is logarithmic, it takes a halving of the traffic volumes (or a 50 percent decrease), or a doubling of the traffic volumes (or a 100 percent increase) for the noise levels to change by 3 dBA (FTA 2018). The decrease in VMT would not result in a halving of traffic volumes, and, thus, the change in traffic noise due to a decrease in VMT would not be acoustically perceptible. Therefore, the Build Alternatives would result in an insignificant change in traffic noise from the No Project Alternative. As a result, no further traffic noise analysis was conducted.

4.10 Area of Potential Impact

In accordance with the *FTA Transit Noise and Vibration Impact Assessment Manual* (FTA 2018), a screening assessment was conducted to determine the location and number of noise- and vibration-sensitive receptors along the Project corridor. The FTA screening distances for operations are based on typical LRT systems and were adjusted to reflect Project-specific conditions. The FTA screening distances listed below were used to develop the population of receptors included in the noise and vibration modeling analyses.

- 350 feet – unobstructed noise screening distance
- 150 feet – unobstructed vibration screening distance

The screening distances were applied from the centerline of the proposed transit corridors to determine the area of potential impact (API).

The API for construction activities varies, depending on factors such as types and numbers of construction equipment operating in an area at the same time and the specific location and distance between the construction activity and the sensitive receptor. As mentioned, the specific types and locations of equipment in any one location are difficult to predict at this early stage of project development. Therefore, the same API used to assess operational impacts may also be used to assess the potential for construction impacts. Nevertheless, it is acknowledged that there would be some impacts and strategies to reduce or minimize the effect are detailed.

5.0 THRESHOLDS OF SIGNIFICANCE

CEQA does not provide quantitative thresholds for a substantial operational noise impact or a significant adverse vibration impact.

The thresholds for determining the significance of operational impacts for this CEQA analysis are based on the *FTA Transit Noise and Vibration Impact Assessment Manual* (FTA 2018), also referred to as the FTA Guidance Manual, and are detailed in the subsections below.

5.1 Operational Noise

As discussed in **Section 3.1.1**, the FTA Guidance Manual presents both moderate and severe noise impact thresholds. The severe noise impact criteria are used as the operational noise significance threshold for the Project.

5.2 Construction Noise

Construction noise impacts are difficult to predict at this early stage of project development, as previously stated. However, the analysis recognizes that there would be some adverse impacts during construction and describes potential measures to mitigate such impacts (see **Section 7.0** and **Section 8.0**). FTA suggests there may be adverse community reaction to daytime construction noise when levels exceed 80 dBA at residences for work at night, 90 dBA at residences for work during the day, and 100 dBA at commercial uses for work at night or during the day. Therefore, a significance threshold of 80 dBA and 90 dBA at residences during the night and day respectively and 100 dBA at commercial uses is used as the construction noise significance threshold for the Project.

5.3 Operational Vibration

The FTA has established specific operational vibration criteria for transit projects in the FTA Guidance Manual. For frequent annoyance from operational vibration (i.e., more than 70 events per day), the FTA considers an exceedance of 72 VdB at residential or other Category 2 land uses as an impact. Therefore, a significance threshold of 72 VdB at residential or other Category 2 land use is considered as the operational vibration significance threshold for the Project.

5.4 Construction Vibration

The FTA has established specific construction vibration criteria for transit projects in the FTA Guidance Manual.

- For infrequent annoyance from construction vibration (i.e., less than 30 events per day), the FTA considers an exceedance of 80 VdB at residential or other Category 2 land uses as an impact. Therefore, a significance threshold of 80 VdB at residential or other Category 2 land use is considered as the construction vibration significance threshold for the Project.
- For structural damage from construction vibration, the FTA considers an exceedance of ppv 0.2 ips for typical timber and masonry residences as an impact. An exceedance of ppv 0.2 ips for typical timber and masonry residences is Therefore, a significance threshold of ppv 0.2 ips for structural damage is considered as the construction vibration significance threshold for the Project.

5.5 CEQA Appendix G

In accordance with Appendix G of the State CEQA Guidelines, a project would have a significant impact related to noise if it would result in:

Impact NOI 1: Generation of a substantial temporary or permanent increase in ambient noise levels in the vicinity of the Project in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies.

Impact NOI 2: Generation of excessive ground-borne vibration or ground-borne noise levels.

Appendix G of the State CEQA Guidelines also includes a significance criterion for impacts relating to a project located within the vicinity of private airport airstrip or an airport land use plan, or that is located within two miles of public airport that does not have an adopted airport land use plan. The nearest public airport or airstrip to the Build Alternatives is Whittier Air Strip, which at the nearest point is over four miles to the north; therefore, this criterion is not applicable and was not evaluated.

6.0 EXISTING SETTING

As described in **Section 1.0** and shown in **Figure 6.1** below, the DSA encompasses the five cities Commerce, Montebello, Pico Rivera, Santa Fe Springs, and Whittier and communities of unincorporated East Los Angeles and Whittier-Los Nietos. The DSA for Alternative 1 generally includes the area within a half-mile to two-mile distance from the guideway centerline, as shown on **Figure 6.1**. Because the DSA for Alternative 1 also encapsulates the DSA for Alternative 2 and Alternative 3, it is used in this impacts report to characterize the existing setting.

A diverse mix of land uses are located within the DSA, including single- and multi-family residences, commercial and retail uses, industrial development, parks and recreational, health and medical uses, educational institutions, flood control facilities, and vacant land. The Project would traverse densely populated, low-income, and heavily transit-dependent communities with major activity centers within the Gateway Cities subregion of Los Angeles County.

6.1 Existing Noise

The locations at which existing background noise levels were measured are shown in **Figure 6.1** and identified in **Table 6-1**. **Table 6-1** also shows the measured day-night noise levels along the Project corridor Build Alternatives. Noise levels range from 57 dBA at Receptor Mo4 (740 1/2 Woods Avenue) to 71 dBA at Receptors Mo6 (860 Washington Boulevard) and M10 (7857 Milna Avenue). In general, the lower noise levels represent urban locations with city streets.

Measured peak-hour noise levels along the Project corridor Build Alternatives range from 57 dBA at Receptor Mo4 (740 1/2 Woods Avenue) to 73 dBA at Receptor Mo8 (9122 Washington Boulevard). These levels are representative of active urban land uses.

In general, the Build Alternatives consist of a mix of residential and commercial communities along urban arterials. Based on the monitoring results, the high ambient noise conditions identified in **Table 6-1** reflect the proximity of residences to heavily-used transportation corridors.

6.2 Existing Vibration

The DSA for all Build Alternatives is dominated by busy auto-oriented corridors, including busy city streets and congested highways. Therefore, although no vibration measurements were conducted, current ambient vibration levels are dominated by vehicular traffic, particularly heavy trucks at locations adjacent to active roadways such as Atlantic Boulevard and Washington Boulevard.

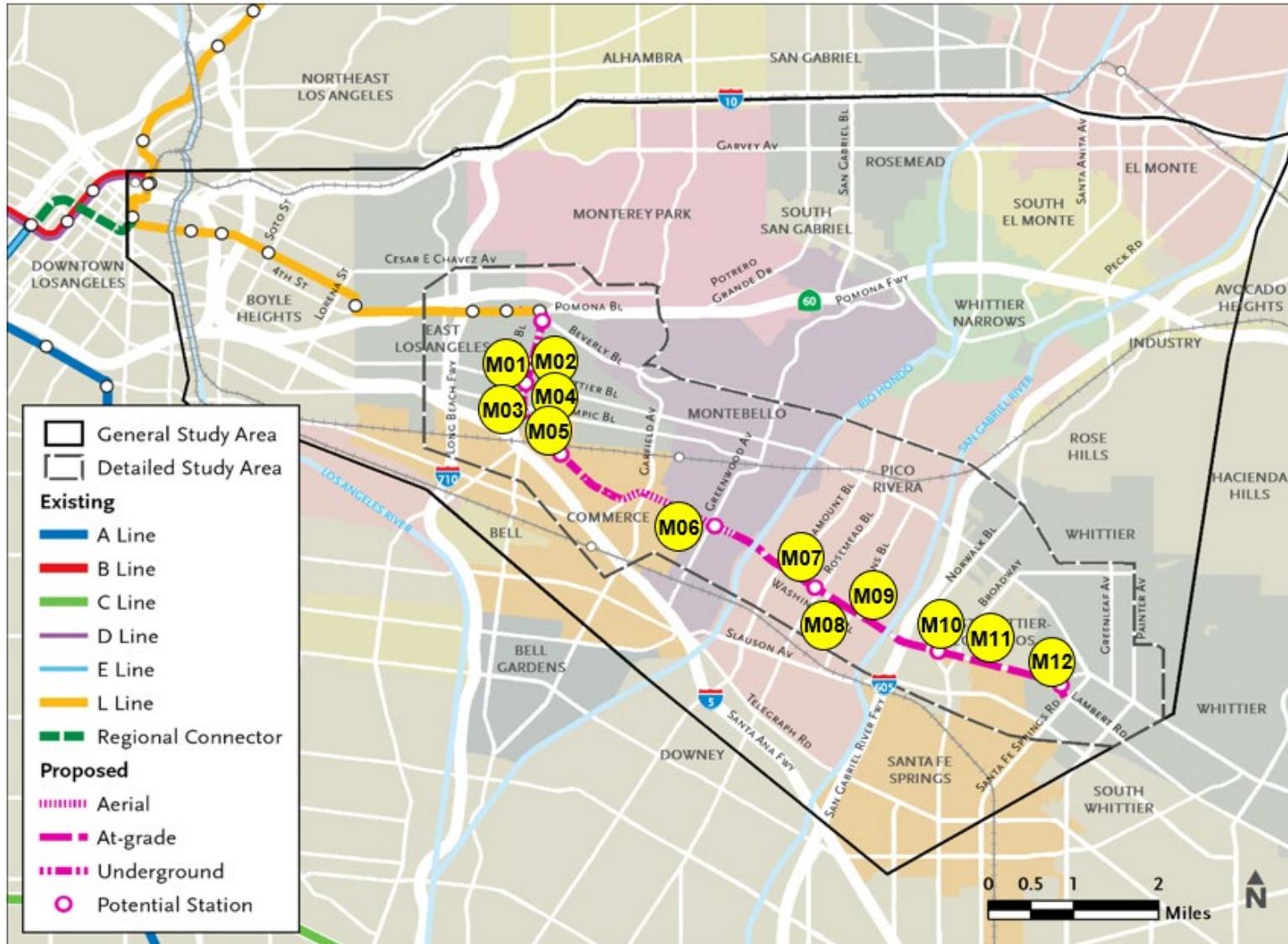


Figure 6.1. Noise Monitoring Locations

Table 6-1. Baseline Noise Levels Measured along the Project Corridor (in dBA)

Receptor		Alternative	Land Use		24-Hr Ldn	Pk-Hr Leq
ID No. ¹	Noise Measurement Location		Type ²	FTA ³		
Mo1	376 S Woods Avenue	1,2,3	SFR	2	62	63
Mo2	5224 1/2 Via Corona Street	1,2,3	SFR	2	66	65
Mo3	743 Amalia Avenue	1,2,3	SFR	2	58	59
Mo4	740 1/2 Woods Avenue	1,2,3	SFR	2	57	57
Mo5	668 S Atlantic Boulevard	1,2,3	School	3	-- ⁴	63
Mo6	860 Washington Boulevard	1,2	SFR	2	71	68
Mo7	6735 Keltonview Drive	1	SFR	2	67	64
Mo8	9122 Washington Boulevard	1	Museum	3	-- ⁴	73
Mo9	6768 Washington Boulevard	1	SFR	2	70	67
M10	7857 Milna Avenue	1	SFR	2	71	67
M11	7904 Broadway Avenue	1	SFR	2	66	63
M12	7972 Calobar Avenue	1	SFR	2	69	67

Source: AECOM, November 2010; Morgner, December 2019 and July 2021.

Notes:

¹ Refer to **Figure 6.1** and Attachment A of this Impacts Report for locations of representative noise measurements.

² "SFR" = Single-Family Residence.

³ FTA Land Use Categories: Category 1 - high sensitivity, Category 2 – residential, and Category 3 - institutional.

⁴ The day-night noise level is not applicable to institutional land uses.

7.0 IMPACTS

7.1 Impact NOI-1: Ambient Noise

Impact NOI-1: Would a Build Alternative result in generation of a substantial temporary or permanent increase in ambient noise levels in the vicinity of the project in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies?

7.1.1 Alternative 1 Washington

7.1.1.1 Operational Impacts

At residences and other FTA Category 2 land uses sensitive to nighttime activity, such as hospitals, the Ldn descriptor was used to reflect the particularly heightened sensitivity to nighttime noise. To evaluate the change in noise levels from the existing condition, the predicted future noise levels from operation of Alternative 1 are summarized in **Table 7-1** for the same representative receptor locations used to monitor current noise levels (see **Figure 6.1**) based on FTA criteria identified in **Figure 3.3** and **Table 4-1**. The criteria are based on land use category, existing noise levels and projected Project noise levels.

The Ldn day-night noise levels at residences along the proposed alignment are predicted to range from 55 dBA at Receptor M11 (single-family residences along Broadway Avenue) to 66 dBA at Receptor Mo6 (a single-family residence at 860 Washington Boulevard). At the selected representative receptors, only the noise levels at Receptors Mo6 and Mo7 are predicted to equal or barely exceed the FTA moderate impact criteria.

Noise impacts at the selected noise monitoring locations described above were used to characterize noise impacts from Alternative 1 at receptors throughout the DSA as described in **Section 4.1** and **Section 4.2**. As a result of this overall evaluation, corridor-wide Project noise levels along Alternative 1 are predicted to exceed the FTA moderate impact criteria at 28 residences and at one FTA Category 3 receptor (a contractor's license school along Washington Boulevard opposite Crossway Drive). These moderate impacts are discussed below. No noise level exceedances are predicted above the FTA severe impact criteria at sensitive receptors and thus, no significant noise impacts would occur. The predicted corridor-wide noise impacts are summarized in **Table 7-2** and shown in Attachment A. Note that the receptors identified in the table are representative receptors which are intended to characterize noise levels for given residential areas and do not each represent an individual property.

Table 7-1. Summary of Project Noise Levels at Representative Receptors from Alternative 1 Washington (in dBA)

ID No. ¹	Receptor Noise Measurement Location	Land Use		Existing Noise	Build Noise ^{5, 6}	FTA Criteria ²		Significant Impact? (Build noise greater than FTA "Severe" Criteria)
		Type ³	FTA ⁴			"Moderate"	"Severe"	
Mo1	376 S Woods Avenue	SFR	2	62	N/A	59	65	No
Mo2	5224 1/2 Via Corona Street	SFR	2	66	N/A	62	68	No
Mo3	743 Amalia Avenue	SFR	2	58	N/A	57	63	No
Mo4	740 1/2 Woods Avenue	SFR	2	57	N/A	57	63	No
Mo5	668 S Atlantic Boulevard	School	3	63	N/A	65	71	No
Mo6	860 Washington Boulevard	SFR	2	71	<u>66</u>	66	71	No
Mo7	6735 Keltonview Drive	SFR	2	67	<u>64</u>	63	68	No
Mo8	9122 Washington Boulevard	Museum	3	73	61	71	77	No
Mo9	6768 Washington Boulevard	SFR	2	70	61	64	70	No
M10	7857 Milna Avenue	SFR	2	71	63	65	70	No
M11	7904 Broadway Avenue	SFR	2	66	55	62	68	No
M12	7972 Calobar Avenue	SFR	2	69	61	64	70	No

Source: AECOM, February 2011; Morgner, December 2019 and July 2021.

Notes:

1 See **Figure 6.1** and Attachment A of this Impacts Report for receptor locations.

2 FTA moderate impacts are bold and underlined.

3 SFR = Single-Family Residence; MFR = Multi-Family Residence.

4 FTA Land Use Categories: Category 1 - high sensitivity, Category 2 – residential, and Category 3 - institutional.

5 The "Build Noise" levels represent the future Project noise only. The cumulative future ambient noise with the Project would be equal to the "Existing Noise" logarithmically added to the "Build Noise."

6 N/A = not applicable (no airborne noise along tunnel sections).

Table 7-2. Corridor-Wide Project Noise Impacts Along Alternative 1 Washington

Nearest ID No. ¹	Location	Land Use Type ²	Impact (Moderate or Severe)	No. Residences Affected	Major Source(s) Contributing to Impact
Mo6	Kelly House, Washington Boulevard	SFR	Moderate	1	LRT passbys
Mo7	Washington Boulevard at Paramount Boulevard	MFR	Moderate	10	LRT Bells and LRT passbys
Mo9	Washington Boulevard at Bonnie Vale Place	SFR	Moderate	2	Switches and LRT passbys
	Washington Boulevard at Lemoran Avenue	SFR	Moderate	1	
	Pico Vista Road	SFR	Moderate	0	
M10	Washington Boulevard at Pioneer Boulevard	SFR	Moderate	3	LRT Bells and LRT passbys
M11	Washington Boulevard at Ridgeview Lane	SFR	Moderate	1	LRT passbys
M12	Sorensen Avenue	SFR	Moderate	8	LRT Bells and LRT passbys
	Crowndale Avenue	SFR	Moderate	1	Switches and LRT passbys
MFR		Moderate	1		
Total FTA Category 2			Severe	0	
			Moderate	28	
			Total	28	

Source: AECOM, February 2011; Morgner, December 2019 and July 2021.

¹ See **Figure 6.1** and Attachment A for receptor locations.

² SFR = Single-Family Residence; MFR = Multi-Family Residence.

7.1.1.1.1 Passby Impacts from LRT Vehicles

Except for receptors in the immediate vicinity of stationary noise sources (such as stations and parking facilities or special trackwork such as switches), receptor noise along the Alternative 1 would be primarily due to passbys from LRT vehicles. Maximum passby noise levels from LRT vehicles (summarized in **Table 4-4**) were used to develop cumulative day-night noise levels over a 24-hour period using typical weekday operating conditions.

Unlike the Leq and Ldn noise metrics (which are statistically derived), the Lmax is the sound that people actually hear during a noise event. For example, Lmax's along the Alternative 1 from LRT train passbys are predicted to range from 67 dBA at Receptor M11 (single-family residences along Broadway Avenue) to 81 dBA at representative Receptor Mo6 (both single-family residences on Washington Boulevard). Except in the vicinity of grade crossings, where onboard warning bells are used, the dominant noise sources from LRT passbys along the proposed transit corridors would be wheel-rail and aerodynamic noise. Shielding provided by the aerial guideway is, however, offset slightly by the four-decibel increase associated with aerial track. Noise generated by passby LRT vehicles would not exceed the FTA moderate noise impact criteria at any sensitive receptors along Alternative 1. The impact would be less than significant.

7.1.1.1.2 Impacts from At-Grade Crossings

There are ten at-grade crossings along Alternative 1, all east of South Greenwood Avenue in Montebello. However, the closest noise-sensitive receptors at most grade crossings are shielded by commercial buildings (i.e., commercial buildings fill the four quadrants surrounding the grade crossings, thereby blocking the line-of-sight of the crossing signals). At Pioneer Boulevard, for example, Lmax noise levels from grade crossings at the closest residence where impacts are predicted are 76 dBA for LRT vehicle warning bells. Therefore, FTA moderate noise impacts are predicted at 15 residences in the vicinity of at-grade crossings along Alternative 1. At Sorensen Avenue, Paramount Boulevard, and Pioneer Boulevard, these impacts would be partially due to LRT passbys and warning bells. The impacts would be less than significant.

7.1.1.1.3 Impacts from Special Trackwork

Special trackwork (such as turnouts and crossovers) is proposed at several locations along Alternative 1 to provide operational flexibility. Turnouts or switches allow trains to move from one track to another, while crossovers allow trains to move between parallel tracks. Noise from switches or crossovers comes from a small gap in the central part of the switch known as a frog. When the steel LRT wheel hits this gap, train noise levels could increase up to 8 dBA in the vicinity of the switch. As shown in **Table 7-2**, switches are primary sources contributing to moderate noise impacts at representative Receptors M09 and M12. Noise generated by special trackwork would not exceed the FTA moderate noise impact criteria at any sensitive receptors along Alternative 1. The impact would be less than significant.

7.1.1.1.4 Impacts from Traction Power Substations

The TPSS are transformers that “step-up” the voltage necessary to operate the trains. Although these box-like devices do not have any gears, belts or other moving mechanical parts, TPSS noise is a continuous hum. Transformer noise is caused by the constant expansion and contraction of the magnetically charged metal plates inside the casing. However, the absolute level of the TPSS is regulated by Metro’s own specifications, thereby minimizing the potential for noise impact in the community.

As part of the Alternative 1, TPSS would be installed at several locations along the proposed rail corridor to provide adequate electrical power for LRT service. As set forth in PM NOI-1 (**Section 8.o**), each TPSS would be designed in accordance with the Metro Rail Design Criteria (MRDC) of 45 dBA at 50 feet or at the setback line of the nearest building or occupied area, whichever is closer (Metro 2018). This operating noise level for the TPSS would be significantly lower than existing ambient noise levels (which range from 66 dBA Ldn to 73 dBA Leq) and LRT passby noise levels of 78 dBA at 50 feet. Therefore, noise generated by the TPSS would not exceed the FTA moderate noise impact criteria at any sensitive receptors along Alternative 1. The impact would be less than significant.

7.1.1.1.5 Station Construction Staging Area Options

Construction staging has been identified for each new or relocated station. The options and potential construction noise impacts are identified in **Section 7.1.1.2.1**. At staging sites occupied by existing structures, the existing structures would be demolished to accommodate the staging needs.

7.1.1.1.6 Operational Noise Impacts at Historic Properties

As summarized in **Table 7-3**, several historic properties were identified along Alternative 1. At historic residences, the Ldn descriptor was used to be conservative with respect to reflect the particularly heightened sensitivity to nighttime noise. At institutional (FTA Category 3) receptors (former Atchison, Topeka and Santa Fe Railway [AT&SF] Depot/Museum of Pico Rivera), the peak-hour Leq descriptor was used to reflect the sensitivity to daytime noise. Since the FTA does not consider commercial properties (historic or not) such as restaurants and stores to be sensitive to transit noise, the peak-hour Leq noise levels are reported at these sites (Steak Corral Restaurant) for informational purposes only and the impact was not assessed. Noise impacts would not exceed the FTA moderate noise impact criteria at any historic properties along Alternative 1. The impact would be less than significant.

Table 7-3. Summary of Project Noise Levels at Historic Properties Along the Alternative 1 Washington (in dBA)¹

Receptor		Land Use		Existing Noise	Build Noise ⁴	FTA Criteria	
ID No. ²	Description	Type	FTA ³			Moderate	Severe
HP2	Kelly House	Historic	2	71	65	65	70
HP3	Former AT&SF Depot ⁵	Historic	3	73	61	70	77
HP4	Cliff May-designed Ranch House	Historic	2	70	62	64	70
HP5	Steak Corral Restaurant	Historic	--	63	63	--	--

Source: AECOM, February 2011; Morgner, December 2019 and July 2021.

Notes:

¹ Peak-hour Leq noise levels are reported for all institutional receptor Sites No. 106 and 108, while the 24-hour Ldn noise level is reported for Sites No. 104 and 107.

² See **Figure 6.1** and Attachment A for receptor locations.

³ FTA Land Use Categories: Category 1 – high sensitivity, Category 2 – residential, and Category 3 – institutional.

⁴ FTA moderate impacts are bold and underlined.

⁵ Current site of the Museum of Pico Rivera.

7.1.1.1.7 Operational Noise Impacts at Parks, Schools, and Other Institutional Receptors

As summarized in **Table 7-4**, several parks, schools, hospitals, and other non-residential receptors were identified along Alternative 1. At these non-residential sites, the peak-hour Leq descriptor was used to reflect the sensitivity to daytime noise. At the Presbyterian Intercommunity Hospital (PIH) in Whittier, which as shown in **Table 7-4** is predicted to be 46 dBA, the Ldn descriptor was used to reflect the particularly heightened sensitivity to nighttime noise. Project Leq noise levels at parks along Alternative 1 are predicted to range from 38 dBA at the Whittier Greenway to 56 dBA at the San Gabriel Coastal Basin Spreading Grounds.

Similarly, peak-hour Leq noise levels at institutional receptors are predicted to range from 40 dBA at the Tri-Cities Regional Occupational Program (ROP) in Whittier to 56 dBA at the San Gabriel Coastal Spreading Grounds and Greenwood Elementary School. However, none of the Project noise levels at the parks, schools, libraries, hospitals, or churches are predicted to exceed the FTA moderate or severe impact criteria along the Alternative 1 alignment. Note that the build noise represents noise from the Project alone, which in no case exceeds existing noise. The impact would be less than significant.

Table 7-4. Summary of Project Noise Levels at Parks, Schools, and Other Institutional Receptors Along Alternative 1 Washington (in dBA)¹

ID No. ²	Receptor Description	Land Use		Existing Noise	Build Noise ³	FTA Criteria	
		Type	FTA ³			Moderate	Severe
201	San Gabriel Coastal Basin Spreading Grounds	Park	3	67	56	67	73
202	Whittier Greenway	Park	3	67	38	67	73
206	Chet Holifield Park	Park	3	68	45	68	73
301	Chet Holifield Library	Library	3	68	48	68	73
304	Tri-Cities ROP	School	3	67	40	67	73
305	Washington Elementary School	School	3	63	51	65	70
306	Pioneer High School	School	3	67	51	67	73
308	Greenwood Elementary School	School	3	68	56	68	73
309	Brethren Christian School	School	3	67	54	67	73
313	Presbyterian Intercommunity Hospital	Hospital	2	67	46	67	73

Source: AECOM, February 2011; Morgner, December 2019 and July 2021.

Notes:

¹ Peak-hour Leq noise levels are reported for all institutional receptors Site No. 103, 201-312, while the 24-hour Ldn noise level is reported for Site No. 313 (Presbyterian Intercommunity Hospital).

² See **Figure 6.1** and Attachment A of for receptor locations.

³ FTA Land Use Categories: Category 1 – high sensitivity, Category 2 – residential, and Category 3 – institutional.

⁴ FTA moderate impacts are bold and underlined.

Design Options

Atlantic/Pomona Station Option

The operational impacts for Alternative 1 with the Atlantic/Pomona Station Option would be the same as the base Alternative 1 because there is no difference in the number of sensitive receptors that would experience noise impacts exceeding the FTA severe impact criteria. The Atlantic/Pomona Station Option would be in a below grade cut and screened from the residences to the east. The Atlantic/Pomona Station Option would not change grade crossings, special trackwork, or TPSS locations compared to the base Alternative 1. There is one school, the Arts in Action Community Charter Elementary School, located approximately 200 feet from the Atlantic/Pomona Station Option site; however, the school is screened by existing structures and the trackwork at the Atlantic/Pomona Station Option site would be below grade and the predicted noise levels at the school would not exceed the FTA severe noise impact criteria. As shown in **Table 7-2** for the base Alternative 1, Alternative 1 with the Atlantic/Pomona Station Option is predicted to exceed the FTA moderate impact criteria at 28 residences and have no exceedances above the FTA severe impact criteria. The impact would be less than significant.

Montebello At-Grade Option

The operational impacts for Alternative 1 with the Montebello At-Grade Option would be very similar to the base Alternative 1 because there are no sensitive receptors adjacent to the Montebello At-Grade Option segment due to land use type (commercial and industrial). Therefore, as shown in **Table 7-1**, for the base Alternative 1, Alternative 1 with the Montebello At-Grade Option is also predicted to exceed the FTA moderate impact criteria at 28 residences and have no exceedances above the FTA severe impact criteria.

The Montebello At-Grade Option would include additional LRT guideway running at-grade, with a slightly reduced distance between the LRT vehicles and first floors of buildings and as a result, a slightly increased noise level than with an aerial guideway; however, the area is commercial and industrial and there are no sensitive receptors that are exposed to passbys from LRT vehicles.

The Montebello At-Grade Option has grade crossings at Garfield Avenue, Vail Avenue, Maple Avenue and Greenwood Avenue; however, the area is commercial and industrial and there would be no impacts from grade crossing LRT vehicle warning bells.

Special trackwork (such as turnouts and crossovers) is proposed at one additional location for the Montebello At-Grade Option at Stationing 355+00 to provide operational flexibility. Turnouts or switches allow trains to move from one track to another, while crossovers allow trains to move between parallel tracks. Noise from switches or crossovers comes from a small gap in the central part of the switch known as a frog. There are no sensitive receptors that would be exposed to noise from this special trackwork.

The location of the TPSS remain the same for Alternative 1 with the Montebello At-Grade Option as the base Alternative 1. Construction staging areas would be vacated by Metro after construction and, therefore, the Project would not have operational impacts associated with the construction staging sites. The impact would be less than significant.

There is one historic property adjacent to the Montebello At-Grade Option, the Kelly House at 860 Washington Boulevard; there is a moderate noise impact at this location, which would also occur under the base Alternative 1. The impact would be less than significant.

There are no parks, schools, or other institutional receptors adjacent to the Montebello At-Grade Option alignment. The impacts would be the same as the base Alternative 1. The impact would be less than significant.

7.1.1.2 Construction Impacts

Construction of Alternative 1 would include:

- Potholing and utility relocation
- Demolition and site preparation
- Tunneling
- Aerial structure construction

- Guideway track laying
- TPSS, station and public area work
- Parking facility construction
- MSF construction

Construction of Alternative 1 would produce noise from various construction activities. Demolition and site preparation would involve for the most part, breakers, backhoes, excavators, dump trucks, concrete saws, cranes and trucks. Equipment would also include compressors and generators and handheld pneumatic tools, for temporary work to secure and make the sites safe, and construct enabling works. Guideway construction equipment would generally consist of concrete trucks, rubber-tired excavators, loaders, rubber-tired compactors, graders and small bulldozers, and water trucks for dust control. For aerial guideway construction, activities would include the placement of piles or support columns and girders to create a span between the bents.

Equipment required for the temporary shoring of the cut and cover excavation, temporary shoring of the underground stations, and aerial guideway construction and bridge replacements at the Rio Hondo and San Gabriel River would include pile drivers (vibratory or impact), drilling rigs, possibly specialized water jet excavators, trucks to remove excavated soil, concrete trucks and concrete pumps, specialized truck trailers to deliver pre-cast concrete beams, cranes, trucks to deliver forms, reinforcing steel, pavement saws, pre-cast concrete post tensioning jacks and related equipment, and water trucks for dust control. It was assumed that potholing and utility relocation would occur ahead of major construction, to prepare for underground work. Some utility relocations must be carried out at night because these can involve road closures.

Pile driving requires a heavy-duty machine that would hammer prefabricated steel beams (i.e., piles) and drive them into the ground. Application of this high-impact machinery would create ground disturbance through the displacement and compression of the surrounding soil and therefore increase vibration and noise levels. The use of pile drivers as construction equipment would result in a potentially significant impact to noise and vibration.

The Project also includes a tunnel section, which would involve excavation and shoring of the launching and receiving pits, tunneling with the use of the TBM, and muck removal. Ventilation would be required during construction and operation of Alternative 1 for adequate circulation of air flow in the tunnels. Tunnel vent fans would be located at ground surface level and their activation would increase ambient noise levels for their surrounding areas and would therefore result in a potentially significant impact. Tunneling activities would require the use of machinery to remove excavation spoils (i.e., muck) from the TBM. Muck removal and heavy machinery, such as excavators and mini-excavators, to move TBM spoils would be a source of noise that could increase ambient noise levels result in a potentially significant impact to noise and vibration.

In addition to the tunneling portion, the Project would require grading, excavation, and the movement of excavated material, resulting in an increase in truck traffic and associated noise. As further described in the Section 3.8, Hazards and Hazardous Materials, and Section 3.14, Transportation and Traffic, haul routes would be located along the Project corridor right-of-way (ROW) and/or major streets connecting to construction staging areas and the nearest freeways (e.g., State Route [SR] 60, Interstate [I]-5, and I-605). These haul routes would be identified during final design in cooperation with the jurisdictions along the alignment and implemented throughout the construction process. As

discussed under **Section 4.9**, it takes a doubling of traffic volumes for noise levels to change by 3 dBA (FTA 2018); even assuming a higher noise factor for haul trucks compared to passenger vehicles, the addition of haul truck trips would not be so substantial as to result in an acoustically perceptible change in ambient noise levels.

Noise levels during construction vary depending on the types of construction activity and the types of equipment used for each stage of work. Heavy machinery, the major source of noise in construction, moves in unpredictable patterns and is not usually at one location very long. In addition, activities associated with construction staging and/or material laydown areas can result in adverse noise impacts if they take place in noise-sensitive areas. Construction normally occurs during daylight hours when some residents are not at home, when residents who are at home are less sensitive to construction activities, and when other community noise sources contribute to higher ambient noise levels. However, since the proposed construction is expected to last about 12 to 18 months at any one location, depending on the type of activity, potentially significant noise impacts would occur, particularly for those receptors adjacent to the alignment.

To evaluate the change in noise levels during construction, the predicted future noise levels from construction of Alternative 1 are summarized in **Table 7-5** for the same representative receptor locations used to monitor current noise levels (see **Figure 6.1**) based on FTA criteria. The criteria are based on land use category, existing noise levels, and worst-case construction noise levels as specified in the FTA general assessment.

Table 7-5. Summary of Construction Noise Levels at Representative Receptors from Alternative 1 Washington (in dBA)

ID No. ¹	Receptor Noise Measurement Location	Land Use Type	Construction Noise ^{2,3}	FTA Criteria ²		Significant Impact? (Construction noise greater than FTA Criteria)
				Daytime	Nighttime	
Mo1	376 S Woods Avenue	Residential	103	90	80	Yes
Mo2	5224 1/2 Via Corona Street	Residential	101	90	80	Yes
Mo3	743 Amalia Avenue	Residential	95	90	80	Yes
Mo4	740 1/2 Woods Avenue	Residential	103	90	80	Yes
Mo5	668 S Atlantic Boulevard ^{4,5}	Commercial	-	100	100	No
Mo6	860 Washington Boulevard	Residential	93	90	80	Yes
Mo7	6735 Keltonview Drive	Residential	88	90	80	Yes
Mo8	9122 Washington Boulevard ⁴	Commercial	97	100	100	Yes
Mo9	6768 Washington Boulevard	Residential	92	90	80	Yes
M10	7857 Milna Avenue	Residential	91	90	80	Yes
M11	7904 Broadway Avenue	Residential	79	90	80	No
M12	7972 Calobar Avenue	Residential	89	90	80	Yes

Source: AECOM, February 2011; Morgner, December 2019 and July 2021.

Notes:

1 See **Figure 6.1** or Attachment A of the Draft EIR for receptor locations.

2 Based on worst case, two impact pile driving rigs. Operation taken as 20 percent on time.

3 One hour Leq, dB(A).

4 FTA does not separately identify schools or museums Commercial category applied here.

5 Alignment in tunnel close to receptor.

Construction normally occurs during the day; therefore, construction impacts were evaluated based on the FTA daytime noise limits of 90 dBA at residential receptors and 100 dBA at commercial receptors. The distances at which an exceedance of the FTA daytime noise limits of 90 dBA at residential receptors is predicted ranges from 32 feet during station construction to 40 feet during at-grade track laying. The distances at which an exceedance of the FTA daytime noise limits of 100 dBA at commercial receptors would occur range from 10 feet during station construction to 13 feet during at-grade track-laying. As a result of these construction noise estimates, construction activities are predicted to exceed the FTA daytime noise limits at 70 noise sensitive receivers for Alternative 1 and a significant impact would occur. Construction at night is not expected to occur under typical conditions; however, unforeseen schedule or operational limitations may require certain construction activities to occur at night at points along the alignment. If construction at night must occur, construction noise activities would be predicted to exceed the FTA nighttime noise limits of 80 dBA at nearby residential receptors; therefore, a significant impact would occur.

Section 8.o describes project measures related to construction noise that are components to the Project. As described in PM NOI-1, each TPSS would be designed in accordance with the MRDC of 45 dBA at 50 feet or at the setback line of the nearest building or occupied area, whichever is closer (Metro 2018). Additionally, as described in PM NOI-2 (**Section 8.o**), all construction activities would be carried out in compliance with Metro's baseline specifications Section 015619, Construction Noise and Vibration Control, to reduce noise generation associated with construction activities to the degree feasible by using methods that may include, but not be limited to, conducting construction in daytime hours, using construction equipment with noise-suppression devices, and using noise barriers or other noise control measures. Implementation of these project measures would reduce construction noise; however, mitigation measures identified in **Section 9.1.1** and summarized below would be required to further reduce noise impacts.

MM NOI-1 would require implementation of a noise control plan and construction monitoring plan that would meet, at minimum, the FTA general assessment noise criteria. MM NOI-2 would require Metro's contractor to use cast-in-drill hole (CIDH) or drilled piles rather than impact pile drivers except where these are impracticable to reduce excessive noise. MM NOI-3 would require the construction contractor to erect temporary noise barriers between noisy activities and noise sensitive receptors to ensure compliance with applicable noise limits. Noise barriers block the direct path of sound waves and would reduce noise impacts from receptors when applied. MM NOI-4 would require Metro's contractor to locate construction equipment and material staging areas away from sensitive receptors where practicable to increase the distance between receptors and noise generating construction equipment/material staging areas. MM NOI-5 would require construction traffic and haul route routing in areas without noise-sensitive receptors where practicable, thereby minimizing traffic noise. MM NOI-6 would require contractors to use best available control technologies (e.g., piling noise shrouds) to limit excessive noise when working near residences where practicable to muffle sounds created by Project-related construction equipment and therefore reduce noise levels. MM NOI-7 would require the contractor wherever practicable, to conduct construction activities during the daytime and during weekdays in residential areas, since noise is more disruptive at night and weekends when residents are more likely to be home. MM NOI-8 would require Metro to establish a Noise and Vibration Complaint Hotline to resolve noise issues arising from construction activities.

MM NOI-9 and MM NOI-10, identified in **Section 9.1.1**, would require using a muck removal conveyor for the TBM if practicable, with specifications to reduce noise generation, including using temporary tunnel track with smooth rail and wheels, limiting car speeds and removing the muck by truck during the day where the haul route impacts residences. Implementation of MM NOI-9 and MM NOI-10 would lessen noise associated with muck removal and minimize nighttime noise impacts. MM NOI-

11, discussed in in **Section 9.1.1**, would reduce impacts from ventilation fans by requiring that they be placed away from sensitive receptors, thereby increasing distance between sensitive receptors and noise generating ventilation fans.

Implementation of MM NOI-1 through MM NOI-11 would reduce construction noise impacts to less than significant. See **Section 9.1.1** for the proposed mitigation and impacts after incorporation of mitigation.

7.1.1.2.1 Station Construction Staging Area Options

Two potential options have been identified for the construction staging area for each new or relocated station. The options and potential construction noise impacts are identified below. At staging sites occupied by existing structures, the existing structures would be demolished to accommodate the staging needs.

Atlantic Station (Relocated/Reconfigured) Construction Staging Area Options

Construction staging areas for the relocated/reconfigured Atlantic station, connection to the existing Metro system, and the TBM receiving pit would either be located on three commercial parcels to the west of the alignment, or on three parcels to the east of the alignment.

The sites to the west would have a construction noise impact on 10 residential properties and the sites to the east would have a construction noise impact on nine residential properties. Either construction staging area option would have a significant impact. Alternative 1 with either staging area site would require implementation of MM NOI-1 through MM NOI-11 as summarized previously and identified in **Section 9.1.1**, which would reduce construction noise impacts to less than significant.

Commerce/Citadel Station Construction Staging Area Options

Construction staging areas for the underground Commerce/Citadel station would be either located on a property to the southwest of the alignment, or on a property to the northeast of the alignment. The site to the southwest and the site to the northeast would have no construction noise impact on adjacent properties. The impact would be less than significant.

Greenwood Station Construction Staging Area Options

Construction staging areas for Greenwood station would be located to the south of Washington Boulevard, either to the west or east.

The site to the west would have construction noise impacts on two adjacent properties and the site to the east would have construction noise impacts on three residential properties. Either construction staging area option would have a significant impact. Alternative 1 with either staging area site would require implementation of MM NOI-1 through MM NOI-11 as identified in **Section 9.1.1**, which would reduce construction noise impacts to less than significant.

Rosemead Station Construction Staging Area Options

Construction staging areas for Rosemead station would be located either to the south of the alignment or to the north.

The site to the south would have no construction noise impact on adjacent properties and therefore, no significant noise impact would occur if this location is selected. The site to the north would have one construction noise impact on an adjacent property, and therefore, a significant noise impact would occur if this location is selected. Alternative 1 with either staging area site would require implementation of MM NOI-1 through MM NOI-11 as summarized previously and identified in **Section 9.1.1**, which would reduce construction noise impacts to less than significant.

Norwalk Station Construction Staging Area Options

Construction staging areas for Norwalk station would be located either directly to the south of the station or southwest of the station.

The site to the south would have no impact on adjacent properties and therefore, no significant noise impact would occur if this location is selected. The site to the southwest has construction noise impacts on eight residential properties, and therefore, a significant noise impact would occur if this location is selected. Alternative 1 with either staging area site would require implementation of MM NOI-1 through MM NOI-11, as summarized previously and identified in **Section 9.1.1**, which would reduce construction noise impacts to less than significant.

Lambert Station Construction Staging Area

Construction staging areas for Lambert Road would be located adjacent to Lambert station and would have no construction noise impact on adjacent properties. The impact would be less than significant.

Design Options

Atlantic/Pomona Station Option

Construction activities are predicted to exceed the FTA daytime noise limits at 70 Noise Sensitive Receivers for Alternative 1 with the Atlantic/Pomona Station Option, which is the same as the base Alternative 1. Therefore, a significant impact would occur.

The construction noise impacts and mitigation measures associated with Alternative 1 with the Atlantic/Pomona Station Option would be the same as for the base Alternative 1. Alternative 1 with the Atlantic/Pomona Station Option would require implementation of MM NOI-1 through MM NOI-11, as summarized previously and identified in **Section 9.1.1**, which would reduce construction noise impacts to less than significant.

Montebello At-Grade Option

Construction activities are predicted to exceed the FTA daytime noise limits at 70 Noise Sensitive Receivers for Alternative 1 with the Montebello At-Grade Option, which is the same as the base Alternative 1. Therefore, a significant impact would occur. The construction noise impacts and

mitigation measures associated with the Montebello At-Grade Option would be the same as for the base Alternative 1. Alternative 1 with the Montebello At-Grade Option would require implementation of MM NOI-1 through MM NOI-11, as summarized previously and identified in **Section 9.1.1**, which would reduce construction noise impacts to less than significant.

7.1.2 Alternative 2 Atlantic to Commerce/Citadel IOS

7.1.2.1 Operational Impacts

7.1.2.1.1 Passby Impacts from LRT Vehicles

Alternative 2 is underground except for where the alignment daylights after crossing Saybrook Avenue and transitioning to an aerial structure that then ends at the Commerce MSF. The area is commercial and industrial and there are no sensitive receptors within the screening distance for the LRT that are exposed to passbys from LRT vehicles. There would be no operational noise impacts from LRT passbys from the alignment.

7.1.2.1.2 Impacts from At-Grade Crossings

Alternative 2 would have no at-grade crossings, and, therefore, there are no impacts from grade crossing LRT vehicle warning bells.

7.1.2.1.3 Impacts from Special Trackwork

Special trackwork (such as turnouts and crossovers) is proposed at several locations along the Alternative 2 to provide operational flexibility. Turnouts or switches allow trains to move from one track to another, while crossovers allow trains to move between parallel tracks. Noise from switches or crossovers comes from a small gap in the central part of the switch known as a frog. Airborne noise from frogs is not an issue because most of the alignment is underground, and the only aboveground section is commercial or industrial, and therefore there would be no impacts from special trackwork.

7.1.2.1.4 Impacts from Traction Power Substations

The TPSS are transformers that “step-up” the voltage necessary to operate the trains. Although these box-like devices do not have any gears, belts or other moving mechanical parts, TPSS noise is a continuous hum. Transformer noise is caused by the constant expansion and contraction of the magnetically charged metal plates inside the casing.

As part of Alternative 2, TPSS would be installed at several locations along the proposed rail corridor to provide adequate electrical power for LRT service. As set forth in PM NOI-1, each TPSS would be located at-grade and designed in accordance with the MRDC noise guideline of 45 dBA at 50 feet or at the setback line of the nearest building or occupied area, whichever is closer. This operating noise level for the TPSS would be significantly lower than existing ambient noise levels (which range from 66 dBA Ldn to 73 dBA Leq) and LRT passby noise levels of 78 dBA at 50 feet. Therefore, noise generated

by the TPSS would not exceed the FTA noise impact criteria at any receptors along the Alternative 2 Atlantic to Commerce/Citadel IOS, and less than significant noise impact would occur.

7.1.2.1.5 Station Construction Staging Area Options

Two potential options have been identified for the construction staging area for each new or relocated station. The options and potential construction noise impacts are identified in **Section 7.1.2.2.1**. At staging sites occupied by existing structures, the existing structures would be demolished to accommodate the staging needs. Following construction, the sites would be vacated by Metro and, therefore, the Project would not have operational impacts associated with the construction staging sites.

7.1.2.1.6 Operational Noise Impacts at Historic Properties

There are no historic properties close to Alternative 2 that would be affected by noise. No impact would occur.

7.1.2.1.7 Operational Noise Impacts at Parks, Schools, and Other Institutional Receptors

Chet Holifield Library, Chet Holifield Park and Greenwood Elementary School are not within the FTA screening distance for noise impacts from Alternative 2. There are no parks, schools, and other institutional receptors adjacent to the alignment. No noise impact would occur.

Design Option

Atlantic/Pomona Station Option

The operational impacts for Alternative 2 with the Atlantic/Pomona Station Option would be the same as the base Alternative 2. There would be no noise impact relative to passbys, at-grade crossings, special trackwork, TPSSs, historic properties, parks, schools, or other institutional receptors. No noise impact would occur.

7.1.2.2 Construction Impacts

Construction of Alternative 2 would include:

- Potholing and utility relocation
- Demolition and site preparation
- Tunneling
- Aerial structure construction
- Guideway track laying
- TPSS, station and public area work

- Parking facility construction
- MSF construction

Construction of Alternative 2 would produce noise from the same types of construction activities as Alternative 1 and use the same types of equipment for those activities. As with Alternative 1, construction of Alternative 2 would result in a significant noise impact from general construction activities, which could include the use of pile drivers, nighttime noise, tunnel ventilation, tunneling activities, and on-road truck traffic. Construction normally occurs during the day; therefore, construction impacts were evaluated based on the FTA daytime noise limits of 90 dBA at residential receptors and 100 dBA at commercial receptors. As with Alternative 1, the distances at which an exceedance of the FTA daytime noise limits of 90 dBA at residential receptors is predicted ranges from 32 feet during station construction to 40 feet during at-grade track laying. The distances at which an exceedance of the FTA daytime noise limits of 100 dBA at commercial receptors would occur range from 10 feet during station construction to 13 feet during at-grade track-laying. As a result of these preliminary construction noise estimates, construction activities are predicted to exceed the FTA daytime noise limits at 17 Noise Sensitive Receivers for Alternative 2. Construction at night is not expected to occur under typical conditions; however, unforeseen schedule or operational limitations may require certain construction activities to occur at night at points along the alignment. If construction at night must occur, construction noise activities would be predicted to exceed the FTA nighttime noise limits of 80 dBA at nearby residential receptors; therefore, a significant impact would occur.

Project measures and mitigation measures are summarized in the construction evaluation in **Section 7.1.1.2** and identified in **Section 8.0** and **Section 9.0**. TPSS systems would be designed in accordance with MRDC, and all construction activities would be carried out in compliance with Metro's Construction Noise and Vibration Control specifications as set forth in PM NOI-2. Additionally, MM NOI-1 through MM NOI-11, summarized in **Section 9.0**, would reduce construction noise levels experienced by sensitive receptors through means such as use of noise buffers, maximizing the distance between noise generating activities and sensitive receptors to the degree feasible, minimizing noise generation such as through the use of equipment mufflers to the degree feasible, and establishing a Noise and Vibration Complaint Hotline to resolve noise issue. Implementation of MM NOI-1 through MM NOI-11 would reduce construction noise impacts to less than significant. See **Section 9.1.2** for the proposed mitigation and impacts after incorporation of mitigation.

7.1.2.2.1 Station Construction Staging Area Options

Two options have been identified for the construction staging area for the two new or relocated station that would be implemented under Alternative 2. See **Section 7.1.1.2** for additional information. The options and potential construction noise impacts are identified below. For those staging area site options that would have significant impacts, see **Section 9.1.2** for proposed mitigation and impacts after incorporation of mitigation. At staging sites occupied by existing structures, the existing structures would be demolished to accommodate the staging needs.

Atlantic Station (Relocated/Reconfigured) Construction Staging Area Options

Construction staging areas for the relocated Atlantic station, connection to the existing Metro system and the TBM receiving pit would either be located on three commercial parcels to the west of the alignment, or on three parcels to the east of the alignment.

The sites to the west have a construction noise impact on 10 residential properties and the sites to the east have a construction noise impact on nine residential properties. Either construction staging area option would have a significant impact, which would require implementation of MM NOI-1 through MM NOI-11 as described in **Section 9.o**, which would reduce construction noise impacts to less than significant.

Commerce/Citadel Station Construction Staging Area Options

Construction staging areas for the underground Commerce/Citadel station would be either located on a property to the southwest of the alignment, or on a property to the northeast of the alignment. The site to the southwest and the site to the northeast would have no construction noise impact on adjacent properties. The impact would be less than significant.

Design Option

Atlantic/Pomona Station Option

The staging area for the Atlantic/Pomona Station Option would be the same as that of the Atlantic (Relocated/Reconfigured) Construction Staging Area Option for the western sites and it would have a construction noise impact on 10 residential properties. Therefore, a significant impact would occur. Like the base Alternative 2, Alternative 2 with the Atlantic/Pomona Station Option would require implementation of MM NOI-1 through MM NOI-11 as identified in **Section 9.o**, which would reduce construction noise impacts to less than significant.

7.1.3 Alternative 3 Atlantic to Greenwood IOS

7.1.3.1 Operational Impacts

7.1.3.1.1 Passby Impacts from LRT Vehicles

Alternative 3 would be in an underground alignment until it daylights after crossing Saybrook Avenue and links to either the Commerce MSF site option or Montebello MSF site option and terminates in an aerial configuration at Greenwood station. The area is commercial and industrial and there are no sensitive receptors that are exposed to passbys from LRT vehicles. Therefore, no impact would occur.

7.1.3.1.2 Impacts from At-Grade Crossings

Alternative 3 has no at-grade crossings, and, therefore, there are no impacts from grade crossing LRT vehicle warning bells.

7.1.3.1.3 Impacts from Special Trackwork

Special trackwork (such as turnouts and crossovers) is proposed at several locations along Alternative 3 to provide operational flexibility. Turnouts or switches allow trains to move from one track to another, while crossovers allow trains to move between parallel tracks. Noise from switches or crossovers comes from a small gap in the central part of the switch known as a frog. Airborne noise from frogs would not be an issue because the land use surrounding Alternative 3 in its aboveground configuration is commercial or industrial. Therefore, no significant impact would occur.

7.1.3.1.4 Impacts from Traction Power Substations

The TPSS are transformers that “step-up” the voltage necessary to operate the trains. Although these box-like devices do not have any gears, belts or other moving mechanical parts, TPSS noise is a continuous hum. Transformer noise is caused by the constant expansion and contraction of the magnetically charged metal plates inside the casing. However, the absolute level of the TPSS is regulated by Metro’s own specifications, thereby minimizing the potential for noise impact in the community.

As part of the Alternative 3, TPSS would be installed at several locations along the proposed rail corridor to provide adequate electrical power for LRT service. As set forth in PM NOI-1, each TPSS would be located at-grade and designed in accordance with the MRDC noise guideline of 45 dBA at 50 feet or at the setback line of the nearest building or occupied area, whichever is closer. This operating noise level for the TPSS would be significantly lower than existing ambient noise levels (which range from 66 dBA Ldn to 73 dBA Leq) and LRT passby noise levels of 78 dBA at 50 feet. Therefore, noise generated by the TPSS would not exceed the FTA noise impact criteria at any receptors along Alternative 3, and a less than significant noise impact would occur.

7.1.3.1.5 Station Construction Staging Area Options

Two options have been identified for the construction staging area for each new or relocated station. The options and potential construction noise impacts are identified in **Section 7.1.3.2.1**. At staging sites occupied by existing structures, the existing structures would be demolished to accommodate the staging needs. Following construction, the sites would be vacated by Metro and, therefore, the Project would not have operational impacts associated with the construction staging sites.

7.1.3.1.6 Operational Noise Impacts at Historic Properties

There is one historic property adjacent to the Alternative 3 Atlantic to Greenwood IOS, the Kelly House at 860 Washington Boulevard, there is a moderate noise impact at this location. This would be a less than significant impact.

7.1.3.1.7 Operational Noise Impacts at Parks, Schools, and Other Institutional Receptors

There are no parks, schools, or other institutional receptors adjacent to the aerial sections of the alignment and, therefore, no significant impacts would occur.

Design Options

Atlantic/Pomona Station Option

The operational impacts for Alternative 3 with the Atlantic/Pomona Station Option would be the same as the base Alternative 3. The impact would be less than significant.

Montebello At-Grade Option

The operational impacts for Alternative 3 with the Montebello At-Grade Option would be very similar to the base Alternative 3 with an aerial guideway at this location because the area is commercial and industrial and there are no adjacent sensitive receptors. The impact would be less than significant.

7.1.3.2 Construction Impacts

Construction of Alternative 3 would include:

- Potholing and utility relocation
- Demolition and site preparation
- Tunneling
- Aerial structure construction
- Guideway track laying
- TPSS, station and public area work
- Parking facility construction
- MSF construction

Construction of Alternative 3 would produce noise from the same types of construction activities as Alternative 1 and use the same types of equipment for those activities. As with Alternative 1, construction of Alternative 3 would result in a significant noise impact from general construction activities, the use of pile drivers, nighttime noise, tunnel ventilation, tunneling activities, and on-road truck traffic. Construction normally occurs during the day; therefore, construction impacts were evaluated based on the FTA daytime noise limits of 90 dBA at residential receptors and 100 dBA at commercial receptors. As with Alternative 1, the distances at which an exceedance of the FTA daytime noise limits of 90 dBA at residential receptors is predicted ranges from 32 feet during station construction to 40 feet during at-grade track laying. The distances at which an exceedance of the FTA daytime noise limits of 100 dBA at commercial receptors would occur range from 10 feet during station construction to 13 feet during at-grade track-laying. As a result of these preliminary construction noise estimates, construction activities are predicted to exceed the FTA daytime noise limits at 29 Noise Sensitive Receivers for Alternative 3. Construction at night is not expected to occur under typical conditions; however, unforeseen schedule or operational limitations may require certain construction activities to occur at night at points along the alignment. If construction at night must

occur, construction noise activities would be predicted to exceed the FTA nighttime noise limits of 80 dBA at nearby residential receptors; therefore, a significant impact would occur.

Project measures and mitigation measures are summarized in the construction evaluation in **Section 7.1.1.2** and identified in **Section 8.0** and **Section 9.0**, respectively. TPSS would be designed in accordance with MRDC, and all construction activities would be carried out in compliance with Metro's Construction Noise and Vibration Control specifications as set forth in PM NOI-2. MM NOI-1 through MM NOI-11, summarized in **Section 7.1.1.2** and identified in **Section 9.0**, would reduce construction noise levels experienced by sensitive receptors through means such as use of noise buffers, maximizing the distance between noise generating activities and sensitive receptors to the degree feasible, minimizing noise generation such as through the use of equipment mufflers to the degree feasible, and establishing a Noise and Vibration Complaint Hotline to resolve noise issue. Implementation of MM NOI-1 through MM NOI-11 would reduce construction noise impacts to less than significant.

7.1.3.2.1 Station Construction Staging Area Options

As described in **Section 7.1.1**, two options have been identified for the construction staging area for the three new or relocated stations that would be constructed under Alternative 3. The potential construction noise impacts are identified below. See **Section 7.1.1** for additional information.

Atlantic Station (Relocated/Reconfigured) Construction Staging Area Options

Construction staging areas for the relocated Atlantic station, connection to the existing Metro system, and the TBM receiving pit would either be located on three commercial parcels to the west of the alignment, or on three parcels to the east of the alignment. The sites to the west have a construction noise impact on 10 residential properties and the sites to the east have a construction noise impact on nine residential properties. Either construction staging area option would have a significant impact. Alternative 3 with either staging area site would require implementation of MM NOI-1 through MM NOI-11, as described in **Section 9.0**, which would reduce construction noise impacts to less than significant.

Commerce/Citadel Station Construction Staging Area Options

Construction staging areas for the underground Commerce/Citadel station would be either located on a property to the southwest of the alignment, or on a property to the northeast of the alignment. The site to the southwest and the site to the northeast would have no construction noise impact on adjacent properties. The impact would be less than significant.

Greenwood Station Construction Staging Area Options

Construction staging areas for Greenwood station would be located to the south of Washington Boulevard, either to the west or east. The site to the west would have construction noise impacts on two adjacent properties and the site to the east would have construction noise impacts on three residential properties. Either construction staging area option would have a significant impact. Alternative 1 with either staging area site would require implementation of MM NOI-1 through MM NOI-11 as summarized previously and identified in **Section 9.0**, which would reduce construction noise impacts to less than significant.

Design Options

Atlantic/Pomona Station Option

Construction activities are predicted to exceed the FTA daytime noise limits at 29 Noise Sensitive Receivers for Alternative 3 with the Atlantic/Pomona Station Option, which is the same as the base Alternative 3. Therefore, a significant impact would occur. As with the base Alternative 3, Alternative 3 with the Atlantic/Pomona Station Option would require implementation of MM NOI-1 through MM NOI-11, identified in **Section 9.o**, which would reduce construction noise impacts to less than significant.

Montebello At-Grade Option

Construction activities are predicted to exceed the FTA daytime noise limits at 29 Noise Sensitive Receivers for Alternative 3 with the Montebello At-Grade Option, which is the same as the base Alternative 3. Therefore, a significant impact would occur. As with the base Alternative 3, Alternative 3 with the Montebello At-Grade Option would require implementation of MM NOI-1 through MM NOI-11, described in **Section 9.o**, which would reduce construction noise impacts to less than significant.

7.1.4 Maintenance and Storage Facilities

7.1.4.1 Operational Impacts

7.1.4.1.1 Commerce MSF

The Commerce MSF site option would accommodate daily maintenance, inspection and repairs, and storage of the LRT vehicles. The Commerce MSF site option would require an at-grade crossing where crossing gates and bells would be activated when the LRT accesses the facility.

The Commerce MSF site option would be located in an industrial area and would have no noise-sensitive receptors (such as residences, schools, churches, or parks) within the FTA screening distance of 650 feet (where there are intervening buildings). Therefore, no moderate or severe noise impact would occur. The impact would be less than significant.

7.1.4.1.2 Montebello MSF

The Montebello MSF site option would accommodate daily maintenance, inspection and repairs, and storage of the LRT vehicles. The Montebello MSF site option would require at-grade crossings where crossing gates and bells would be activated when the LRT crosses roads.

The Montebello MSF site option would be located in an industrial area and would have no noise-sensitive receptors (such as residences, schools, churches, or parks) within the FTA screening distance of 650 feet (where there are intervening buildings). Therefore, no moderate or severe noise impact would occur. The impact would be less than significant.

Design Option

Montebello MSF At-Grade Option

The Montebello MSF At-Grade Option involves an at-grade crossing over Washington Boulevard for access to the Montebello MSF site option. There are no noise-sensitive receptors (such as residences, schools, churches, or parks) within the FTA screening distance of 650 feet (where there are intervening buildings). The noise level would be slightly reduced at distance because the MSF site/lead tracks would be at-grade. Therefore, no moderate or severe noise impact would occur. The impact would be less than significant.

7.1.4.2 Construction Impacts

7.1.4.2.1 Commerce MSF

Construction of the Commerce MSF site option would require site demolition and facility construction which would produce noise from various construction activities. Demolition and site preparation would generally involve breakers, backhoes, excavators, dump trucks, concrete saws, cranes, and trucks. Equipment would also include compressors, generators, and handheld pneumatic tools for temporary work to secure the sites and construct enabling works.

The Commerce MSF site option is located in an industrial area with the nearest sensitive receptors (such as residences, schools, churches, or parks) being more than 1,000 feet away with intervening buildings. Noise levels from construction would not exceed the FTA criteria for residential receivers of 90 dBA through the day or 80 dBA at night or 100 dBA through the day or night at commercial and industrial receivers. Impacts would be less than significant.

7.1.4.2.2 Montebello MSF

Construction of the Montebello MSF site option would require site demolition and facility construction, which would produce noise from various construction activities. Demolition and site preparation would generally involve breakers, backhoes, excavators, dump trucks, concrete saws, cranes, and trucks. Equipment would also include compressors, generators, and handheld pneumatic tools for temporary work to secure the sites and construct enabling works.

The Montebello MSF site option is located in an industrial area with the nearest sensitive receptors (such as residences, schools, churches, or parks) being more than 1,000 feet away with intervening buildings. Noise levels from construction would not exceed the FTA criteria for residential receivers of 90 dBA through the day or 80 dBA at night. However, noise levels would exceed the FTA criteria for commercial or industrial receivers of 100 dBA through the day or 100 dBA at night at one industrial building immediately adjacent to the site. Therefore, a significant impact would occur.

All construction activities would be carried out in compliance with Metro's Construction Noise and Vibration Control specifications as set forth in PM NOI-2. Additionally, MM NOI-1 through MM NOI-8, summarized in **Section 7.1.1.2** and identified in **Section 9.o**, would reduce construction noise levels through means such as use of noise buffers, maximizing the distance between noise generating activities and sensitive receptors to the degree feasible, minimizing noise generation such as through the use of equipment mufflers to the degree feasible, and establishing a Noise and Vibration

Complaint Hotline to resolve noise issues. Implementation of MM NOI-1 through MM NOI-8 would reduce construction noise impacts to less than significant.

Design Option

Montebello MSF At-Grade Option

Construction of the Montebello MSF At-Grade Option would require site demolition and facility construction which would produce noise from various construction activities. Demolition and site preparation would generally involve breakers, backhoes, excavators, dump trucks, concrete saws, cranes, and trucks. Equipment would also include compressors, generators, and handheld pneumatic tools for temporary work to secure the sites and construct enabling works.

The Montebello MSF At-Grade Option is located in an industrial area with the nearest sensitive receptors (such as residences, schools, churches, or parks) being more than 1,000 feet away with intervening buildings. The noise impacts associated with the Montebello MSF At-Grade Option would be similar to an aerial alignment at this location. Noise levels would exceed the FTA criteria for commercial or industrial receivers of 100 dBA through the day or 100 dBA at night at one adjacent industrial building. Therefore, a significant impact would occur.

All construction activities would be carried out in compliance with Metro's Construction Noise and Vibration Control specifications, as set forth in PM NOI-2. Additionally, MM NOI-1 through MM NOI-8, summarized in **Section 7.1.1.2** and identified in **Section 9.0**, would reduce construction noise levels through means such as use of noise buffers, maximizing the distance between noise generating activities and sensitive receptors to the degree feasible, minimizing noise generation such as through the use of equipment mufflers to the degree feasible, and establishing a Noise and Vibration Complaint Hotline to resolve noise issues. Implementation of MM NOI-1 through MM NOI-8 would reduce construction noise impacts to less than significant.

7.2 Impact NOI-2: Ground-Borne Vibration or Ground-Borne Noise

Impact NOI-2: Would a Build Alternative result in generation of excessive ground-borne vibration or ground-borne noise levels?

7.2.1 Alternative 1 Washington

7.2.1.1 Operational Impacts

Unlike noise, which is assessed using cumulative noise levels over a 24-hour period, transit vibration impacts are assessed based on individual events, such as when a train passes by and the frequency of those events. The entire rail corridor would be constructed with CWR track. In the at-grade configuration, the track would be embedded. CWR track is continuous and therefore produces less vibration than non-CWR track because it does not have any breaks or gaps that could cause vibrations when a wheel passes over the track. Embedded track is vibration-isolated by a material which reduces

transmitted vibration. Along aerial sections, elevated structures create additional separation between the train source and the ground-level receptors resulting in greater attenuation. At at-grade crossings, embedded track at cross streets is not expected to result in any vibration impacts, due to the short section limited to the width of the cross street. Along tunnel sections, train steel wheels over steel rails would input vibration into the track support structures and onwards to the ground. CWR track would reduce this vibration to some degree. All predicted vibration levels were compared with the FTA frequent impact criteria to assess the onset and severity of impact.

Alternative 1 would have three potential sources of vibration during operations, including LRT vehicle passbys along CWR track, LRT passbys through special trackwork such as switches along the corridor during revenue service, and switches at the MSF.

7.2.1.1.1 Passby Impacts from LRT Vehicles

To show the variation in vibration levels along Alternative 1, transit vibration levels were predicted at the same representative receptor locations as for the noise analysis. As summarized in **Table 7-6**, the maximum vibration levels from LRT vehicles are predicted to range from 48 VdB at representative Receptor M11 (a single-family residence along Broadway Avenue) to 80 VdB at representative Receptor Mo5 (Kipp Raices Academy on Atlantic Boulevard). Except for representative Receptors Mo5, Mo7 (single-family residence on Keltonview Drive), and M10 (single-family residence on Milna Avenue), all the vibration levels at the representative receptor sites are predicted to be below the FTA frequent impact criteria. As summarized in **Table 7-6**, the maximum vibration level from switches in the vicinity of representative Receptors Mo7 and M10 is predicted to exceed the FTA frequent criterion of 72 VdB for residential land uses along the Alternative 1 alignment.

Table 7-6. Summary of Project Vibration Levels at Representative Receptors from Alternative 1 Washington (in VdB)

Receptor		Land Use		Build Vibration ⁴	FTA Criteria	
ID No. ¹	Location of Vibration Monitoring	Type ²	FTA ³		"Frequent"	Impact
Mo1	376 South Woods Avenue	SFR	2	66	72	No
Mo2	5224 1/2 Via Corona Street	SFR	2	65	72	No
Mo3	743 Amalia Avenue	SFR	2	62	72	No
Mo4	740 1/2 Woods Avenue	SFR	2	64	72	No
Mo5	668 S Atlantic Boulevard	School	2	<u>80</u>	75	Yes
Mo6	860 Washington Boulevard	SFR	2	70	72	No
Mo7	6735 Keltonview Drive	SFR	2	<u>73</u>	72	Yes
Mo8	9122 Washington Boulevard	Museum	3	69	75	No
Mo9	6768 Washington Boulevard	SFR	2	64	72	No
M10	7857 Milna Avenue	SFR	2	<u>76</u>	72	Yes
M11	7904 Broadway Avenue	SFR	2	48	72	No
M12	7972 Calobar Avenue	SFR	2	62	72	No

Source: AECOM, November 2010; Morgner, December 2019 and July 2021.

Notes:

1 See **Figure 6.1** and Attachment A for receptor locations.

2 SFR = Single-family Residence.

3 FTA Land Use Categories: Category 1 - high sensitivity, Category 2 – residential, and Category 3 - institutional.

4 Exceedances of the FTA frequent criteria are bold and underlined.

As summarized in **Table 7-7**, corridor-wide vibration levels are predicted to exceed the FTA frequent criterion of 72 VdB at 85 residences. These impacts are due to the proximity of residences to proposed switches and proximity to the tunnel section of the alignment. Additionally, one vibration impact is predicted at an FTA Category 3 receptor, Kipp Raices Academy school close to the alignment at 668 South Atlantic Boulevard. Additionally, vibration levels along Alternative 1 are predicted to exceed the FTA frequent criterion of 75 VdB at one other institutional receptor (a Contractors State License school along Washington Boulevard at Keltonview Drive) due to the switches at Stationing 516+50. Therefore, a significant impact would occur. See **Section 8.2.1** for proposed mitigation and impacts after incorporation of mitigation. The predicted corridor-wide vibration impacts are shown graphically in Attachment A.

Table 7-7. Corridor-wide Project Vibration and GBN Impacts Along Alternative 1 Washington

Nearest ID No. ¹	Location	Type Use ²	Impact (Frequent)	No. Residences Affected	Major Source(s) Contributing to Impact ³
FTA Category 2					
Mo1	376 South Woods Avenue	SFR	Frequent	10	Crossover/switch
Mo2	5224 1/2 Via Corona Street	SFR MFR	Frequent	6 3	Crossover/switch
Mo7	Washington Boulevard at Keltonview Drive	SFR	Frequent	5	Crossover/switch
M10	Washington Boulevard at Milna Avenue	SFR	Frequent	15	Crossover/switch
M12	Calobar Avenue	SFR MFR	Frequent	1 1	Crossover/switch
Mo4	Area local to E Olympic Boulevard	SFR MFR	Frequent	28 7	Operations
Total FTA Category 2			Frequent	85	
FTA Category 3					
Mo5	668 South Atlantic Boulevard	School	Frequent	1	Operations
Mo7	8705 Washington Boulevard	School	Frequent	1	Operations
Total FTA Category 3			Frequent	2	
Total – All Uses			Total	87	

Source: AECOM, February 2011; Morgner, December 2019 and July 2021.

Notes:

¹ See **Figure 6.1** and Attachment A for receptor locations.

² SFR = Single-Family Residence; MFR = Multi-Family Residence.

³ Major sources include LRT passbys, LRT warning bells, and switches or special trackwork. The MSF and TPSS are not expected to be a major source for impacts in any vibration-sensitive locations.

7.2.1.1.2 Impacts from Special Trackwork

Special trackwork is proposed at several locations along Alternative 1 to provide operational flexibility. Turnouts or switches allow trains to move from one track to another, while crossovers allow trains to move between parallel tracks. Vibration from switches or crossovers comes from a small gap in the central part of the switch known as a frog. Due to the rail discontinuities at switches, vibration levels from LRT vehicle passbys are predicted to range from below background to 76 VdB at representative

Receptor M10 (a single-family residence at Milna Avenue). The vibration levels from LRT passby over switches are predicted to exceed the FTA impact criterion of 72 VdB at 85 residential land uses (FTA Category 2) and two schools (FTA Category 3 land use). Therefore, a significant impact would occur. See **Section 9.0** for the proposed mitigation and impacts after incorporation of mitigation.

Compliance with MM NOI-12 and MM NOI-13, identified in **Section 9.0**, would minimize potential vibration impacts by reducing vibratory impacts caused by steel wheels rolling over steel rails at rail joints during the passby of LRT vehicles at residences and by reducing the width of gaps at joints when steel wheels roll over steel rails at rail joints. Thus, implementation of MM NOI-12 and MM NOI-13 would reduce operational vibration impacts from special trackwork to less than significant.

7.2.1.1.3 Operational Vibration Impacts at Historic Properties

As summarized in **Table 7-8**, maximum vibration levels at historic resources along the proposed Washington Alternative are predicted to range from 67 VdB at the Golden Gate Theater to 71 VdB at the Steak Corral Restaurant (along Washington Boulevard).

Due to the strategic location of switches, none of the vibration levels predicted at historic properties are predicted to exceed the FTA frequent impact criteria along Alternative 1. Since the vibration levels predicted at historic properties are not predicted to exceed the FTA frequent impact criteria along Alternative 1, the vibration levels would also not exceed the FTA structural damage criteria along Alternative 1 since the structural damage threshold is higher than the frequent impact criteria. The impact would be less than significant.

**Table 7-8. Summary of Project Vibration Levels at Historic Properties
Alternative 1 Washington (in VdB)**

Receptor		Land Use		Build Vibration ³	FTA Criteria	
ID No. ²	Description	Type	FTA ¹		"Frequent"	Impact
HP1	Golden Gate Theater	Historic	2	67	75	No
HP2	Kelly House	Historic	2	68	72	No
HP3	Former AT&SF Depot	Historic	3	70	75	No
HP4	Cliff May-designed Ranch House	Historic	2	68	72	No
HP5	Steak Corral Restaurant	Historic	--	71	--	No

Source: AECOM, February 2011; Morgner, December 2019 and July 2021.

Note:

¹ See **Figure 6.1** and Attachment A for receptor locations.

² FTA Land Use Categories: Category 1 - high sensitivity, Category 2 – residential, and Category 3 - institutional.

³ Exceedances of the FTA frequent criteria are bold and underlined.

7.2.1.1.4 Operational Vibration Impacts at Parks, Schools, and Other Institutional Receptors

As summarized in **Table 7-9**, maximum vibration levels at parks along Alternative 1 vary between below detectable levels at the Whittier Greenway and Chet Holifield Park to 64 VdB at the San Gabriel Coastal Basin Spreading Grounds.

Similarly, maximum vibration levels at schools and other institutional receptors along Alternative 1 are predicted to range from below detection at the Tri-Cities ROP, Washington Elementary School, and Pioneer High School to 80 VdB at the Kipp Raices Academy on Atlantic Boulevard. Based on the modeling analysis, the Kipp Raices Academy on Atlantic Boulevard is predicted to exceed the FTA frequent impact criteria. Therefore, a significant impact would occur. See **Section 9.0** for the proposed mitigation and impacts after incorporation of mitigation.

Table 7-9. Summary of Project Vibration Levels at Parks, Schools, and Other Institutional Receptor Sites (in VdB)

Receptor		Land Use		Build	FTA Criteria	
ID No.	Description	Type	FTA	Vibration	"Frequent"	Impact
201	San Gabriel Coastal Basin Spreading Grounds	Park	3	64	75	No
202	Whittier Greenway	Park	3	BD ¹	75	No
206	Chet Holifield Park	Park	3	BD ¹	75	No
301	Chet Holifield Library	Library	3	BD ¹	75	No
304	Tri-Cities ROP	School	3	BD ¹	75	No
305	Washington Elementary School	School	3	BD ¹	75	No
306	Pioneer High School	School	3	BD ¹	75	No
308	Greenwood Elementary School	School	3	22	75	No
Mo5	Kipp Raices Academy, 668 S Atlantic Boulevard	School	3	80	75	Yes
313	Presbyterian Intercommunity Hospital	Hospital	2	40	75	No

Source: AECOM, February 2011; Morgner, December 2019 and July 2021.

Note:

¹ Due to attenuation over large distances, the predicted vibration level is below detection level and well below the ambient background level. Therefore, it is not perceptible.

Compliance with MM NOI-12 and MM NOI-13, identified in **Section 9.0**, would minimize potential vibration impacts by reducing vibratory impacts caused by steel wheels rolling over steel rails at rail joints during the passby of LRT vehicles at sensitive receptors and by reducing the width of gaps at joints when steel wheels roll over steel rails at rail joints. Implementation of MM NOI-12 and MM NOI-13 would reduce operational vibration impacts on institutional receptors to less than significant.

Design Options

Atlantic/Pomona Station Option

The Atlantic/Pomona Station Option guideway alignment is located east of Atlantic Boulevard and connects with the base Alternative 1 alignment just north of the proposed Atlantic/Whittier station. Because of the variation in the alignment, the location of the potential vibration impacts are different than that of the base Alternative 1. As summarized in **Table 7-10**, like the base Alternative 1, corridor-wide vibration levels are predicted to exceed the FTA frequent criterion of 72 VdB at 85 residences. These impacts are due to the proximity of residences to proposed switches and proximity to the tunnel section of the alignment. Also like the base Alternative 1, Alternative 1 with the Atlantic/Pomona Station Option would result in one predicted vibration impact at an FTA Category 3 receptor, Kipp Raices Academy school close to the alignment at 668 S Atlantic Boulevard, and one exceedance of the FTA frequent criterion of 75 VdB at one other institutional receptor (a Contractor's State License

school along Washington Boulevard at Keltonview Drive) due to crossover/switches. However, unlike the base Alternative 1, Alternative 1 with the Atlantic/Pomona Station Option would result in potential vibration impacts to fewer residences near representative receptor Mo1 and more residences near representative receptor Mo2. This is due to the variation in the track alignment that would be required for the Atlantic/Pomona Station Option. The impact would be significant. The predicted corridor-wide vibration impacts are shown graphically in Attachment A.

Table 7-10. Corridor-wide Project Vibration and GBN Impacts Along Alternative 1 Washington with the Atlantic/Pomona Station Option

ID No. ¹	Location	Type Use ²	Impact (Frequent)	No. Residences Affected	Major Source(s) Contributing to Impact ³
FTA Category 2					
Mo2	5224 ½ Via Corona Street	SFR MFR	Frequent	15 6	Crossover/switch
Mo7	Washington Boulevard at Keltonview Drive	SFR	Frequent	5	Crossover/switch
M10	Washington Boulevard at Milna Avenue	SFR	Frequent	15	Crossover/switch
M12	Calobar Avenue	SFR MFR	Frequent	1 1	Crossover/switch
Mo4	Area local to E Olympic Boulevard	SFR MFR	Frequent	28 7	Operations
Total FTA Category 2			Frequent	85	
FTA Category 3					
Mo5	668 S Atlantic Boulevard	School	Frequent	1	Operations
Mo7	8705 Washington Boulevard	School	Frequent	1	Operations
Total FTA Category 3			Frequent	2	
Total – All Uses			Total	87	

Source: AECOM, February 2011; Morgner, December 2019 and July 2021.

Notes:

1 See **Figure 6.1** and Attachment A for receptor locations.

2 SFR = Single-Family Residence; MFR = Multi-Family Residence.

3 Major sources include LRT passbys, LRT warning bells, and switches or special trackwork. The MSF and TPSS are not expected to be a major source for impacts in any vibration-sensitive locations.

As with the base Alternative 1, Alternative 1 with the Atlantic/Pomona Station Option would require implementation of MM NOI-12 and MM NOI-13, described in **Section 9.o**, which would reduce operational vibration impacts to less than significant.

Montebello At-Grade Option

Alternative 1 with the Montebello At-Grade Option would have three potential sources of vibration during operations, including LRT vehicle passbys along CWR track, LRT passbys through special trackwork such as switches along the corridor during revenue service, and switches at the MSF site options. The corridor-wide Project vibration impacts along Alternative 1 with the Montebello At-Grade Option would be the same as the base Alternative 1. The impact would be significant. As with the base Alternative 1, Alternative 1 with the Montebello At-Grade Option would require implementation of MM

NOI-12 and MM NOI-13, identified in Section 9.0, which would reduce operational vibration impacts to less than significant. See **Section 9.2.1** for the proposed mitigation and impacts after incorporation of mitigation.

7.2.1.2 Construction Impacts

Vibration levels from construction activities are not cumulative but rather dependent on the type of activity and equipment used. Vibration is also dependent on the ground and terrain conditions, the presence of underground utilities, and the type and condition of the building at the receptor. As a result, except for digging and pounding activities in hard soils, most construction activities do not contribute to vibration impacts, due to the typically long distance between the activity and the sensitive receptor.

Tunneling activities could cause construction vibration. Operation of the TBM and machinery to remove excavation spoils from the TBM could result in vibration damage to structures and annoyance to residences and other FTA Category 2 land uses. Typically, vibration from the TBM would not be perceptible at any one residence for longer than one week.

Other construction activities could cause construction vibration. Use of other construction equipment and heavy-machinery such as, bulldozers, dump trucks, vibratory rollers, and pile drivers could result in vibration damage to structures and annoyance to residences and other FTA Category 2 land uses.

In accordance with the FTA guidelines, the vibration limit is used to identify potential impacts. The FTA infrequent event category was used to assess impact from perceptible vibration events since not all construction activity would be perceptible.

The distances at which an exceedance of the FTA vibration infrequent annoyance criterion of 80 VdB for residences and other FTA Category 2 land uses would occur range from 40 feet for trucks, 50 feet for bulldozers, and 70 feet for vibratory rollers. The distances at which an exceedance of the FTA vibration damage criterion of 0.2 ips would occur (for typical timber and masonry residences) range from 15 feet for trucks, 20 feet for bulldozers, and 35 feet for vibratory rollers, which is a much closer distance than the FTA vibration infrequent annoyance criterion. As a result of these preliminary construction vibration estimates, construction activities are predicted to exceed the FTA impact criteria at the closest residences and commercial properties. Therefore, a significant impact would occur.

PM NOI-2, discussed in Section 8.0, sets forth construction activities to be carried out in compliance with Metro's baseline specifications Section 015619, Construction Noise and Vibration Control. Additional mitigation measures identified in **Section 9.0** and summarized below would be required to reduce impacts.

MM NOI-2 would require Metro's contractor to use CIDH or drilled piles rather than impact pile drivers to reduce excessive vibration, except where these are impracticable, because pre-drilling reduces noise and vibration impacts by reducing the rate of displacement and compression of the surrounding soil. MM NOI-4 would require Metro's contractor to locate construction equipment and material staging areas away from sensitive receptors to increase the distance in relation to sensitive receptors and thereby reduce impacts. MM NOI-5 would require Metro's contractor to route construction traffic, and haul routes away from sensitive receptors where practicable to reduce vibratory impacts related to haul routes. MM NOI-7 would require the contractor, wherever

practicable, to conduct construction activities during the daytime and weekdays to reduce nighttime and weekend disruption when residents are more likely to be home. MM NOI-8 would require Metro to establish a Noise and Vibration Complaint Hotline to resolve vibration issues. MM NOI-9 would require using a muck removal conveyor for the TBM if practicable, with specifications to reduce vibration, including using temporary tunnel track with smooth rail and wheels.

MM NOI-14 would require Metro to conduct a survey of selected properties within 100 feet of the alignment to determine the baseline structural integrity and condition of walls and joints to provide a basis for comparison after construction is completed and to provide baseline data for monitoring vibration impacts and developing the construction vibration control plan and monitoring plan described in MM NOI-15. Under MM NOI-15, Metro would require the contractor to develop a construction vibration control plan and a construction vibration monitoring plan to minimize vibration impact and reduce the risk of damage to susceptible structures.

Implementation of MM NOI-2, MM NOI-4, MM NOI-5, MM NOI-7, MM NOI-8, MM NOI-9, MM NOI-14, and MM NOI-15 would reduce construction vibration impacts to less than significant.

Design Options

Atlantic/Pomona Station Option

The construction vibration impacts for Alternative 1 with the Atlantic/Pomona Station Option would be the same as the base Alternative 1. However, unlike the base Alternative 1, Alternative 1 with the Atlantic/Pomona Station Option would result in potential vibration impacts to fewer residences near representative receptor Mo1 and more residences near representative receptor Mo2. This is due to the variation in the track alignment that would be required for the Atlantic/Pomona Station Option. Construction activities are predicted to exceed the FTA impact criteria at the closest residences and commercial properties. Therefore, a significant impact would occur. Construction of Alternative 1 with the Atlantic/Pomona Station Option would require implementation of MM NOI-2, MM NOI-4, MM NOI-5, MM NOI-7, MM NOI-8, MM NOI-9, MM NOI-14, and MM NOI-15, as summarized above and identified in **Section 9.o**, which would reduce construction vibration impacts to less than significant.

Montebello At-Grade Option

Construction of Alternative 1 with the Montebello At-Grade Option would involve additional at-grade construction in place of aerial guideway construction as compared to the base Alternative 1. As discussed in **Section 7.1.1.2** and **Section 7.2.1.2**, at-grade track laying or guideway construction equipment would generally consist of rubber-tired excavators, loaders, rubber-tired compactors, graders and small bulldozers, and water trucks for dust control.

Construction activities for Alternative 1 with the Montebello At-Grade Option are predicted to exceed the FTA impact criteria at the closest residences and commercial properties. Therefore, a significant impact would occur. Construction of Alternative 1 with the Montebello At-Grade Option would require implementation of MM NOI-2, MM NOI-4, MM NOI-5, MM NOI-7, MM NOI-8, MM NOI-9, MM NOI-14, and MM NOI-15, as summarized above and identified in **Section 9.o**, which would reduce construction vibration impacts to less than significant.

7.2.2 Alternative 2 Atlantic to Commerce/Citadel IOS

7.2.2.1 Operational Impacts

As with Alternative 1, the Alternative 2 rail corridor would be constructed with CWR track. In the at-grade configuration, the track would be embedded. CWR track is continuous and therefore produces less vibration than non-CWR track because it does not have any breaks or gaps that could cause vibrations when a wheel passes over the track. Embedded track is vibration-isolated by a material which reduces transmitted vibration. Along the aerial section, elevated structures create additional separation between the train source and the ground-level receptors resulting in greater attenuation. Along tunnel sections, train steel wheels over steel rails would input vibration into the track support structures and onwards to the ground. CWR track would reduce this vibration to some degree. All predicted vibration levels were compared with the FTA frequent impact criteria to assess the onset and severity of impact.

Alternative 2 would have three potential sources of vibration during operations, including LRT vehicle passbys along CWR track, LRT passbys through special trackwork such as switches along the corridor during revenue service, and switches at the Commerce MSF site option.

7.2.2.1.1 Passby Impacts from LRT Vehicles

To show the variation in vibration levels along Alternative 2, transit vibration levels were predicted at the same receptor locations as for the noise analysis. As summarized in **Table 7-11**, the maximum vibration levels from LRT vehicles are predicted to range from 62 VdB at representative Receptor Mo3 a single-family residence, to 80 VdB at Receptor Mo5 (Kipp Raices Academy at 668 S Atlantic Boulevard). Except for representative Receptor Mo5, all the vibration levels at the representative receptor sites are predicted to be below the FTA frequent impact criteria.

Table 7-11. Summary of Project Vibration Levels at Representative Receptors from Alternative 2 Atlantic to Commerce/Citadel IOS (in VdB)

Receptor		Land Use		Build Vibration ⁴	FTA Criteria	
ID No. ¹	Location of Vibration Monitoring	Type ²	FTA ³		"Frequent"	Impact
Mo1	376 S Woods Avenue	SFR	2	66	72	No
Mo2	5224 1/2 Via Corona Street	SFR	2	65	72	No
Mo3	743 Amalia Avenue	SFR	2	62	72	No
Mo4	740 1/2 Woods Avenue	SFR	2	64	72	No
Mo5	Kipp Raices Academy, 668 South Atlantic Boulevard	School	2	<u>80</u>	75	Yes

Source: AECOM, November 2010; Morgner, December 2019 and July 2021.

Notes:

1 See **Figure 6.1** and Attachment A for receptor locations.

2 SFR = Single-family Residence.

3 FTA Land Use Categories: Category 1 - high sensitivity, Category 2 – residential, and Category 3 - institutional.

4 Exceedances of the FTA frequent criteria are bold and underlined.

As summarized in **Table 7-12**, corridor-wide vibration levels are predicted to exceed the FTA frequent criterion of 72 VdB at 54 residences. These impacts are due to the proximity of residences to proposed switches, and proximity to the tunnel section of the alignment.

One vibration impact is predicted at an FTA Category 3 receptor, a school over the alignment on Atlantic Boulevard. Additionally, vibration levels along Alternative 2 are predicted to exceed the FTA frequent criterion of 75 VdB at one institutional receptor (Kipp Raices Academy, at 668 S Atlantic Boulevard). Therefore, a significant impact would occur. The predicted corridor-wide vibration impacts are shown in Attachment A.

Mitigation measures would be implemented to reduce vibration impacts. As summarized in **Section 7.1.1.2** and identified in **Section 9.0**, MM NOI-12 would require the use of track support systems to reduce vibratory impacts caused by steel wheels rolling over steel rails at rail joints during the passby of LRT vehicles at residences and MM NOI-13 would reduce vibratory levels by reducing the width of gaps at joints when steel wheels roll over steel rails at rail joints. Implementation of MM NOI-12 and MM NOI-13 would reduce operational vibration impacts from passbys to less than significant.

Table 7-12. Corridor-wide Project Vibration and GBN Impacts Along Alternative 2 Atlantic to Commerce/Citadel IOS

Nearest ID No. ¹	Location	Type Use ²	Impact (Frequent)	No. Residences Affected	Major Source(s) Contributing to Impact ³
FTA Category 2					
Mo1	376 S Woods Avenue	SFR	Frequent	10	Crossover
Mo2	5224 1/2 Via Corona Street	SFR MFR	Frequent	6 3	Crossover
Mo4	Area local to East Olympic Boulevard	SFR MFR	Frequent	28 7	Operations
Total FTA Category 2			Frequent	54	
FTA Category 3					
Mo5	668 S Atlantic Boulevard	School	Frequent	1	Operations
Total FTA Category 3			Frequent	1	
Total – All Uses			Total	55	

Source: AECOM, February 2011; Morgner, December 2019 and July 2021.

Notes:

¹ See **Figure 6.1** and Attachment A for receptor locations.

² SFR = Single-family Residence, MFR = Multi-family Residence.

³ Major sources include LRT passbys, and switches or special trackwork. The MSF and TPSS are not expected to be a major source for impacts in any noise-sensitive locations.

7.2.2.1.2 Operational Vibration Impacts at Historic Properties

Alternative 2 would not impact any vibration sensitive historic properties. Alternative 2 is entirely underground, and there are no historic properties located where they would be impacted by operational vibration. No impact would occur.

7.2.2.1.3 Operational Vibration Impacts at Parks, Schools, and Other Institutional Receptors

As summarized in **Table 7-13**, maximum vibration levels at one institutional receptor along Alternative 2 are predicted to reach 80 VdB at the Kipp Raices Academy on Atlantic Boulevard, exceeding the FTA frequent impact criteria. Therefore, a significant impact would occur.

Compliance with MM NOI-12 and MM NOI-13, summarized in **Section 7.1.1.2** and identified in **Section 9.0**, would minimize potential vibration impacts by reducing vibratory impacts caused by steel wheels rolling over steel rails at rail joints during the passby of LRT vehicles at sensitive receptors and by reducing the width of gaps at joints when steel wheels roll over steel rails at rail joints. Implementation of MM NOI-12 and MM NOI-13 would reduce operational vibration impacts on institutional receptors to less than significant.

Table 7-13. Summary of Project Vibration Levels at Parks, Schools, and Other Institutional Receptor Sites for Alternative 2 Atlantic to Commerce/Citadel IOS (in VdB)

Receptor		Land Use		Build Vibration ³	FTA Criteria	
ID No. ¹	Description	Type	FTA ²		“Frequent”	Impact
Mo5	Kipp Raices Academy, 668 South Atlantic Boulevard	School	3	<u>80</u>	75	Yes

Source: AECOM, February 2011; Morgner, December 2019 and July 2021.

Notes:

1 See **Figure 6.1** and Attachment A for receptor locations.

2 FTA Land Use Categories: Category 1 – high sensitivity, Category 2 – residential, and Category 3 – institutional.

3 Exceedances of the FTA frequent criteria are bold and underlined.

Design Option

Atlantic/Pomona Station Option

The Atlantic/Pomona Station Option guideway alignment is located east of Atlantic Boulevard and connects with the base Alternative 2 alignment just north of the proposed Atlantic/Whittier station. Because of the variation in the alignment, the location of the potential vibration impacts are different than that of the base Alternative 2. Like the base Alternative 2, corridor-wide vibration levels are predicted to exceed the FTA frequent criterion of 72 VdB at 54 residences. These impacts are due to the proximity of residences to proposed switches and proximity to the tunnel section of the alignment. Also like the base Alternative 2, Alternative 2 with the Atlantic/Pomona Station Option would result in one predicted vibration impact at an FTA Category 3 receptor, Kipp Raices Academy school close to the alignment at 668 S Atlantic Boulevard. However, unlike the base Alternative 2, Alternative 2 with the Atlantic/Pomona Station Option would result in potential vibration impacts to fewer residences near representative receptor Mo1 and more residences near representative receptor Mo2. This is due to the variation in the track alignment that would be required for the Atlantic/Pomona Station Option. The impact would be significant. The predicted corridor-wide vibration impacts are shown graphically in Attachment A.

As with the base Alternative 2, Alternative 2 with the Atlantic/Pomona Station Option would require implementation of MM NOI-12 and MM NOI-13, as summarized in **Section 7.1.1.2** and identified in **Section 9.0**, which would reduce operational vibration impacts to less than significant.

7.2.2.2 Construction Impacts

Construction of Alternative 2 would produce vibration from the same types of construction activities as Alternative 1 and use the same types of equipment for those activities. As with Alternative 1, use of construction equipment and heavy-machinery such as TBMs, bulldozers, dump trucks, vibratory rollers, pile drivers, and machinery to remove excavation spoils from the TBM could result in vibration damage to structures and annoyance to residences and other FTA Category 2 land uses. The distances at which an exceedance of the FTA vibration infrequent annoyance criterion of 80 VdB for residences and other FTA Category 2 land uses would occur range from 40 feet for trucks, 50 feet for bulldozers, and 70 feet for vibratory rollers. The distances at which an exceedance of the FTA vibration damage criterion of 0.2 ips would occur (for typical timber and masonry residences) range from 15 feet for trucks, 20 feet for bulldozers, and 35 feet for vibratory rollers, which is a much closer distance than the FTA vibration infrequent annoyance criterion. As a result of these preliminary construction vibration estimates, construction activities are predicted to exceed the FTA impact criteria at the closest residences and commercial properties.

As set forth by PM NOI-2, identified in **Section 8.o**, construction activities would be carried out in compliance with Metro's baseline specifications Section 015619, Construction Noise and Vibration Control. Additional mitigation measures would be required to reduce impacts. MM NOI-2, MM NOI-4, MM NOI-5, MM NOI-7, MM NOI-8, MM NOI-9, MM NOI-14, and MM NOI-15, summarized in the construction evaluation in **Section 7.1.1.2** and identified in **Section 9.o**, would reduce vibration effects through means such as requiring use of equipment that produces less vibration, maximizing the distance between vibration generating activities and sensitive receptors to the degree feasible, establishing a Noise and Vibration Complaint Hotline to resolve vibration issues, surveying properties to determine the baseline structural integrity and condition, and developing a construction vibration control plan and monitoring plan. Implementation of MM NOI-2, MM NOI-4, MM NOI-5, MM NOI-7, MM NOI-8, MM NOI-9, MM NOI-14, and MM NOI-15 would reduce construction vibration impacts to less than significant.

Design Option

Atlantic/Pomona Station Option

The construction impacts for Alternative 2 with the Atlantic/Pomona Station Option would be the same as the base Alternative 2. Construction activities are predicted to exceed the FTA impact criteria at the closest residences and commercial properties. Therefore, a significant impact would occur. Construction of Alternative 2 with the Atlantic/Pomona Station Option would require implementation of MM NOI-2, MM NOI-4, MM NOI-5, MM NOI-7, MM NOI-8, MM NOI-9, MM NOI-14, and MM NOI-15, as summarized in the construction evaluation in **Section 7.1.1.2** and identified in **Section 9.o**, which would reduce construction vibration impacts to less than significant.

7.2.3 Alternative 3 Atlantic to Greenwood IOS

7.2.3.1 Operational Impacts

Unlike noise, which is assessed using cumulative noise levels over a 24-hour period, transit vibration impacts are assessed based on individual events, such as when a train passes by. As with Alternative 1,

Alternative 3 would be constructed with CWR track. In the at-grade configuration, the track would be embedded. CWR track is continuous and therefore produces less vibration than non-CWR track because it does not have any breaks or gaps that could cause vibrations when a wheel passes over the track. Embedded track is vibration-isolated by a material which reduces transmitted vibration. Along the aerial section, elevated structures create additional separation between the train source and the ground-level receptors resulting in greater attenuation. At at-grade crossings, embedded track at cross streets is not expected to result in any vibration impacts, due to the short section limited to the width of the cross street. Along tunnel sections, train steel wheels over steel rails would input vibration into the track support structures and onwards to the ground. CWR track would reduce this vibration to some degree. All predicted vibration levels were compared with the FTA frequent impact criteria to assess the onset and severity of impact.

Alternative 3 would have three potential sources of vibration during operations, including LRT vehicle passbys along CWR track, LRT passbys through special trackwork such as switches along the corridor during revenue service, and switches at the MSF.

7.2.3.1.1 Passby Impacts from LRT Vehicles

To show the variation in vibration levels along Alternative 3, transit vibration levels were predicted at the same receptor locations as for the noise analysis. As summarized in **Table 7-14**, the maximum vibration levels from LRT vehicles are predicted to range from 62 VdB at representative Receptor Mo3 a single-family residence, to 80 VdB at representative Receptor Mo5 (Kipp Raices Academy, 668 S Atlantic Boulevard). Except for representative Receptor Mo5, all of the vibration levels at the representative receptor sites are predicted to be below the FTA frequent impact criteria.

Table 7-14. Summary of Project Vibration Levels at Representative Receptors from Alternative 3 Atlantic to Greenwood IOS (in VdB)

Receptor		Land Use		Build Vibration ⁴	FTA Criteria	
ID No. ¹	Vibration Measurement Location	Type ²	FTA ³		"Frequent"	Impact
Mo1	376 S Woods Avenue	SFR	2	66	72	No
Mo2	5224 1/2 Via Corona Street	SFR	2	65	72	No
Mo3	743 Amalia Avenue	SFR	2	62	72	No
Mo4	740 1/2 Woods Avenue	SFR	2	64	72	No
Mo5	Kipp Raices Academy, 668 South Atlantic Boulevard	School	2	<u>80</u>	75	Yes

Source: AECOM, November 2010; Morgner, December 2019 and July 2021.

Notes:

¹ See **Figure 6.1** and Attachment A for receptor locations.

² SFR = Single-family Residence.

³ FTA Land Use Categories: Category 1 – high sensitivity, Category 2 – residential, and Category 3 – institutional.

⁴ Exceedances of the FTA frequent criteria are bold and underlined.

As summarized in **Table 7-15**, corridor-wide vibration levels are predicted to exceed the FTA frequent criterion of 72 VdB at 54 residences. These impacts are due to the proximity of residences to proposed switches, and proximity to the tunnel section of the alignment. Additionally, one vibration impact exceeding the criteria of 72VdB is predicted at a FTA Category 3 receptor, Kipp Raices Academy, 668 S Atlantic Boulevard close to the alignment. Therefore, a significant impact would occur. The predicted corridor-wide vibration impacts are shown in Attachment A.

Mitigation measures would be implemented to reduce vibration impacts. As summarized in **Section 7.1.1.2** and identified in **Section 9.0**, MM NOI-12 would require the use of track support systems to reduce vibratory impacts caused by steel wheels rolling over steel rails at rail joints during the passby of LRT vehicles at residences and MM NOI-13 would reduce vibratory levels by reducing the width of gaps at joints when steel wheels roll over steel rails at rail joints. Implementation of MM NOI-12 and MM NOI-13 would reduce operational vibration impacts from passbys to less than significant.

Table 7-15. Corridor-wide Project Vibration and GBN Impacts Along Alternative 3 Atlantic to Greenwood IOS

Nearest ID No. ¹	Location	Type Use ²	Impact (Frequent)	No. Residences Affected	Major Source(s) Contributing to Impact ³
FTA Category 2					
Mo1	376 South Woods Avenue	SFR	Frequent	10	Crossover
Mo2	5224 1/2 Via Corona Street	SFR MFR	Frequent	6 3	Crossover
Mo4	Area local to East Olympic Boulevard	SFR MFR	Frequent	28 7	Operations
Total FTA Category 2			Frequent	54	
FTA Category 3					
Mo5	Kipp Raices Academy, 668 South Atlantic Boulevard	School	Frequent	1	Operations
Total FTA Category 3			Frequent	1	
Total – All Uses			Total	55	

Source: AECOM, February 2011; Morgner, December 2019 and July 2021.

Notes:

1 See **Figure 6.1** and Attachment A for receptor locations.

2 SFR = Single-Family Residence; MFR = Multi-Family Residence.

3 Major sources include LRT passbys, LRT warning bells, and switches or special trackwork. The MSF and TPSS are not expected to be a major source for impacts in any noise-sensitive locations.

7.2.3.1.2 Operational Vibration Impacts at Historic Properties

Alternative 3 would not impact any vibration sensitive historic properties. There are no historic properties located where they would be impacted by operational vibration. No impact would occur.

7.2.3.1.3 Operational Vibration Impacts at Parks, Schools, and Other Institutional Receptors

As with Alternative 2 and summarized in **Table 7-16**, maximum vibration levels at one institutional receptor along Alternative 3 are predicted to reach 80 VdB at the Kipp Raices Academy on Atlantic Boulevard, exceeding the FTA frequent impact criteria. Therefore, a significant impact would occur. Compliance with MM NOI-12 and MM NOI-13, summarized in **Section 7.1.1.2** and identified in **Section 9.0**, would minimize potential vibration impacts by reducing vibratory impacts caused by steel wheels rolling over steel rails at rail joints during the passby of LRT vehicles at sensitive receptors and by reducing the width of gaps at joints when steel wheels roll over steel rails at rail joints. Implementation

of MM NOI-12 and MM NOI-13 would reduce operational vibration impacts on institutional receptors to less than significant.

Table 7-16. Summary of Project Vibration Levels at Parks, Schools, and Other Institutional Receptor Sites Along Alternative 3 Atlantic to Greenwood IOS (in VdB)

Receptor		Land Use		Build Vibration	FTA Criteria	
ID No.	Description	Type	FTA		"Frequent"	Impact
Mo5	Kipp Raices Academy, 668 South Atlantic Boulevard	School	3	80	75	Yes

Source: AECOM, February 2011; Morgner, December 2019 and July 2021.

Note:

Due to attenuation over large distances, the predicted vibration level is below detection level and well below the ambient background level. Therefore, it is not perceptible.

Design Options

Atlantic/Pomona Station Option

The Atlantic/Pomona Station Option guideway alignment is located east of Atlantic Boulevard and connects with the base Alternative 3 alignment just north of the proposed Atlantic/Whittier station. Because of the variation in the alignment, the location of potential vibration impacts is different than that of the base Alternative 3. Like the base Alternative 3, corridor-wide vibration levels are predicted to exceed the FTA frequent criterion of 72 VdB at 54 residences. These impacts are due to the proximity of residences to proposed switches and proximity to the tunnel section of the alignment. As with the base Alternative 3, Alternative 3 with the Atlantic/Pomona Station Option would result in one predicted vibration impact at an FTA Category 3 receptor, Kipp Raices Academy school close to the alignment at 668 S Atlantic Boulevard. However, unlike the base Alternative 3, Alternative 3 with the Atlantic/Pomona Station Option would result in potential vibration impacts to fewer residences near representative receptor Mo1 and more residences near representative receptor Mo2. This is due to the variation in the track alignment that would be required for the Atlantic/Pomona Station Option. The impact would be significant. The predicted corridor-wide vibration impacts are shown graphically in Attachment A.

As with the base Alternative 3, Alternative 3 with the Atlantic/Pomona Station Option would require implementation of MM NOI-12 and MM NOI-13, summarized in **Section 7.1.1.2** and identified in **Section 9.o**, which would reduce operational vibration impacts to less than significant.

Montebello At-Grade Option

Alternative 3 with the Montebello At-Grade Option would have three potential sources of vibration during operations, including LRT vehicle passbys along CWR track, LRT passbys through special trackwork such as switches along the corridor during revenue service, and switches at the MSF. The corridor-wide Project vibration impacts along Alternative 3 with the Montebello At-Grade Option is the same as for the base Alternative 3 with an aerial configuration. The impact would be significant. As with the base Alternative 3, Alternative 3 with the Montebello At-Grade Option would require implementation of MM NOI-12 and MM NOI-13 as identified in **Section 9.o**, which would reduce operational vibration impacts to less than significant.

7.2.3.2 Construction Impacts

Construction of Alternative 3 would produce vibration from the same types of construction activities as Alternative 1 and use the same types of equipment for those activities. As with Alternative 1, use of construction equipment and heavy-machinery such as TBMs, bulldozers, dump trucks, vibratory rollers, pile drivers, and machinery to remove excavation spoils from the TBM could result in vibration damage to structures and annoyance to residences and other FTA Category 2 land uses. As with Alternative 1, the distances at which an exceedance of the FTA vibration infrequent annoyance criterion of 80 VdB for residences and other FTA Category 2 land uses would occur range from 40 feet for trucks, 50 feet for bulldozers, and 70 feet for vibratory rollers. The distances at which an exceedance of the FTA vibration damage criterion of 0.2 ips would occur (for typical timber and masonry residences) range from 15 feet for trucks, 20 feet for bulldozers, and 35 feet for vibratory rollers, which is a much closer distance than the FTA vibration infrequent annoyance criterion. As a result of these preliminary construction vibration estimates, construction activities are predicted to exceed the FTA impact criteria at the closest residences and commercial properties.

As set forth by PM NOI-2, identified in **Section 8.o**, construction activities would be carried out in compliance with Metro's baseline specifications Section 015619, Construction Noise and Vibration Control. Mitigation measures would be required to reduce impacts. MM NOI-2, MM NOI-4, MM NOI-5, MM NOI-7, MM NOI-8, MM NOI-9, MM NOI-14, and MM NOI-15, summarized in the construction evaluation in **Section 7.1.1.2** and identified in **Section 9.o**, would reduce vibration effects through means such as requiring use of equipment that produces less vibration, maximizing the distance between vibration generating activities and sensitive receptors to the degree feasible, establishing a Noise and Vibration Complaint Hotline to resolve vibration issues, surveying properties to determine the baseline structural integrity and condition, and developing a construction vibration control plan and monitoring plan. Implementation of MM NOI-2, MM NOI-4, MM NOI-5, MM NOI-7, MM NOI-8, MM NOI-9, MM NOI-14, and MM NOI-15 would reduce construction vibration impacts to less than significant.

Design Options

Atlantic/Pomona Station Option

The construction impacts for Alternative 3 with the Atlantic/Pomona Station Option would be the same as the base Alternative 3. Construction of the Atlantic/Pomona Station Option would involve additional at-grade construction in the area around the station compared to the base Alternative 3. Construction activities are predicted to exceed the FTA impact criteria at the closest residences and commercial properties. Therefore, a significant impact would occur. Construction of Alternative 3 with the Atlantic/Pomona Station Option would require implementation of MM NOI-2, MM NOI-4, MM NOI-5, MM NOI-7, MM NOI-8, MM NOI-9, MM NOI-14, and MM NOI-15 as summarized in the construction evaluation in **Section 7.1.1.2** and identified in **Section 9.o**, which would reduce construction vibration impacts to less than significant.

Montebello At-Grade Option

Construction of Alternative 3 with the Montebello At-Grade Option would involve additional at-grade construction in place of aerial guideway construction as compared to the base Alternative 3. As discussed in **Section 7.1.1.2** and **Section 7.2.1.2**, at-grade track laying or guideway construction

equipment would generally consist of rubber-tired excavators, loaders, rubber-tired compactors, graders and small bulldozers, and water trucks for dust control.

Construction activities are predicted to exceed the FTA impact criteria at the closest residences and commercial properties. Therefore, a significant impact would occur. Construction of Alternative 3 with the Montebello At-Grade Option would require implementation of MM NOI-2, MM NOI-4, MM NOI-5, MM NOI-7, MM NOI-8, MM NOI-9, MM NOI-14, and MM NOI-15, as summarized in the construction evaluation in **Section 7.1.1.2** and identified in **Section 9.0**, which would reduce construction vibration impacts to less than significant.

7.2.4 Maintenance and Storage Facilities

7.2.4.1 Operational Impacts

7.2.4.1.1 Commerce MSF

The Commerce MSF site option would accommodate daily maintenance, inspection and repairs, and storage of the LRT vehicles. Unlike noise, which is assessed using cumulative noise levels over a 24-hour period, transit vibration impacts are assessed based on individual events, such as when a train passes by.

A potential source of vibration during operations would include LRT vehicle passbys along special trackwork such as switches at the MSF. However, since the Commerce MSF site option was selected in a predominantly industrial area, there are no vibration-sensitive receptors (such as residences, schools, churches or parks) identified within the FTA screening distance of 150 feet. Therefore, vibration generated from slow-moving LRT vehicles over switches and other activities at the Commerce MSF site option would not exceed the FTA vibration impact criteria at any of the closest receptors and a less than significant vibration impact would occur.

7.2.4.1.2 Montebello MSF

The Montebello MSF site option would accommodate daily maintenance, inspection and repairs, and storage of the LRT vehicles. Unlike noise, which is assessed using cumulative noise levels over a 24-hour period, transit vibration impacts are assessed based on individual events, such as when a train passes by.

A potential source of vibration during operations would include LRT vehicle passbys along special trackwork such as switches at the MSF. However, since the Montebello MSF site option was selected in a predominantly industrial area, there are no vibration-sensitive receptors (such as residences, schools, churches or parks) identified within the FTA screening distance of 150 feet. Therefore, vibration generated from slow-moving LRT vehicles over switches and other activities at the MSF would not exceed the FTA vibration impact criteria at any of the closest receptors and a less than significant vibration impact would occur.

Design Option

Montebello MSF At-Grade Option

The Montebello MSF At-Grade Option would introduce an at-grade crossing over Washington Boulevard to enter the Montebello MSF and this is potential source of vibration from LRT vehicle passbys. However, since the potential MSF site was selected in a predominantly industrial area, there are no vibration-sensitive receptors (such as residences, schools, churches or parks) identified within the FTA screening distance of 150 feet. Therefore, vibration generated from slow-moving LRT vehicles over switches and other activities at the MSF would not exceed the FTA vibration impact criteria at any of the closest receptors and less than significant vibration impact would occur.

7.2.4.2 Construction Impacts

7.2.4.2.1 Commerce MSF

The construction of Commerce MSF site option would involve similar work to installation of the alignment and construction of stations. Since the Commerce MSF site option is in a predominantly industrial area, there are no adjacent vibration-sensitive receptors, and a less than significant vibration would occur.

7.2.4.2.2 Montebello MSF

The construction of Montebello MSF site option would involve similar work to installation of the alignment and construction of stations. Since the Montebello MSF site option was selected in a predominantly industrial area, there are no adjacent vibration-sensitive receptors, and a less than significant vibration would occur.

Design Option

Montebello MSF At-Grade Option

The construction of Montebello MSF At-Grade Option would involve similar work to installation of the alignment and construction of stations. Since the Montebello MSF site option was selected in a predominantly industrial area, there are no adjacent vibration-sensitive receptors, and a less than significant vibration would occur.

8.0 PROJECT MEASURES

The following project measures are design features, best management practices, or other measures required by law and/or permit approvals. These measures are components of the Project and are applicable to all Build Alternatives, design options, and MSF site options and MSF design option.

Operational Project Measures include:

PM NOI-1: Operational (post-Project) design standards for the Build Alternative may include but are not limited to:

- Design efforts per Metro Rail Design Criteria (MRDC) to reduce operational noise of the TPSSs which would mandate the location of traction power substations (TPSS) to be 45 dBA at 50 feet or at the setback line of the nearest building or occupied area, whichever is closer (Metro 2018).

Construction Project Measures shall include:

PM NOI-2: Construction activities shall comply with Metro's baseline specifications Section 015619, Construction Noise and Vibration Control. Although Metro, as a state-chartered transportation agency, is exempt from local noise ordinances, the agency is committed to consistency with local construction noise limits whenever feasible and reasonable in accordance with its own construction specifications. Metro's contractor shall utilize control measures from Metro's specifications that effectively minimize noise and vibration impacts in the community. Some mitigation measures shown in **Section 9.0** are based on the provisions set forth in Section 015619 and are refined to have more specificity towards the Project-related impacts concerning noise and vibration. Under PM NOI-2, the Project shall comply with the entirety of Metro's baseline specifications Section 015619 and Metro's contractor shall utilize control measures from its own specifications that effectively minimize noise and vibration impacts in the community, such as:

- Conducting construction activities during the daytime whenever practicable.
- Requiring special permits for construction within a specified distance and a specified time period for residential zones during the nighttime and weekends.
- Using construction equipment with effective noise-suppression devices whenever feasible.
- Using noise control measures, such as enclosures and noise barriers, as necessary to protect the public and achieve compliance with Metro's noise limits.
- Conducting all operations in a manner that will minimize, to the greatest extent practicable, disturbance to the public in areas adjacent to the construction activities and to occupants of nearby buildings.

9.0 MITIGATION MEASURES AND IMPACTS AFTER MITIGATION

9.1 Impact NOI-1: Ambient Noise

Impact NOI-1: Would a Build Alternative result in generation of a substantial temporary or permanent increase in ambient noise levels in the vicinity of the project in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies?

9.1.1 Alternative 1 Washington

9.1.1.1 Potential Operational Mitigation Measures

As discussed in **Section 7.1.1.1**, operation of the base Alternative 1 would have a less than significant impact under Impact NOI-1 Ambient Noise; therefore, no operational mitigation measures would be required.

9.1.1.2 Potential Construction Mitigation Measures

As discussed in **Section 7.1.1.2**, construction of the base Alternative 1 would have a significant impact under Impact NOI-1 Ambient Noise; therefore, mitigation measures would be required. The following mitigation measures would be implemented to avoid, minimize, and/or mitigate temporary construction noise impacts.

MM NOI-1: Metro shall require the Contractor to develop a construction noise control plan and a construction noise monitoring plan to minimize noise impacts. The construction noise plan shall include construction noise performance criteria. The performance criteria may not exceed the FTA general assessment construction noise criteria of 80 dBA for nighttime work and 90 dBA for daytime work at residential properties or 100 dBA at commercial or industrial properties for daytime or nighttime work, as measured at the boundary of any occupied property where the noise is being received.

MM NOI-2: Metro shall require the Contractor to use construction methods that avoid pile-driving at locations containing noise- and vibration-sensitive receptors, such as residences, schools, and hospitals where practicable. Metro's contractor shall use CIDH or drilled piles rather than impact pile drivers to reduce excessive noise, except where CIDH or drilled piles are impracticable.

MM NOI-3: Metro shall require the Contractor to erect temporary noise barriers between noisy activities and noise sensitive receptors to ensure compliance with applicable noise limits.

MM NOI-4: Metro shall require the Contractor to locate construction equipment and material staging areas away from sensitive receptors where practicable.

- MM NOI-5:** Metro shall require the Contractor to route construction traffic and haul routes along roads in areas without receptors sensitive to noise and vibration, where practicable.
- MM NOI-6:** Metro shall require contractors to use best available control technologies to limit excessive noise when working near residences (e.g., piling noise shrouds) where practicable.
- MM NOI-7:** Metro shall require the Contractor wherever practicable, to conduct construction activities during the daytime and during weekdays in residential areas.
- MM NOI-8:** Metro shall notify the public of construction operations and schedules. Metro shall provide a construction-alert publication and set up a Noise and Vibration Complaint Hotline that shall reply to complaints within 2 working days.
- MM NOI-9:** Metro shall require the Contractor to use a muck removal conveyor for the TBM unless otherwise impracticable. If a temporary tunnel track is installed it shall have smooth rail and wheels, and car speeds shall be limited to limit structure-borne noise and vibration.
- MM NOI-10:** Metro shall require the Contractor to store muck on site overnight where feasible and remove by truck through the day where the haul route traverses residential areas at night.
- MM NOI-11:** Metro shall require temporary and permanent tunnel vent fans to be located away from residences. Metro shall require that noise from these shall be attenuated to comply with the noise control plan and local code requirements for fixed stationary heating, ventilation, and air conditioning (HVAC) or other machinery noise.

Design Options

Atlantic/Pomona Station Option

As discussed in **Section 7.1.1.2**, construction of Alternative 1 with the Atlantic/Pomona Station Option would have a significant impact under Impact NOI-1 Ambient Noise; therefore, mitigation measures would be required. MM NOI-1 through MM NOI-11 would be implemented to avoid, minimize, and/or mitigate temporary construction noise impacts.

Montebello At-Grade Option

As discussed in **Section 7.1.1.2**, construction of Alternative 1 with the Montebello At-Grade Option would have a significant impact under Impact NOI-1 Ambient Noise; therefore, mitigation measures would be required. MM NOI-1 through MM NOI-11 would be implemented to avoid, minimize, and/or mitigate temporary construction noise impacts.

9.1.1.3 Impacts After Mitigation

9.1.1.3.1 Operational Impacts Determination

Operation of the base Alternative 1 would have a less than significant impact under Impact NOI-1 and no mitigation is required.

Design Options

Atlantic/Pomona Station Option

The operation of Alternative 1 with the Atlantic/Pomona Station Option would have a less than significant impact under Impact NOI-1 and no mitigation is required.

Montebello At-Grade Option

The operation of Alternative 1 with the Montebello At-Grade Option would have a less than significant impact under Impact NOI-1 and no mitigation is required.

9.1.1.3.2 Construction Impacts Determination

With implementation of MM NOI-1 through MM NOI-11, construction of the base Alternative 1 would have a less than significant impact on construction noise.

Design Options

Atlantic/Pomona Station Option

With implementation of MM NOI-1 through MM NOI-11, construction of Alternative 1 with the Atlantic/Pomona Station Option would have a less than significant impact on construction noise.

Montebello At-Grade Option

With implementation of MM NOI-1 through MM NOI-11, construction of Alternative 1 with the Montebello At-Grade Option would have a less than significant impact on construction noise.

9.1.2 Alternative 2 Atlantic to Commerce/Citadel IOS

9.1.2.1 Potential Operational Mitigation Measures

As discussed in **Section 7.1.2.1**, operation of the base Alternative 2 would have a less than significant impact under Impact NOI-1 Ambient Noise; therefore, no mitigation measures would be required.

9.1.2.2 Potential Construction Mitigation Measures

As discussed in **Section 7.1.2.2**, construction of the base Alternative 2 would have a significant impact under Impact NOI-1 Ambient Noise; therefore, mitigation measures would be required. MM NOI-1 through MM NOI-11 would be implemented to avoid, minimize, and/or mitigate temporary construction noise impacts. No additional mitigation is required for construction of the base Alternative 2.

Design Option

Atlantic/Pomona Station Option

As discussed in **Section 7.1.2.2**, construction of Alternative 2 with the Atlantic/Pomona Station Option would have a significant impact under Impact NOI-1 Ambient Noise; therefore, mitigation measures would be required. MM NOI-1 through MM NOI-11 would be implemented to avoid, minimize, and/or mitigate temporary construction noise impacts.

9.1.2.3 Impacts After Mitigation

9.1.2.3.1 Operational Impacts Determination

Operation of the base Alternative 2 would have a less than significant impact under Impact NOI-1 and no mitigation is required.

Design Option

Atlantic/Pomona Station Option

Operation of Alternative 2 with the Atlantic/Pomona Station Option would have a less than significant impact under Impact NOI-1 and no mitigation is required.

9.1.2.3.2 Construction Impacts Determination

With implementation of MM NOI-1 through MM NOI-11, construction of the base Alternative 2 would have a less than significant impact on construction noise.

Design Option

Atlantic/Pomona Station Option

With implementation of MM NOI-1 through MM NOI-11, construction of Alternative 2 with the Atlantic/Pomona Station Option would have a less than significant impact on construction noise.

9.1.3 Alternative 3 Atlantic to Greenwood IOS

9.1.3.1 Potential Operational Mitigation Measures

As discussed in **Section 7.1.3.1**, the base Alternative 3 would have a less than significant impact under Impact NOI-1 Ambient Noise; therefore, no mitigation measures would be required.

9.1.3.2 Potential Construction Mitigation Measures

As discussed in **Section 7.1.3.2**, construction of the base Alternative 3 would have a significant impact under Impact NOI-1 Ambient Noise; therefore, mitigation measures would be required. MM NOI-1 through MM NOI-11 would be implemented to avoid, minimize, and/or mitigate temporary construction noise impacts. No additional mitigation is required for construction of the base Alternative 3.

Design Options

Atlantic/Pomona Station Option

As discussed in **Section 7.1.3.2**, construction of Alternative 3 with the Atlantic/Pomona Station Option would have a significant impact under Impact NOI-1 Ambient Noise; therefore, mitigation measures would be required. MM NOI-1 through MM NOI-11 would be implemented to avoid, minimize, and/or mitigate temporary construction noise impacts.

Montebello At-Grade Option

As discussed in **Section 7.1.3.2**, construction of Alternative 3 with the Montebello At-Grade Option would have a significant impact under Impact NOI-1 Ambient Noise; therefore, mitigation measures would be required. MM NOI-1 through MM NOI-11 would be implemented to avoid, minimize, and/or mitigate temporary construction noise impacts.

9.1.3.3 Impacts After Mitigation

9.1.3.3.1 Operational Impacts Determination

Operation of the base Alternative 3 would have a less than significant impact under Impact NOI-1 and no mitigation is required.

Design Options

Atlantic/Pomona Station Option

The operation of Alternative 3 with the Atlantic/Pomona Station Option would have a less than significant impact under Impact NOI-1 and no mitigation is required.

Montebello At-Grade Option

The operation of Alternative 3 with the Montebello At-Grade Option would have a less than significant impact under Impact NOI-1 and no mitigation is required.

9.1.3.3.2 Construction Impacts Determination

With implementation of MM NOI-1 through MM NOI-11, construction of the base Alternative 1 would have a less than significant impact on construction noise.

Design Options

Atlantic/Pomona Station Option

With implementation of MM NOI-1 through MM NOI-11, construction of Alternative 3 with the Atlantic/Pomona Station Option would have a less than significant impact on construction noise.

Montebello At-Grade Option

With implementation of MM NOI-1 through MM NOI-11, construction of Alternative 3 with the Montebello At-Grade Option would have a less than significant impact on construction noise.

9.1.4 Maintenance and Storage Facilities

9.1.4.1 Commerce MSF Potential Operational or Construction Mitigation Measures

As discussed in **Section 7.1.4.1.1** and **Section 7.1.4.1.2**, operation and construction of the Commerce MSF site option would have a less than significant impact under Impact NOI-1 Ambient Noise; therefore, no mitigation measures would be required.

9.1.4.2 Montebello MSF Potential Operational or Construction Mitigation Measures

As discussed in **Section 7.1.4.1.2**, operation of the Montebello MSF site option would have a less than significant impact under Impact NOI-1 Ambient Noise; therefore, no operational mitigation measures would be required.

As discussed in **Section 7.1.4.2.2**, construction of the Montebello MSF would have a significant impact under Impact NOI-1; therefore, mitigation measures would be required. MM NOI-2 would be implemented to avoid, minimize, and/or mitigate temporary construction noise impacts. No additional mitigation is required for construction of the Montebello MSF site option.

Design Option

Montebello MSF At-Grade Option

Operation of the Montebello MSF At-Grade Option would have a less than significant impact under Impact NOI-1 Ambient Noise; therefore, no operational mitigation measures would be required.

Construction of the Montebello MSF At-Grade Option would have a significant impact under Impact NOI-1; therefore, mitigation measures would be required. MM NOI-2 would be implemented to avoid, minimize, and/or mitigate temporary construction noise impacts. No additional mitigation is required for construction of the Montebello MSF At-Grade Option.

9.1.4.3 Impacts After Mitigation

9.1.4.3.1 Operational Impacts Determination

Commerce MSF

Operation of the Commerce MSF site option would have less than significant impact under Impact NOI-1 and no mitigation is required.

Montebello MSF

Operation of the Montebello MSF site option and Montebello MSF At-Grade Option would have a less than significant impact under Impact NOI-1 and no mitigation is required.

9.1.4.3.2 Construction Impacts Determination

Commerce MSF

Construction of the Commerce MSF site option would have less than significant impact under Impact NOI-1 and no mitigation is required.

Montebello MSF

With implementation of MM NOI-2, construction of the Montebello MSF site option and Montebello MSF At-Grade Option would have a less than significant impact on construction noise.

9.2 Impact NOI-2: Ground-Borne Vibration

Impact NOI-2: Would a Build Alternative result in generation of excessive ground-borne vibration or ground-borne noise levels?

9.2.1 Alternative 1 Washington

9.2.1.1 Potential Operational Mitigation Measures

As discussed in **Section 7.2.1.1**, Alternative 1 would have a significant operational vibration impact under Impact NOI-2 Ground-borne Vibration; therefore, mitigation measures would be required. The following mitigation measures would be implemented to avoid, minimize, and/or mitigate operational vibration impacts.

MM NOI-12: Within the tunnel, Metro shall reduce operational vibration impacts through the use of track support systems which incorporate resilience, such as ballast mats, high resilience track fasteners, resiliently supported ties or floating track slabs.

MM NOI-13: Metro shall reduce vibration impacts due to gaps at switches by installing ballast mats under conventional switches to “decouple” the train vibration from the track supporting structure, or using a “gapless” spring frog or other low vibration switches for the entire alignment.

Design Options

Atlantic/Pomona Station Option

As discussed in **Section 7.2.1.1**, operation of Alternative 1 with the Atlantic/Pomona Station Option would have a significant impact under Impact NOI-2 Ground-borne Vibration; therefore, mitigation measures would be required. MM NOI-12 and MM NOI-13 would be implemented to avoid, minimize, and/or mitigate operational vibration impacts.

Montebello At-Grade Option

As discussed in **Section 7.2.1.1**, operation of Alternative 1 with the Montebello At-Grade Option would have a significant impact under Impact NOI-2 Ground-borne Vibration; therefore, mitigation measures would be required. MM NOI-12 and MM NOI-13 would be implemented to avoid, minimize, and/or mitigate operational vibration impacts.

9.2.1.2 Potential Construction Mitigation Measures

As discussed in **Section 7.2.1.2**, Alternative 1 would have a significant construction vibration impact under Impact NOI-2 Ground-borne Vibration; therefore, mitigation measures would be required. MM NOI-2, MM NOI-4, MM NOI-5, MM NOI-7, MM NOI-8, and MM NOI-9 as discussed under **Section 9.1.1** shall be implemented to avoid minimize and/or mitigate temporary construction

vibration impacts. In addition, the following mitigation measures would be implemented to avoid, minimize, and/or mitigate temporary construction vibration impacts.

MM NOI-14: Metro shall conduct a survey of selected properties within 100 feet of the alignment to determine the baseline structural integrity and condition of walls and joints. These surveys shall include the installation of strain gauges or a photographic documentation of the interior walls and/or exterior façade as a basis for comparison after construction is completed.

MM NOI-15: Metro shall require the Contractor to develop a construction vibration control plan and a construction vibration monitoring plan to minimize vibration impact and reduce the risk of damage to susceptible structures. The construction vibration control plan shall specify implementation of vibration control measures to ensure that vibration during construction activities shall not exceed ppv 0.2 ips at any non-engineered timber and masonry building.

Design Options

Atlantic/Pomona Station Option

As discussed in **Section 7.2.1.2**, construction of Alternative 1 with the Atlantic/Pomona Station Option would have a significant impact under Impact NOI-2 Ground-borne Vibration; therefore, mitigation measures would be required. MM NOI-2, MM NOI-4, MM NOI-5, MM NOI-7, MM NOI-8, MM NOI-9, MM NOI-14, and MM NOI-15 would be implemented to avoid, minimize, and/or mitigate construction vibration impacts.

Montebello At-Grade Option

As discussed in **Section 7.2.1.2**, construction of Alternative 1 with the Montebello At-Grade Option would have a significant impact under Impact NOI-2 Ground-borne Vibration; therefore, mitigation measures would be required. MM NOI-2, MM NOI-4, MM NOI-5, MM NOI-7, MM NOI-8, MM NOI-9, MM NOI-14, and MM NOI-15 would be implemented to avoid, minimize, and/or mitigate construction vibration impacts.

9.2.1.3 Impacts After Mitigation

9.2.1.3.1 Operational Impacts Determination

With implementation of MM NOI-12 and NOI-13, operation of the base Alternative 1 would have a less than significant impact on operational vibration.

Design Options

Atlantic/Pomona Station Option

With implementation of MM NOI-12 and NOI-13, operation of Alternative 1 with the Atlantic/Pomona Station Option would have a less than significant impact on operational vibration.

Montebello At-Grade Option

With implementation of MM NOI-12 and NOI-13, operation of Alternative 1 with the Montebello At-Grade Option would have a less than significant impact on operational vibration.

9.2.1.3.2 Construction Impacts Determination

With implementation of MM NOI-2, MM NOI-4, MM NOI-5, MM NOI-7, MM NOI-8, MM NOI-9, MM NOI-14, and MM NOI-15, construction of the base Alternative 1 would have a less than significant impact on construction vibration.

Design Options

Atlantic/Pomona Station Option

With implementation of MM NOI-2, MM NOI-4, MM NOI-5, MM NOI-7, MM NOI-8, MM NOI-9, MM NOI-14, and MM NOI-15, construction of Alternative 1 with the Atlantic/Pomona Station Option would have a less than significant impact on construction vibration.

Montebello At-Grade Option

With implementation of MM NOI-2, MM NOI-4, MM NOI-5, MM NOI-7, MM NOI-8, MM NOI-9, MM NOI-14, and MM NOI-15, construction of Alternative 1 with the Montebello At-Grade Option would have a less than significant impact on construction vibration.

9.2.2 Alternative 2 Atlantic to Commerce/Citadel IOS

9.2.2.1 Potential Operational Mitigation Measures

As discussed in **Section 7.2.2.1**, the base Alternative 2 would have a significant operational vibration impact under Impact NOI-2 Ground-borne Vibration; therefore, mitigation measures would be required. MM NOI-12 and MM NOI-13 would be implemented to avoid, minimize, and/or mitigate operational vibration impacts.

Design Options

Atlantic/Pomona Station Option

As discussed in **Section 7.2.2.1**, operation of Alternative 2 with the Atlantic/Pomona Station Option would have a significant impact under Impact NOI-2 Ground-borne Vibration; therefore, mitigation measures would be required. MM NOI-12 and MM NOI-13 would be implemented to avoid, minimize, and/or mitigate operational vibration impacts.

9.2.2.2 Potential Construction Mitigation Measures

As discussed in **Section 7.2.2.2**, the base Alternative 2 would have a significant construction vibration impact under Impact NOI-2 Ground-borne Vibration; therefore, mitigation measures would be required. MM NOI-2, MM NOI-4, MM NOI-5, MM NOI-7, MM NOI-8, MM NOI-9, MM NOI-14, and MM NOI-15 would be implemented to avoid, minimize, and/or mitigate construction vibration impacts.

Design Option

Atlantic/Pomona Station Option

As discussed in **Section 7.2.2.2**, construction of Alternative 2 with the Atlantic/Pomona Station Option would have a significant impact under Impact NOI-2 Ground-borne Vibration; therefore, mitigation measures would be required. MM NOI-2, MM NOI-4, MM NOI-5, MM NOI-7, MM NOI-8, MM NOI-9, MM NOI-14, and MM NOI-15 would be implemented to avoid, minimize, and/or mitigate construction vibration impacts.

9.2.2.3 Impacts After Mitigation

9.2.2.3.1 Operational Impacts Determination

With implementation of MM NOI-12 and NOI-13, operation of the base Alternative 2 would have a less than significant impact on operational vibration.

Design Option

Atlantic/Pomona Station Option

With implementation of MM NOI-12 and NOI-13, operation of Alternative 2 with the Atlantic/Pomona Station Option would have a less than significant impact on operational vibration.

9.2.2.3.2 Construction Impacts Determination

With implementation of MM NOI-2, MM NOI-4, MM NOI-5, MM NOI-7, MM NOI-8, MM NOI-9, MM NOI-14, and MM NOI-15, construction of the base Alternative 2 would have a less than significant impact on construction vibration.

Design Option

Atlantic/Pomona Station Option

With implementation of MM NOI-2, MM NOI-4, MM NOI-5, MM NOI-7, MM NOI-8, MM NOI-9, MM NOI-14, and MM NOI-15, construction of Alternative 1 with the Atlantic/Pomona Station Option would have a less than significant impact on construction vibration.

9.2.3 Alternative 3 Atlantic to Greenwood IOS

9.2.3.1 Operational Mitigation Measures

As discussed in **Section 7.2.3.1**, the base Alternative 3 would have a significant operational vibration impact under Impact NOI-2 Ground-borne Vibration; therefore, mitigation measures would be required. MM NOI-12 and MM NOI-13 would be implemented to avoid, minimize, and/or mitigate operational vibration impacts.

Design Options

Atlantic/Pomona Station Option

As discussed in **Section 7.2.3.1**, operation of Alternative 3 with the Atlantic/Pomona Station Option would have a significant impact under Impact NOI-2 Ground-borne Vibration; therefore, mitigation measures would be required. MM NOI-12 and MM NOI-13 would be implemented to avoid, minimize, and/or mitigate operational vibration impacts.

Montebello At-Grade Option

As discussed in **Section 7.2.3.1**, operation of Alternative 3 with the Montebello At-Grade Option would have a significant impact under Impact NOI-2 Ground-borne Vibration; therefore, mitigation measures would be required. MM NOI-12 and MM NOI-13 would be implemented to avoid, minimize, and/or mitigate operational vibration impacts.

9.2.3.2 Construction Mitigation Measures

As discussed in **Section 7.2.3.2**, the base Alternative 3 would have a significant construction vibration impact under Impact NOI-2 Ground-borne Vibration; therefore, mitigation measures would be required. MM NOI-2, MM NOI-4, MM NOI-5, MM NOI-7, MM NOI-8, MM NOI-9, MM NOI-14, and MM NOI-15 would be implemented to avoid, minimize, and/or mitigate construction vibration impacts.

Design Options

Atlantic/Pomona Station Option

As discussed in **Section 7.2.3.2**, construction of Alternative 3 with the Atlantic/Pomona Station Option would have a significant impact under Impact NOI-2 Ground-borne Vibration; therefore, mitigation measures would be required. MM NOI-2, MM NOI-4, MM NOI-5, MM NOI-7, MM NOI-8, MM NOI-9, and MM NOI-12 through MM NOI-15 would be implemented to avoid, minimize, and/or mitigate construction vibration impacts.

Montebello At-Grade Option

As discussed in **Section 7.2.3.2**, construction of Alternative 3 with the Montebello At-Grade Option would have a significant impact under Impact NOI-2 Ground-borne Vibration; therefore, mitigation measures would be required. MM NOI-2, MM NOI-4, MM NOI-5, MM NOI-7, MM NOI-8, MM NOI-9, MM NOI-14, and MM NOI-15 would be implemented to avoid, minimize, and/or mitigate construction vibration impacts.

9.2.3.3 Impacts After Mitigation

9.2.3.3.1 Operational Impacts Determination

With implementation of MM NOI-12 and NOI-13, operation of the base Alternative 3 would have a less than significant impact on operational vibration.

Design Options

Atlantic/Pomona Station Option

With implementation of MM NOI-12 and NOI-13, operation of Alternative 3 with the Atlantic/Pomona Station Option would have a less than significant impact on operational vibration.

Montebello At-Grade Option

With implementation of MM NOI-12 and NOI-13, operation of Alternative 3 with the Montebello At-Grade Option would have a less than significant impact on operational vibration.

9.2.3.3.2 Construction Impacts Determination

With implementation of MM NOI-2, MM NOI-4, MM NOI-5, MM NOI-7, MM NOI-8, MM NOI-9, MM NOI-14, and MM NOI-15, construction of base Alternative 3 would have a less than significant impact on construction vibration.

Design Options

Atlantic/Pomona Station Option

With implementation of MM NOI-2, MM NOI-4, MM NOI-5, MM NOI-7, MM NOI-8, MM NOI-9, MM NOI-14, and MM NOI-15, construction of Alternative 3 with the Atlantic/Pomona Station Option would have a less than significant impact on construction vibration.

Montebello At-Grade Option

With implementation of MM NOI-2, MM NOI-4, MM NOI-5, MM NOI-7, MM NOI-8, MM NOI-9, MM NOI-14, and MM NOI-15, construction of Alternative 3 with the Montebello At-Grade Option would have a less than significant impact on construction vibration.

9.2.4 Maintenance and Storage Facilities

As discussed in **Section 7.2.4**, operation and construction of the Commerce MSF site option, Montebello MSF site option or the Montebello MSF At-Grade Option would have a less than significant impact under Impact NOI-2; therefore, no mitigation is required.

9.3 Summary of Mitigation Measures

See **Table 9-1** for a summary of mitigation measures.

Table 9-1. Summary of Mitigation Measure Alternative Applicability

Mitigation Measure	Alternative 1	Alternative 2	Alternative 3	MSF
NOI-1 Ambient Noise				
MM NOI-1	Applicable	Applicable	Applicable	N/A
MM NOI-2	Applicable	Applicable	Applicable	Applicable ¹
MM NOI-3	Applicable	Applicable	Applicable	N/A
MM NOI-4	Applicable	Applicable	Applicable	N/A
MM NOI-5	Applicable	Applicable	Applicable	N/A
MM NOI-6	Applicable	Applicable	Applicable	N/A
MM NOI-7	Applicable	Applicable	Applicable	N/A
MM NOI-10	Applicable	Applicable	Applicable	N/A
MM NOI-11	Applicable	Applicable	Applicable	N/A
NOI-2 Ground-Borne Vibration				
MM NOI-12	Applicable	Applicable	Applicable	N/A
MM NOI-13	Applicable	Applicable	Applicable	N/A
MM NOI-14	Applicable	Applicable	Applicable	N/A
MM NOI-15	Applicable	Applicable	Applicable	N/A

Note:

¹ MM NOI-2 is applicable to the Montebello MSF site option and the Montebello MSF At-Grade Option only.

10.0 NO PROJECT ALTERNATIVE

10.1 No Project Alternative

10.1.1 Description

The No Project Alternative would maintain existing transit service through the year 2042. No new transportation infrastructure would be built within the GSA aside from projects currently under construction or funded for construction and operation by 2042 via the 2008 Measure R or 2016 Measure M sales taxes. This alternative would include the highway and transit projects in Metro's 2020 LRTP Update and the 2016 SCAG Regional Transportation Plan (RTP).

10.1.1.1 Noise

There are no Project-related construction activities under the No Build Project Alternative. Therefore, there are no construction noise impacts.

Future noise levels under the No Project Alternative are anticipated to be similar to those under existing conditions. The DSA is characterized by urban communities that include major highways and arterials (such as Atlantic Boulevard and Washington Boulevard). Irrespective of other projects in the Metro LRTP, ambient noise under the No Project Alternative is anticipated to be similar to existing conditions without the Project. For example, it takes a doubling of the traffic volumes for the noise levels to increase by 3 dBA, the threshold where most listeners detect the change. However, increases in traffic levels of less than 40 percent in the DSA between now and 2042 are expected to result in higher congestion and lower average travel speeds. Since no Project elements are proposed under the No Project Alternative, no Project-related impacts would occur under the No Project Alternative.

10.1.1.2 Vibration

No Project-related construction activities are proposed under the No Project Alternative. Therefore, no construction vibration impacts are expected under the No Project Alternative.

Future vibration levels under the No Project Alternative are expected to be similar to those currently experienced under existing conditions. Traffic, including heavy trucks and buses, rarely creates perceptible GBV unless vehicles are operating very close to buildings or there are irregularities in the road, such as potholes or expansion joints. The pneumatic tires and suspension systems of automobiles, trucks, and buses eliminate most GBV. Since no Project elements are proposed under the No Project Alternative, no Project-related vibration impacts would occur under the No Project Alternative.

11.0 SUMMARY OF ALTERNATIVES

A summary of impacts is provided in **Table 11-1** below.

Table 11-1. Significant/Adverse Impacts Remaining After Mitigation

Impact Topic	No Project Alternative	Alternative 1	Alternative 2	Alternative 3	MSF
Impact NOI-1: Ambient Noise	No Impact	Less than Significant Impact	Less than Significant Impact	Less than Significant Impact	Less than Significant Impact
Impact NOI-2: Ground-borne Vibration	No Impact	Less than Significant Impact	Less than Significant Impact	Less than Significant Impact	Less than Significant Impact

11.1 No Project

The No Project Alternative would have no impact under NOI-1 (Noise) and NOI-2 (Vibration).

11.2 Alternative 1 Washington + MSF

The operation and construction of the base Alternative 1 and the either the Commerce MSF or Montebello MSF site option would have less than significant impacts under NOI-1 (Noise) and NOI-2 (Vibration) after mitigation.

11.2.1 Alternative 1 Washington + MSF + Design Option

The operation and construction of Alternative 1 with the Atlantic/Pomona Station Option and/or the Montebello At-Grade Option and either the Commerce site option, Montebello MSF site option, or the Montebello MSF At-Grade Option would have a less than significant impact under NOI-1 (Noise) and NOI-2 (Vibration), after mitigation.

11.3 Alternative 2 Atlantic to Commerce/Citadel IOS + Commerce MSF

The operation and construction of the base Alternative 2 and the Commerce MSF site option would have less than significant impacts under NOI-1 (Noise) and NOI-2 (Vibration), after mitigation.

11.3.1 Alternative 2 Atlantic to Commerce/Citadel IOS + MSF + Design Option

The operation and construction of Alternative 2 with the Atlantic/Pomona Station Option and the Commerce MSF site option would have a less than significant impact under NOI-1 (Noise) and NOI-2 (Vibration), after mitigation.

11.4 Alternative 3 Atlantic to Greenwood IOS + MSF

The operation and construction of the base Alternative 3 and either the Commerce MSF site option or Montebello MSF site option would have less than significant impacts under NOI-1 (Noise) and NOI-2 (Vibration), after mitigation.

11.4.1 Alternative 3 Atlantic to Greenwood + MSF + Design Option

The operation and construction of Alternative 3 with the Atlantic/Pomona Station Option and/or the Montebello At-Grade Option and either the Commerce site option, Montebello MSF site option, or the Montebello MSF At-Grade Option would have a less than significant impact under NOI-1 (Noise) and NOI-2 (Vibration), after mitigation.

12.0 PREPARERS QUALIFICATIONS

Name	Title	Education	Experience (Years)
Nick Antonio	Acoustic Consultant/ Technical Specialist	BSc Applied Physics, Liverpool JMU, 1986	35

13.0 REFERENCES CITED

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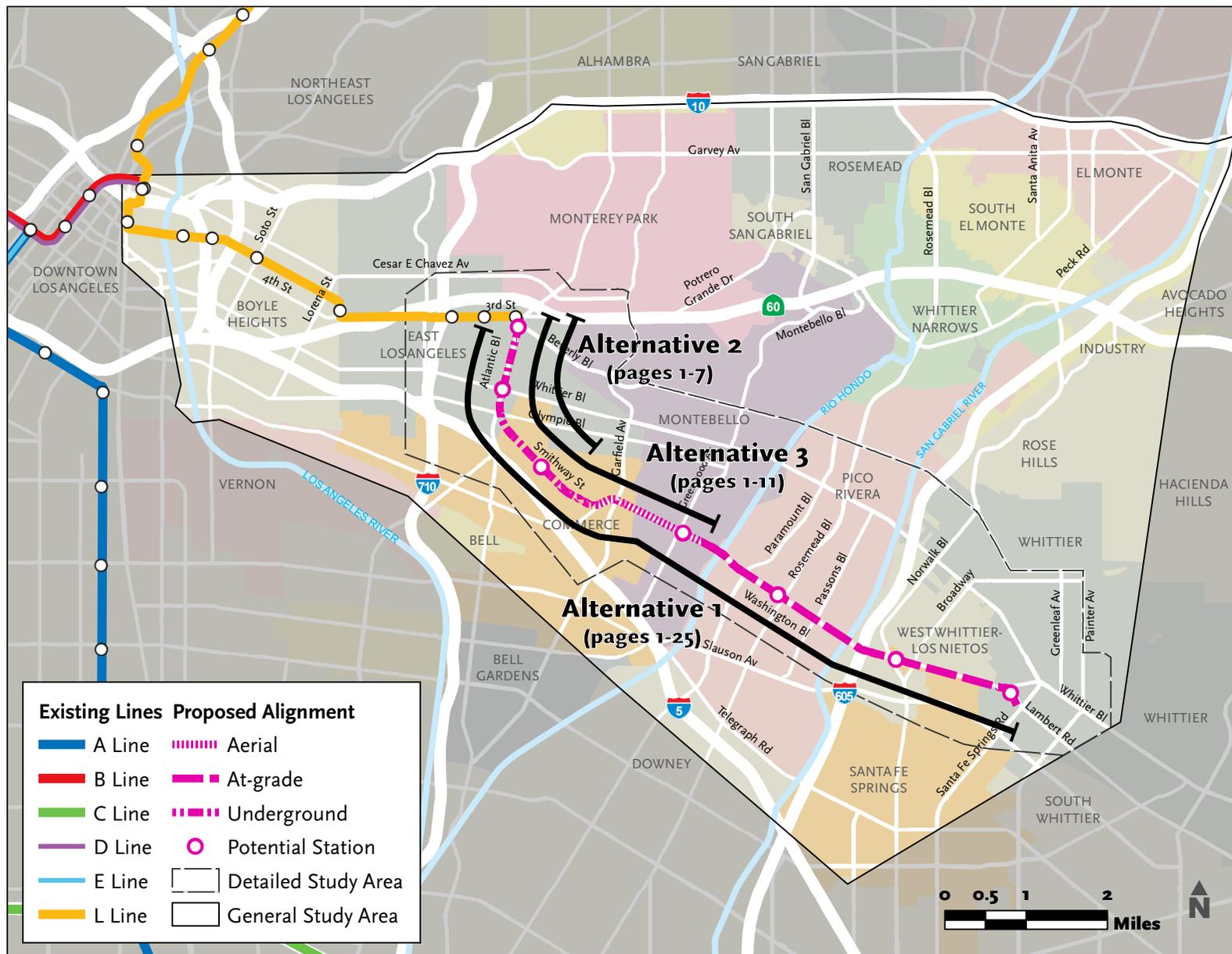
Los Angeles County Metropolitan Transportation Authority and FTA. April 2004. Gold Line Phase II – Pasadena to Montclair Draft Environmental Impact Statement/Draft Environmental Impact Report. Los Angeles, CA.

ATTACHMENT A – NOISE AND VIBRATION IMPACTS

Eastside Transit Corridor

Noise and Vibration Impacts

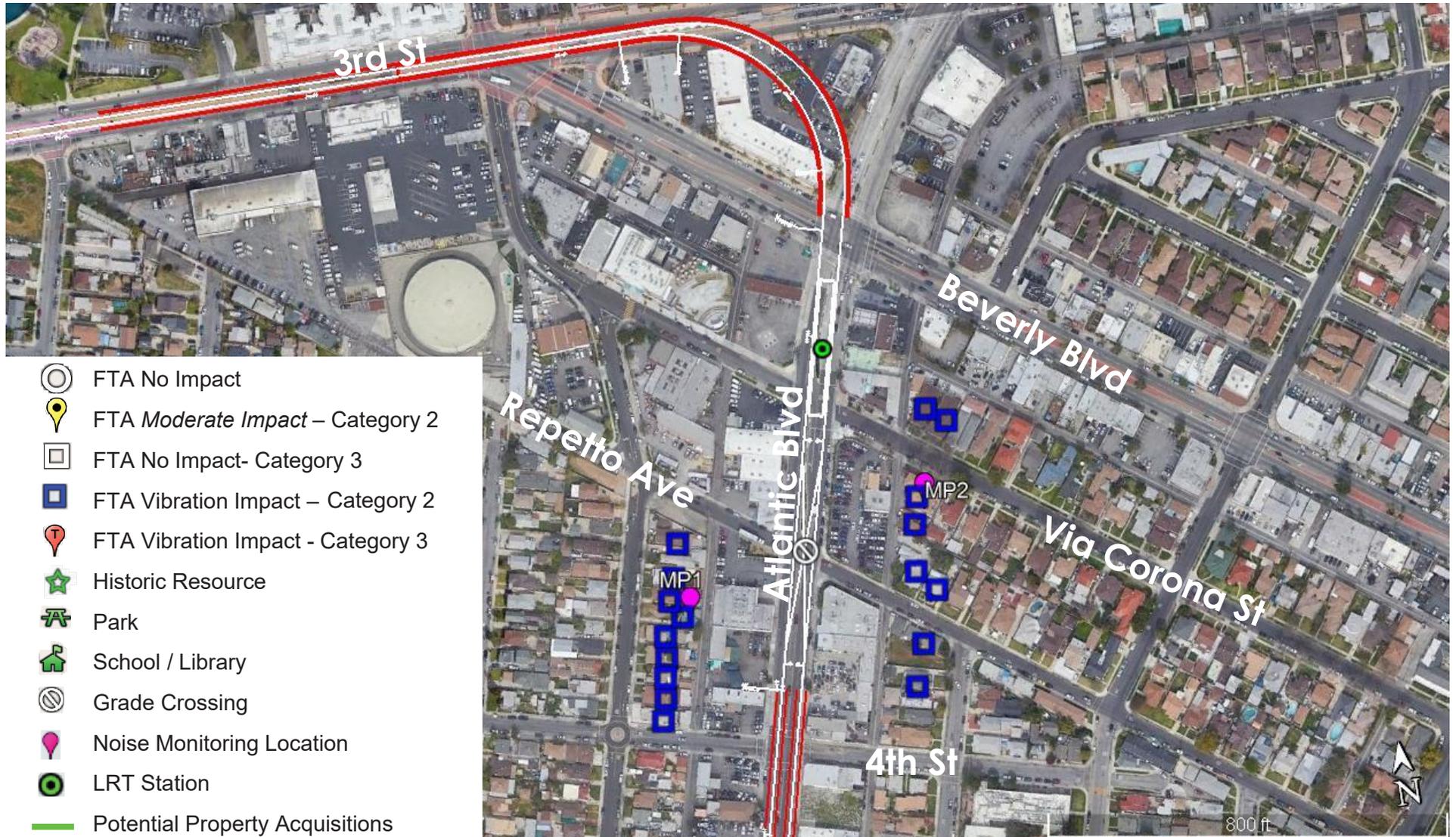
Build Alternatives Alignments



Note: The Atlantic/Pomona Station Design Option is presented on page 26.

Eastside Transit Corridor

Noise and Vibration Impacts



Note: Figure shows segment of Alternative 1, Alternative 2, and Alternative 3 alignments.

Eastside Transit Corridor

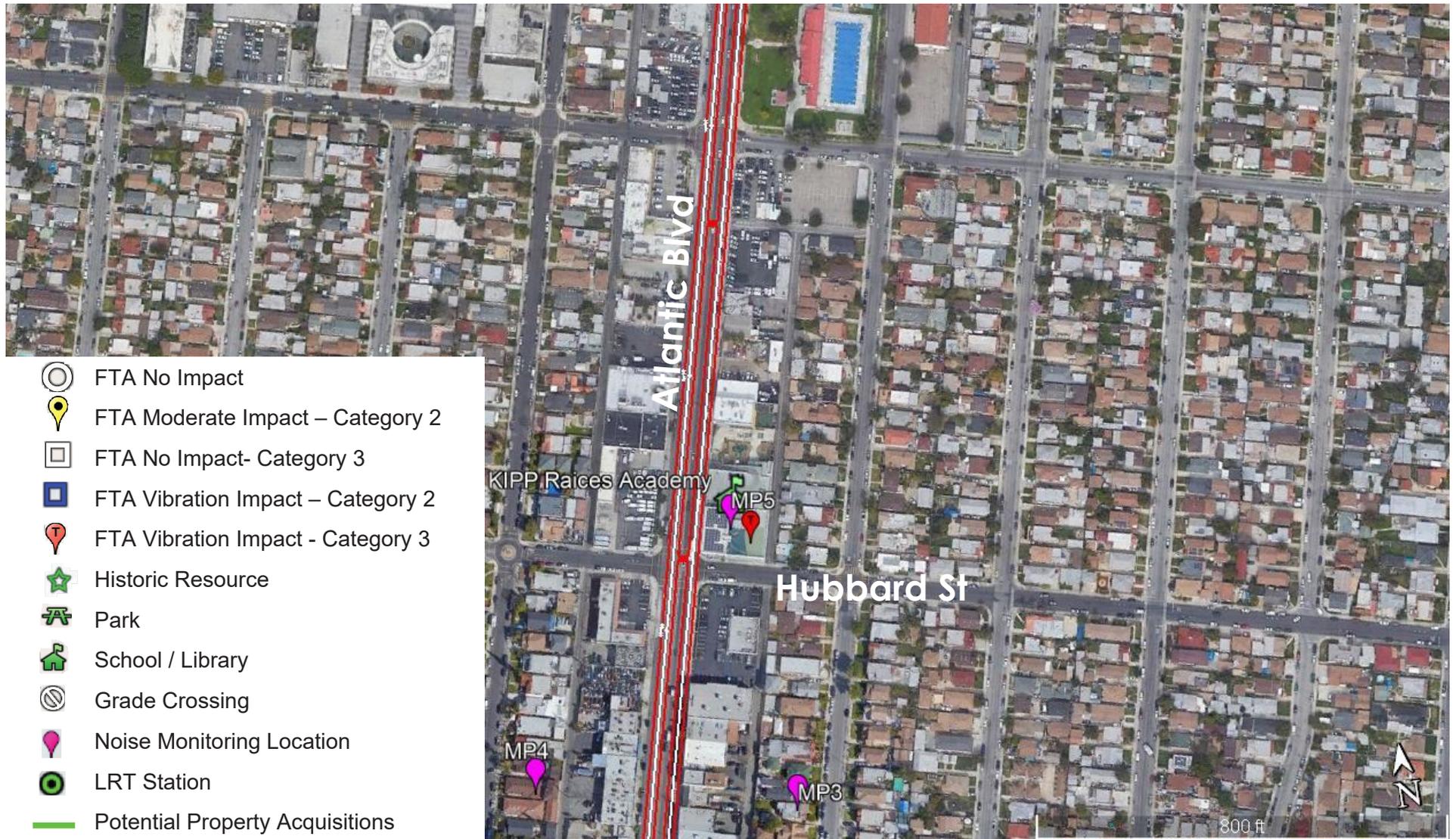
Noise and Vibration Impacts



Note: Figure shows segment of Alternative 1, Alternative 2, and Alternative 3 alignments.

Eastside Transit Corridor

Noise and Vibration Impacts



Note: Figure shows segment of Alternative 1, Alternative 2, and Alternative 3 alignments.

Eastside Transit Corridor

Noise and Vibration Impacts



Note: Figure shows segment of Alternative 1, Alternative 2, and Alternative 3 alignments.

Eastside Transit Corridor

Noise and Vibration Impacts



Note: Figure shows segment of Alternative 1, Alternative 2, and Alternative 3 alignments.

Eastside Transit Corridor

Noise and Vibration Impacts



Note: Figure shows segment of Alternative 1, Alternative 2, and Alternative 3 alignments.

Eastside Transit Corridor

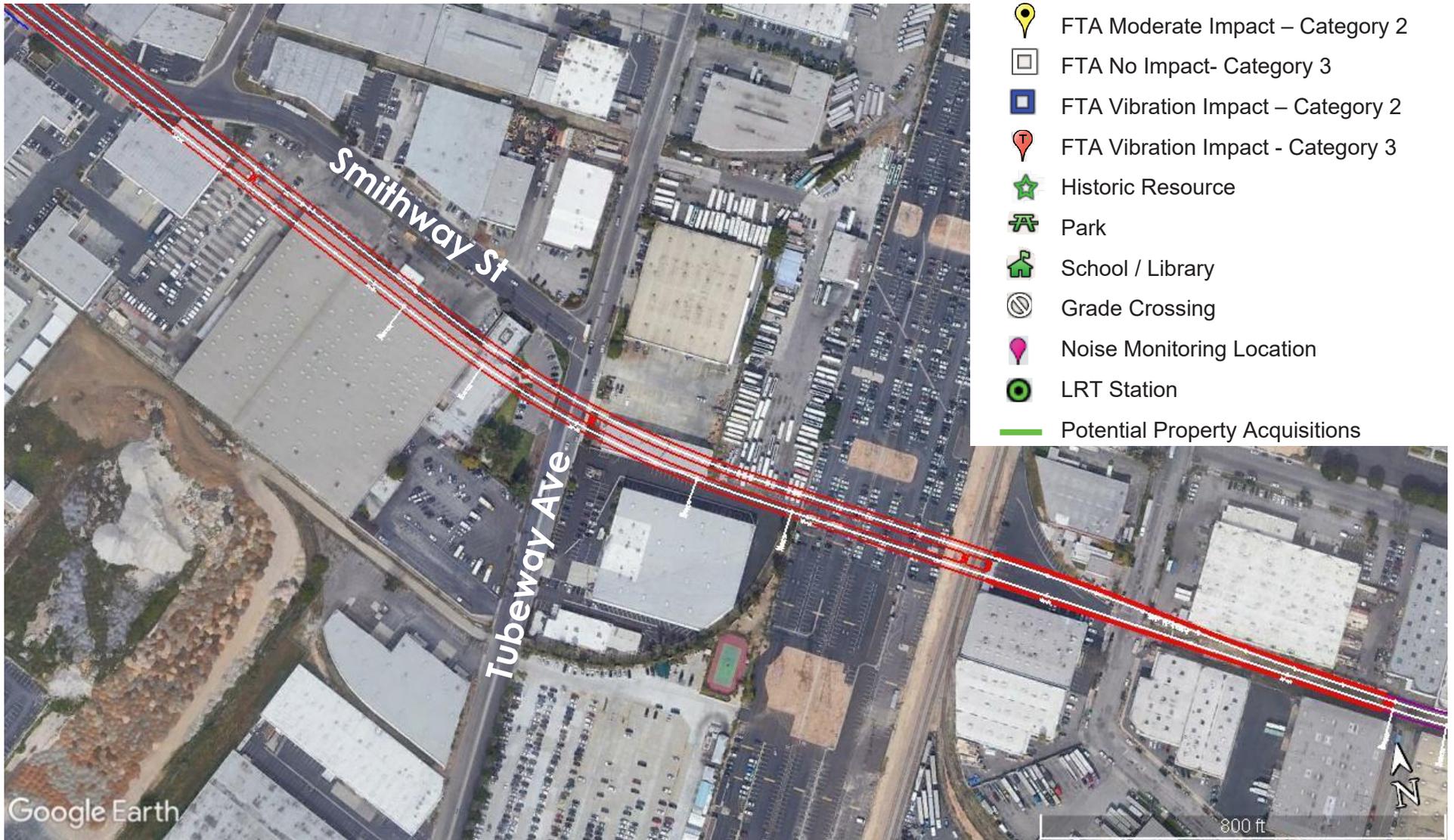
Noise and Vibration Impacts



Note: Figure shows segment of Alternative 1, Alternative 2, and Alternative 3 alignments. Alternative 2 alignment terminates at the proposed Commerce/Citadel station.

Eastside Transit Corridor

Noise and Vibration Impacts



Note: Figure shows segment of Alternative 1 and Alternative 3 alignments.

Eastside Transit Corridor

Noise and Vibration Impacts



Eastside Transit Corridor

Noise and Vibration Impacts



Note: Figure shows segment of Alternative 1 and Alternative 3 alignments. PAGE 10

Eastside Transit Corridor

Noise and Vibration Impacts



-  FTA No Impact
-  FTA Moderate Impact – Category 2
-  FTA No Impact- Category 3
-  FTA Vibration Impact – Category 2
-  FTA Vibration Impact - Category 3
-  Historic Resource
-  Park
-  School / Library
-  Grade Crossing
-  Noise Monitoring Location
-  LRT Station
-  Potential Property Acquisitions

Note: Figure shows segment of Alternative 1 and Alternative 3 alignments. Alternative 3 alignment terminates at the proposed Greenwood station.

Eastside Transit Corridor

Noise and Vibration Impacts



- FTA No Impact
- FTA Moderate Impact – Category 2
- FTA No Impact- Category 3
- FTA Vibration Impact – Category 2
- FTA Vibration Impact - Category 3
- Historic Resource
- Park
- School / Library
- Grade Crossing
- Noise Monitoring Location
- LRT Station
- Potential Property Acquisitions

Note: Figure shows segment of Alternative 1 and Alternative 3 alignments. Alternative 3 alignment terminates at the proposed Greenwood station.

Eastside Transit Corridor

Noise and Vibration Impacts



Note: Figure shows a segment of the Alternative 1 alignment.

Eastside Transit Corridor

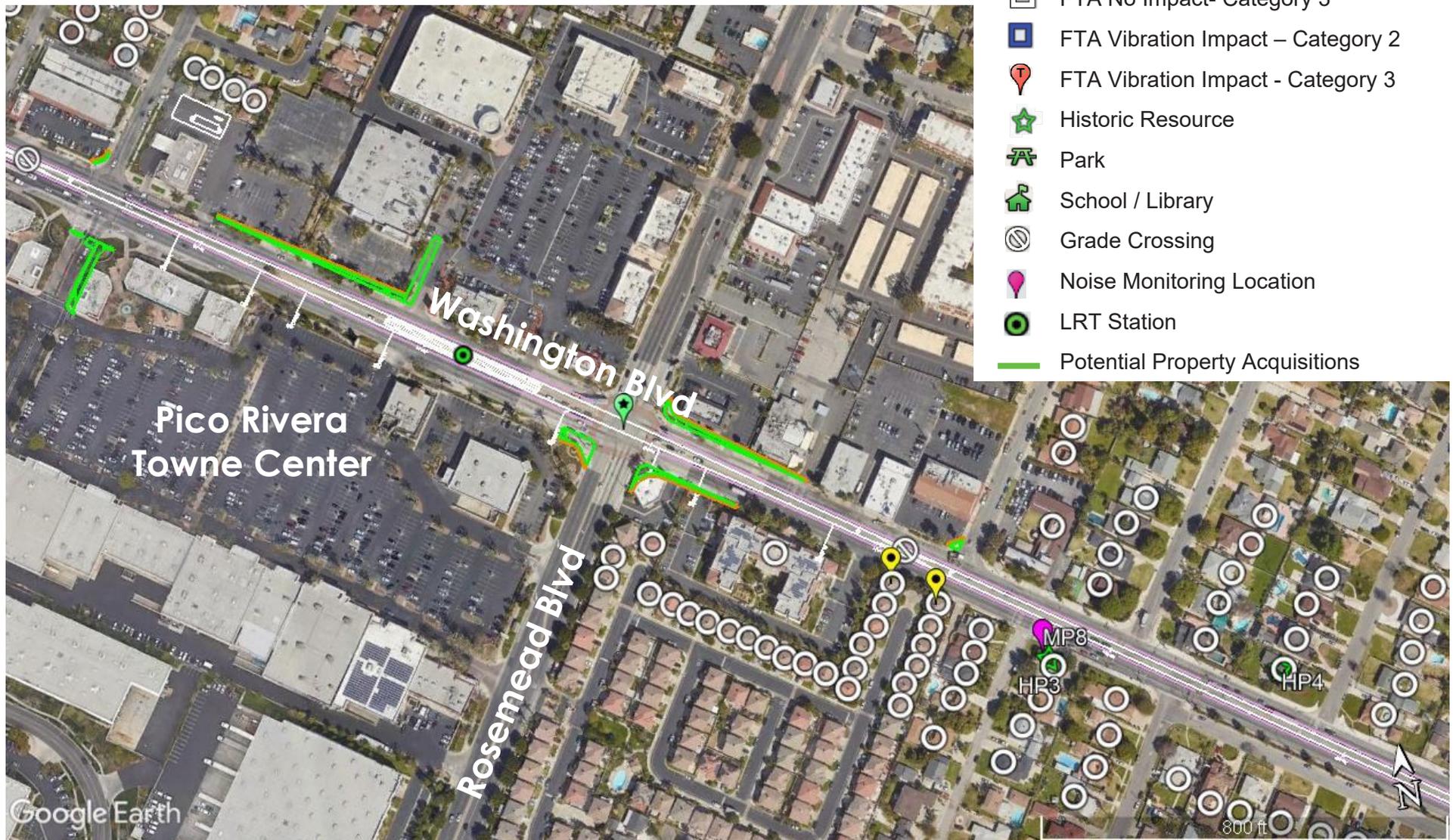
Noise and Vibration Impacts



Note: Figure shows a segment of the Alternative 1 alignment. PAGE 14

Eastside Transit Corridor

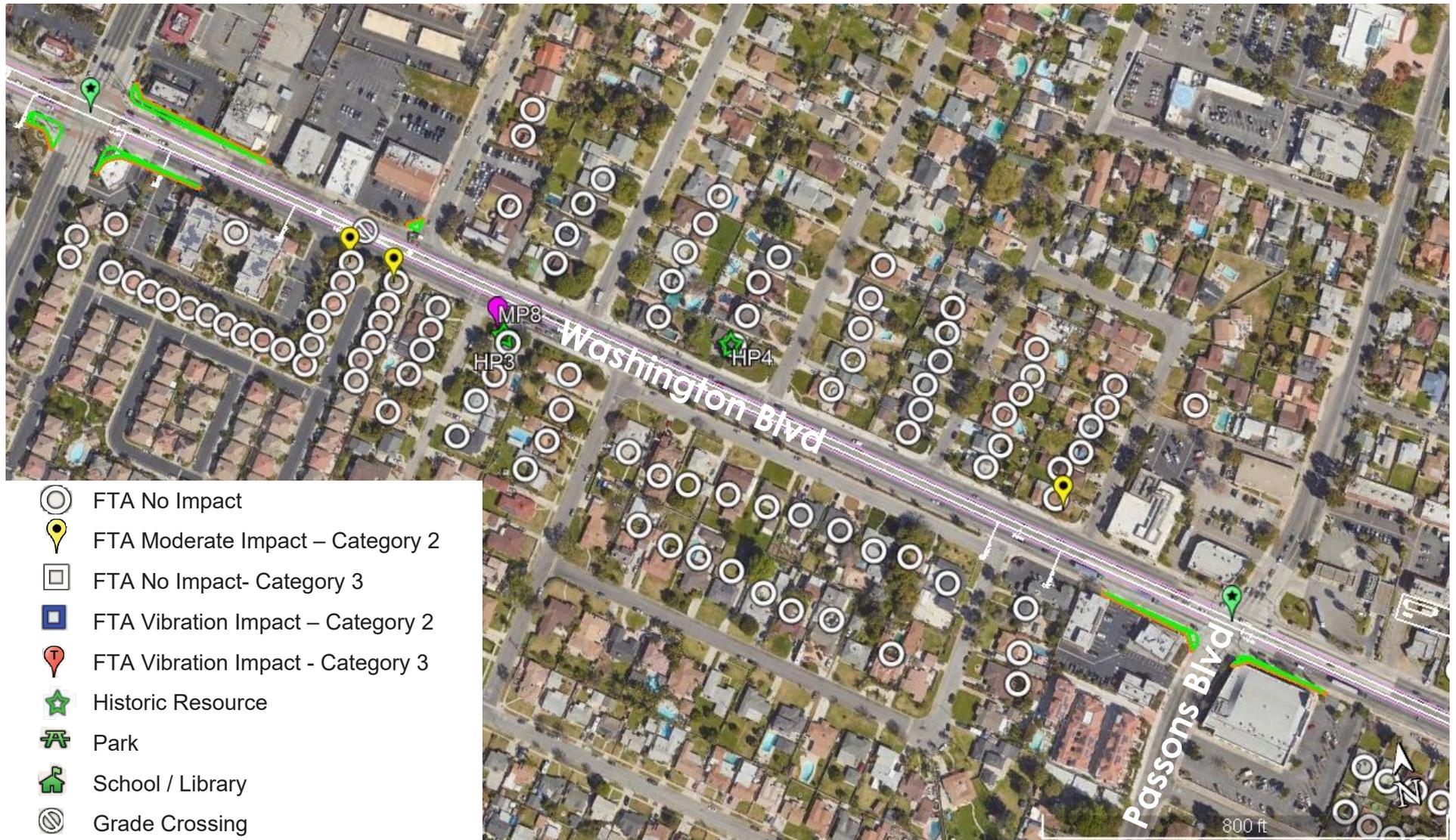
Noise and Vibration Impacts



Note: Figure shows a segment of the Alternative 1 alignment.

Eastside Transit Corridor

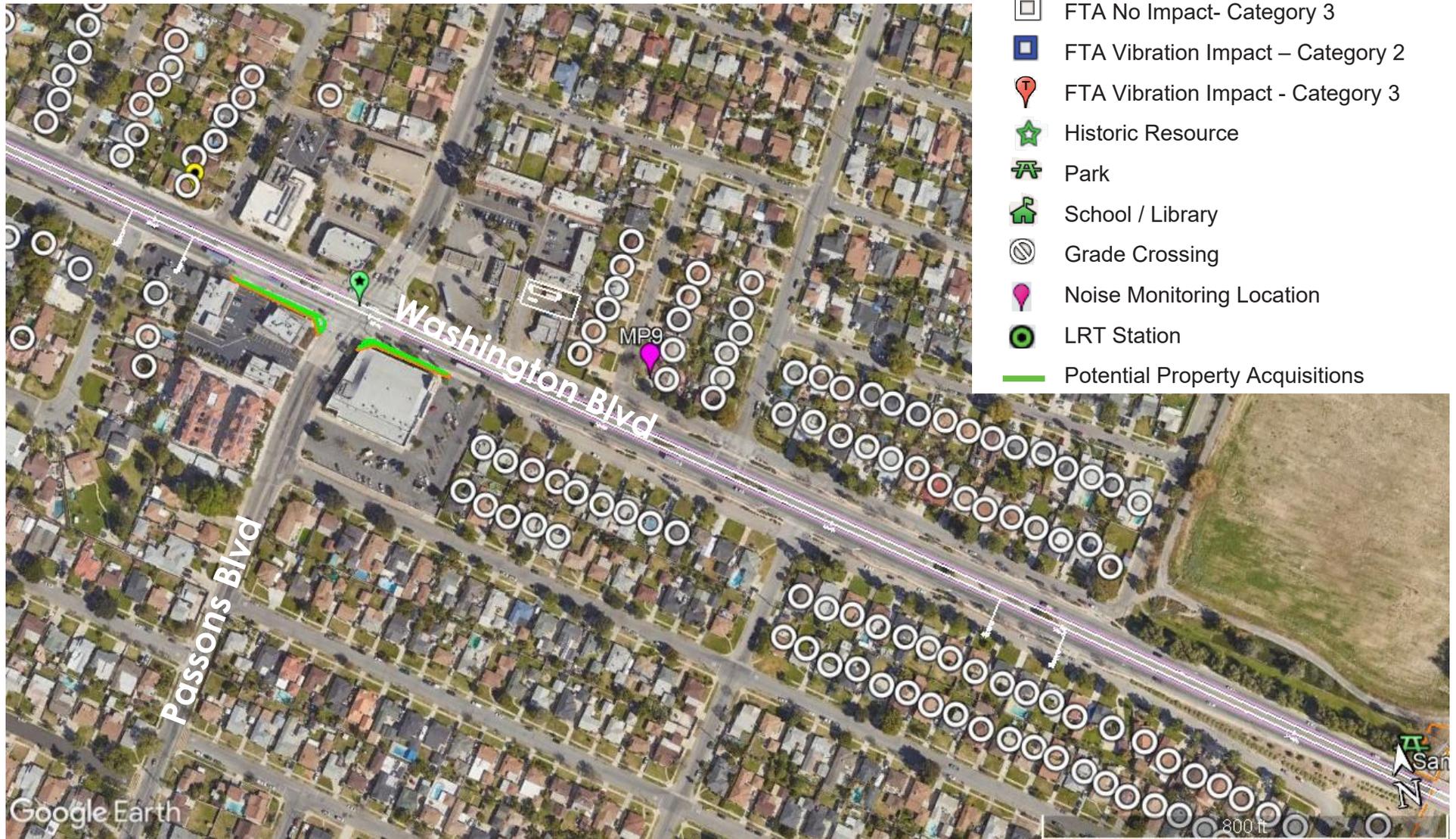
Noise and Vibration Impacts



Note: Figure shows a segment of the Alternative 1 alignment. PAGE 16

Eastside Transit Corridor

Noise and Vibration Impacts



Note: Figure shows a segment of the Alternative 1 alignment.

Eastside Transit Corridor

Noise and Vibration Impacts



Note: Figure shows a segment of the Alternative 1 alignment.

Eastside Transit Corridor

Noise and Vibration Impacts



-  FTA No Impact
-  FTA Moderate Impact – Category 2
-  FTA No Impact- Category 3
-  FTA Vibration Impact – Category 2
-  FTA Vibration Impact - Category 3
-  Historic Resource
-  Park
-  School / Library
-  Grade Crossing
-  Noise Monitoring Location
-  LRT Station
-  Potential Property Acquisitions

Note: Figure shows a segment of the Alternative 1 alignment. PAGE 19

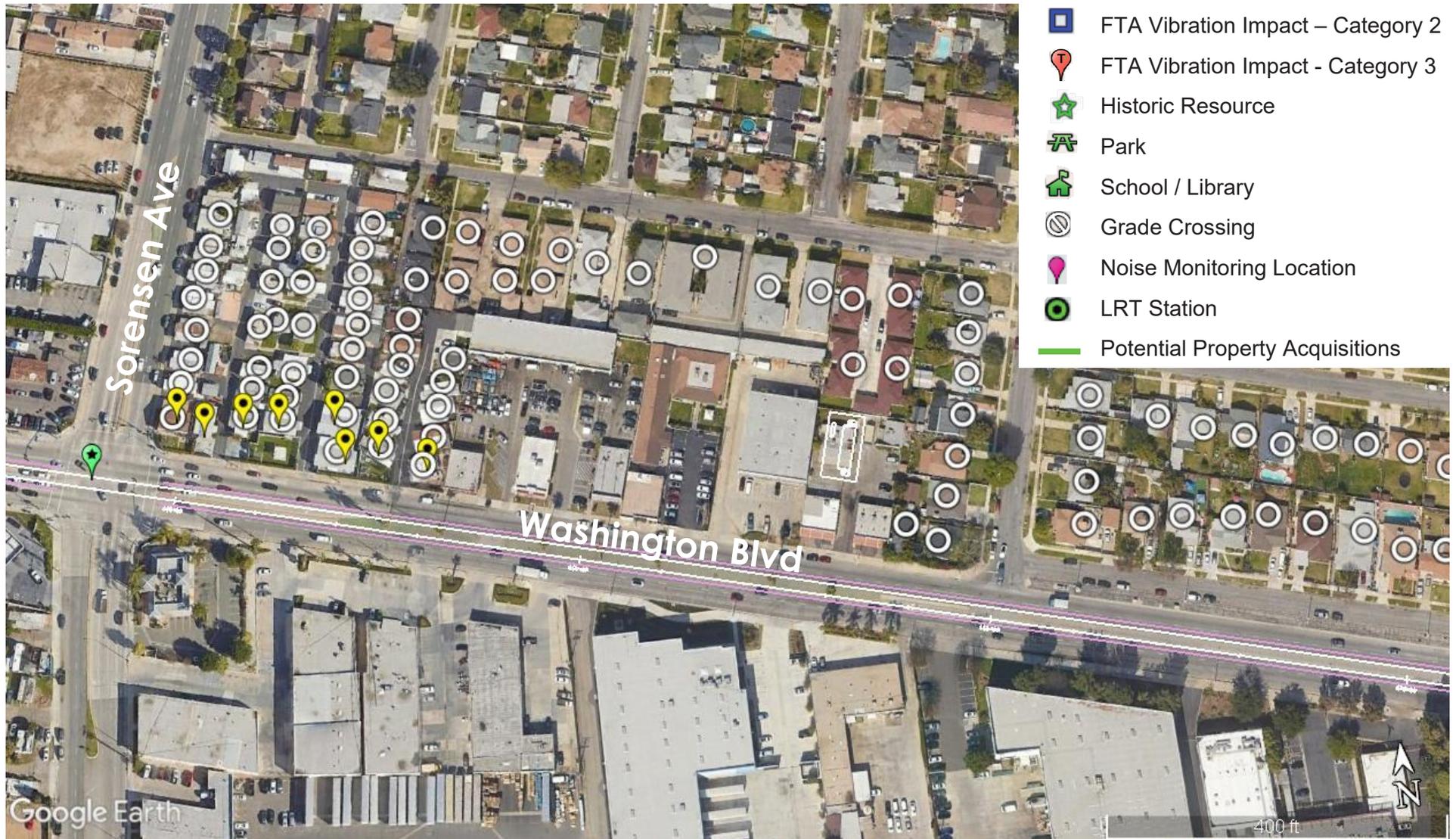
Eastside Transit Corridor

Noise and Vibration Impacts



Eastside Transit Corridor

Noise and Vibration Impacts



Note: Figure shows a segment of the Alternative 1 alignment.

Eastside Transit Corridor

Noise and Vibration Impacts



Note: Figure shows a segment of the Alternative 1 alignment. PAGE 23

Eastside Transit Corridor

Noise and Vibration Impacts



-  FTA No Impact
-  FTA Moderate Impact – Category 2
-  FTA No Impact- Category 3
-  FTA Vibration Impact – Category 2
-  FTA Vibration Impact - Category 3
-  Historic Resource
-  Park
-  School / Library
-  Grade Crossing
-  Noise Monitoring Location
-  LRT Station
-  Potential Property Acquisitions

Note: Figure shows a segment of the Alternative 1 alignment, which terminates at the proposed Lambert station.

Eastside Transit Corridor

Noise and Vibration Impacts



Note: Figure shows a segment of the Alternative 1 alignment, which terminates at the proposed Lambert station.

Eastside Transit Corridor

Noise and Vibration Impacts

Atlantic/Pomona Station Design Option



Note: Figure shows segment of Alternative 1, Alternative 2, and Alternative 3 alignments.