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Project name:
Metro Red/Purple Line Core Capacity Improvements Project

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Technical Memorandum

Subject: LA Metro, Metro Red/Purple Line Core Capacity Improvements Project, Noise and Vibration Analysis

1 Introduction

This document summarizes the results of a noise and vibration impact assessment analysis associated with a planned rapid transit line core capacity improvement project at the existing Division 20 rail yard south of Union Station in Los Angeles CA. This analysis follows the noise and vibration general assessment procedures as outlined by the Federal Transit Administration's Transit Noise and Vibration Impact Assessment Manual (FTA-VA-90-1003-06), May, 2006. The analysis includes measurement of ambient noise levels at nearby noise sensitive land uses, identification of appropriate noise and vibration impact criteria, prediction of project related noise and vibration levels, assessment of operational noise and vibration impacts, assessment of potential construction noise and vibration criteria and impacts, and as required, noise and vibration mitigation recommendations.

1.1 Project Description

As a part of the Los Angeles County Metropolitan Transportation Authority Metro Red/Purple Line Core Capacity Improvements Project (Project), a proposed turn-back facility utilized by LA Metro Red and Purple Line trains is proposed within the Division 20 maintenance and storage yard to support increased service levels and accommodate the required headways. Tracks at this location will divide into a total of four (4) turnback tracks aligning with three (3) proposed operations platforms, all located in the Division 20 yard immediately east of the One Santa Fe (OSF) apartment complex. After a period of time, trains will re-enter service in the opposite direction from which they arrived, this procedure will require the rail cars to pass through a double-crossover switch north of the proposed turnback site. The proposed turnback facility layout, along with noise measurement locations and noise and vibration prediction locations are shown in Figure 1.

1.2 Technical Approach

This noise and vibration analysis adheres to the guidance provided by the Department of Transportation Federal Transit Administration's (FTA) Transit Noise and Vibration Impact Assessment guidance document, which presents procedures for predicting and assessing noise and vibration impacts of proposed mass transit projects. For both noise and vibration impact assessment, the General Assessment procedures were used for the analysis.

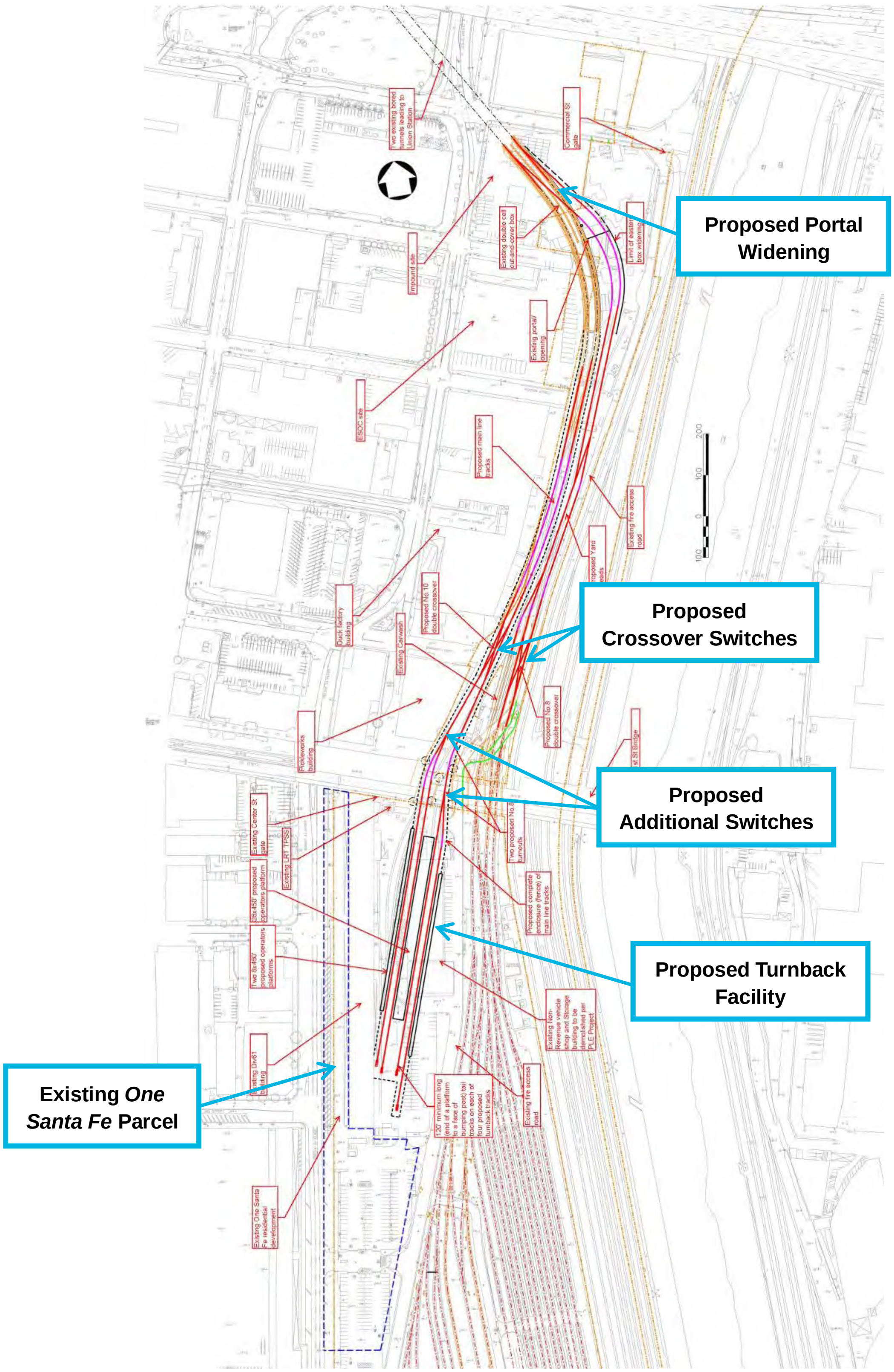

Figure 1. Project Overview

1.3 Background Information

The following Table 1 presents a glossary of general acoustical terminology used in this analysis.

Table 1. Definition of Acoustical Terms

Term	Definition
Noise	Whether something is perceived as a noise event is influenced by the type of sound, the perceived importance of the sound, and its appropriateness in the setting, the time of day and the type of activity during which the noise occurs and the sensitivity of the listener.
Sound	For purposes of this analysis, sound is a physical phenomenon generated by vibrations that result in waves that travel through a medium, such as air, and result in auditory perception by the human brain.
Frequency	Sound frequency is measured in Hertz (Hz), which is a measure of how many times each second the crest of a sound pressure wave passes a fixed point. For example, when a drummer beats a drum, the skin of the drum vibrates a number of times per second. When the drum skin vibrates 100 times per second it generates a sound pressure wave that is oscillating at 100 Hz, and this pressure oscillation is perceived by the ear/brain as a tonal pitch of 100 Hz. Sound frequencies between 20 and 20,000 Hz are within the range of sensitivity of the best human ear.
Amplitude or Level	Is measured in decibels (dB) using a logarithmic scale. A sound level of zero dB is approximately the threshold of human hearing and is barely audible under extremely quiet listening conditions. Normal speech has a sound level of approximately 60 dB. Sound levels above approximately 110 dB begin to be felt inside the human ear as discomfort and eventually pain at 120 dB and higher levels. The minimum change in the sound level of individual events that an average human ear can detect is about one to two dB. A three to five dB change is readily perceived. A change in sound level of about 10 dB is usually perceived by the average person as a doubling (or if decreasing by 10 dB, halving) of the sound's loudness.
Sound pressure	Sound level is usually expressed by reference to a known standard. This report refers to sound pressure level (SPL or L_p). In expressing sound pressure on a logarithmic scale, the sound pressure is compared to a reference value of 20 micropascals (µPa). L_p depends not only on the power of the source, but also on the distance from the source and on the acoustical characteristics of the space surrounding the source.
A-weighting	Sound from a tuning fork contains a single frequency (a pure tone), but most sounds one hears in the environment do not consist of a single frequency and instead are composed of a broad band of frequencies differing in sound level. The method commonly used to quantify environmental sounds consists of evaluating all frequencies of a sound according to a weighting system that reflects the typical frequency-dependent sensitivity of average healthy human hearing. This is called "A-weighting," and the decibel level measured is referred to as dBA. In practice, the level of a noise source is conveniently measured using a sound level meter that includes a filter corresponding to the dBA "curve" of decibel adjustment per octave band center frequency (OBCF) from a "flat" or unweighted SPL.
Equivalent sound level	Although sound level value may adequately indicate the level of environmental noise at any instant in time, community noise levels vary continuously. Most environmental noise includes a mixture of noise from distant sources that creates a relatively steady background noise in which no particular source is identifiable. A single descriptor, L_{eq}, may be used to describe sound that is changing in level. L_{eq} is the energy-average dBA during a measured time interval. It is the "equivalent" constant sound level that would have to be produced by a given source to equal the acoustic energy contained in the fluctuating sound level measured.

L_{max} and L_{min}	Additionally, it is often desirable to know the range of amplitudes for the noise source(s) under study. This is typically accomplished by reporting the L_{max} and L_{min} indicators that represent the root mean square (RMS) maximum and minimum noise levels during a given monitoring interval. The L_{min} value obtained for a particular monitoring location is often called the "noise floor."
Statistical sound values	To describe the time-varying character of environmental noise, the statistical noise descriptors L_{10}, L_{50}, and L_{90} are commonly used. These are the noise levels exceeded during 10, 50, and 90 percent of a stated time interval, respectively. Sound levels associated with L_{10} typically describe transient or short-term events, while levels associated with L_{90} describe the "steady state" (or most prevalent) background noise conditions.
Day-night sound level	Average sound exposure over a 24-hour period is often presented as a day-night average, or time-weighted, sound level (L_{dn}). L_{dn} values are calculated from hourly L_{eq} values, with the L_{eq} values for the nighttime period (10 p.m. to 7 a.m.) increased by 10 dB to reflect the greater disturbance potential from nighttime sounds.

2 Site Visit and Noise Measurements

A site visit and noise measurements were conducted on November 2nd and 3rd, 2016, in order to identify noise sensitive land uses and document the existing noise environment, as described in the following subsections.

2.1 Site Visit Observations

The Project vicinity is surrounded by commercial and industrial land uses. In accordance with FTA guidance, the surrounding parcels were screened for residential and other noise sensitive land uses; the result of this screening resulted in OSF being the sole residential land use in notable proximity to the proposed Project site (See Figure 1).

Sounds perceived during the site visit and noise measurements included the following source types that characterize the existing outdoor ambient sound environment: traffic noise on Santa Fe Avenue and other local streets, HVAC noise from adjacent Metro facilities, occasional commuter rail pass-bys (LA Metro Light Rail and Rapid Transit, Amtrak, and Metrolink) and heavy freight rail pass-bys (Union Pacific/BNSF), and frequent aircraft overflights.

A Kestrel Model 3500 (SN 2058303) handheld anemometer was used during noise measurements to determine average wind speed, temperature, barometric pressure, and relative humidity. During mid-day periods the outdoor temperature was measured at 77 degrees Fahrenheit, with relative humidity measured at 46 percent. Wind speeds during setup were calm, traveling less than 1 mile per hour. Skies were clear, and no precipitation occurred throughout the measurement period.

During the site visit it was confirmed that the One Santa Fe (OSF) mixed-use apartment complex was the only unshielded noise sensitive land use in proximity to the proposed project. The northern portion of OSF features single row of elevated noise sensitive receivers with balconies which directly overlook the Division 61 building and the proposed turnback facility location. Figure 2 below illustrates their elevated line of sight toward the proposed facility.

2.2 Noise Measurement Procedures

Measurement Instrumentation
A fleet of Larson-Davis (LD) sound level meters (SLM) were used for the survey, including a Type-1 Model 820 SLM with Serial Numbers (SN) 1414 and 1324, a Type-2 Model 720 SLM (SN 0436), and a Class-1 Model LxT SLM (SN 4486). As photographed in Attachment A, these SLMs were all outfitted with a 3.5" diameter open-cell microphone windscreen and were attached to a standard camera tripod, allowing the microphone position to be

roughly 4 to 5 feet above grade. SLM calibration was field-checked before and after the measurement period with an acoustic calibrator (LD Model CAL200, SN 3704)

Figure 2. Relationship Between OSF Resident Balconies (Yellow Polygon) and Approximate Proposed Turnback Facility Site (Red Polygon)

Personnel

The field survey was performed by AECOM Principal Engineer Mr. Paul Burge, a board-certified member of the Institute of Noise Control Engineering (INCE Bd. Cert.) and Senior Environmental Noise Specialist Mr. Christopher Kaiser, an INCE Member. Mr. Kaiser is an experienced field noise investigator, having participated in or led similar outdoor sound measurement assessments on several projects across the U.S.

Procedures

To the extent practical, LT and ST measurements were conducted in accordance with appropriate industry standards and guidance. The SLMs recorded data to onboard memory from 1 to 10-minute duration A-weighted intervals and were set to a slow response time.

Measurement Locations

Long-term (LT) measurements of outdoor ambient sound pressure levels were monitored with unattended sound level meters over a 24-hour period at a total of two (2) representative OSF outdoor use areas. Short-term (ST) measurements (i.e., 20-30-minutes) were conducted at a total of two (2) additional representative OSF outdoor use areas on both days of the measurement period with AECOM investigators making simultaneous documentation of observations (e.g., perceived sound sources and environmental conditions) as shown in the collected field notes (available upon request). LT measurements (LT-1 and LT-2) were located on OSF apartment unit balconies and patios, while ST measurements (ST-1 and ST-2) were located at common-use amenities such as barbecue and pool/spa areas. All measurements were taken on the east-facing façade of the building which overlooks the proposed Project site. Figure 3 below illustrates the four measurement locations, as well as 3 additional noise and vibration prediction locations in other sections of OSF (OSF represented as solid grey polygon only). Measurements were conducted at these positions to collect noise level data that quantitatively characterize the existing ambient outdoor sound environment. The following subsections detail the instrumentation, involved staff, and procedures used to conduct this survey.

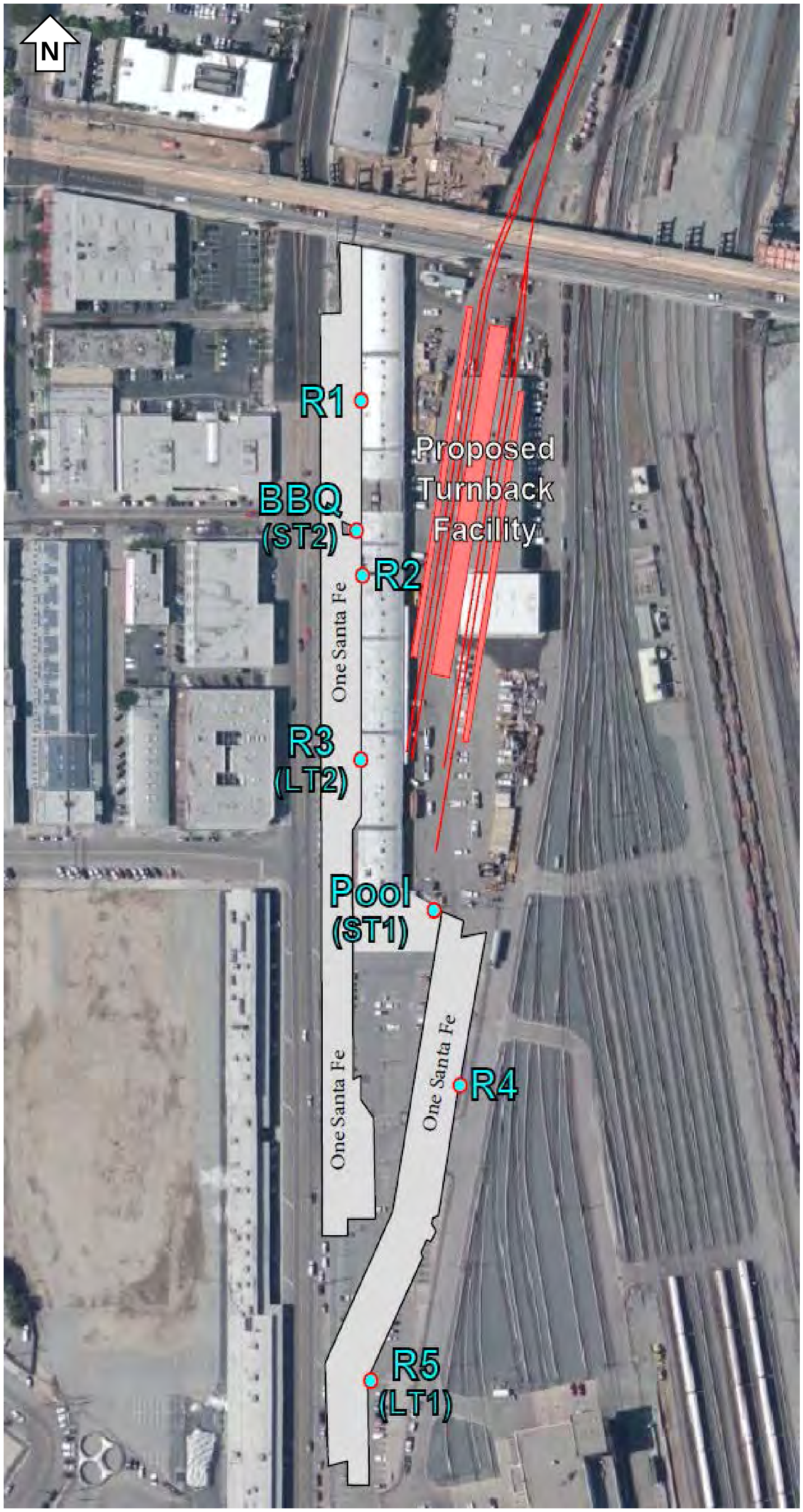

Figure 3. Project Overview - Measurement and Prediction Locations

2.3 Noise Measurement Results

Table 2 presents the SPL measurement data from both LT and ST measurements showing measured A-weighted Leq, as well as calculated or predicted Lday, Lnight, and Ldn metrics. Short-term measurements were conducted at various common-use areas, and although LT measurements were deemed unnecessary at these locations, the data collected can be further extrapolated to predict 24-hour metrics. ST data, compared alongside the long-term data with identical time-period noise levels at the nearest LT monitor (in this case, LT-2 for each ST measurement location), provides a reliable approach to extrapolating daytime, nighttime, and day-night noise levels throughout the 24-hour measurement period. Calculating the difference between the two levels at the same period, a delta can be ascertained, which can then be applied to LT measurement metrics to provide an estimate of concurrent daytime, evening, and nighttime noise levels at the ST location of interest. Detailed measurement and prediction data can be found in Attachment B.

Table 2. Summary of Outdoor Ambient Sound Level Monitoring Results

Meas. ID	Location	Duration	L_{eq}	L_{day}	L_{night}	L_{dn}
LT-1	Unit 284 Patio	24 Hours	58	57	59	65
LT-2	Unit 444 Balcony	24 Hours	61	61	62	68
ST-1	Pool/Spa Area	45 Minutes (Cumulative)	58	60[1]	61[1]	67[1]
ST-2	5th Floor Barbecue Nook	50 Minutes (Cumulative)	59	59[1]	60[1]	67[1]

1. *Extrapolated metrics predicted from LT-2 measurement data using approach explained in preceding paragraph*

Figure 4 below display 24-hour L_{eq} plots recorded at the four measurement locations. Existing noise exposure appears to be at its peak operation between the hours of 7 p.m. and 8 a.m. where the L_{eq} exhibits sustained elevated dBA. At other time periods during the 24 continuous hours of sound level monitoring, ambient L_{eq} values appear to vary between the low 50's and low 60's.

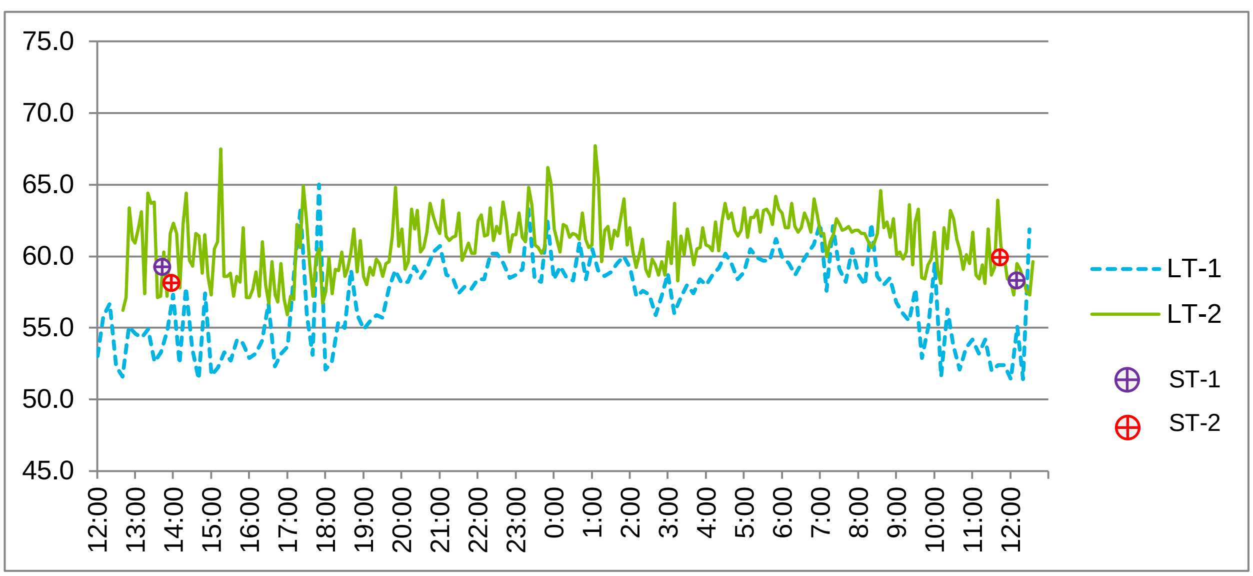

Figure 4. Plot of LT and ST Measurement Sound Pressure Levels – (dBA vs. time)

3 Predicted Noise Levels and Impacts

3.1 Noise Impact Criteria

The FTA impact criterion relies on both land use type and measured baseline noise levels at receiver chosen for prediction. Table 3 describes the three land use types, each of which determine the specific noise metric to be used when assessing transit noise impacts.

Table 3. FTA Land Use Categories for Transit Noise Impacts

Land Use Category	Noise Metric (dBA)	Description of Land Use Category
1	Outdoor L_{eq}(h)*	Tracts of land where quiet is an essential element in their intended purpose. This category includes lands set aside for serenity and quiet, and such land uses as outdoor amphitheaters and concert pavilions, as well as National Historic Landmarks with significant outdoor use. Also included are recording studios and concert halls.
2	Outdoor L_{dn}	Residences and buildings where people normally sleep. This category includes homes, hospitals and hotels where a nighttime sensitivity to noise is assumed to be of utmost importance.
3	Outdoor L_{eq}(h)*	Institutional land uses with primarily daytime and evening use. This category includes schools, libraries, theaters, and churches where it is important to avoid interference with such activities as speech, meditation and concentration on reading material. Places for meditation or study associated with cemeteries, monuments, museums, campgrounds and recreational facilities can also be considered to be in this category. Certain historical sites and parks are also included.

* L_{eq} for the noisiest hour of transit-related activity during hours of noise sensitivity.
Source: FTA Noise and Vibration Impact Assessment, Table 8-2

Figure 5 below illustrates the impact criteria for transit projects. This chart represents a sliding scale wherein impact thresholds for predicted Project noise are influenced by the existing noise exposure at the receiver location. There are two degrees of impacts: Moderate, or the point in which people will generally begin considering the Project noise as an annoyance, and Severe, which would cause a significant number of people to consider the Project noise as an annoyance.

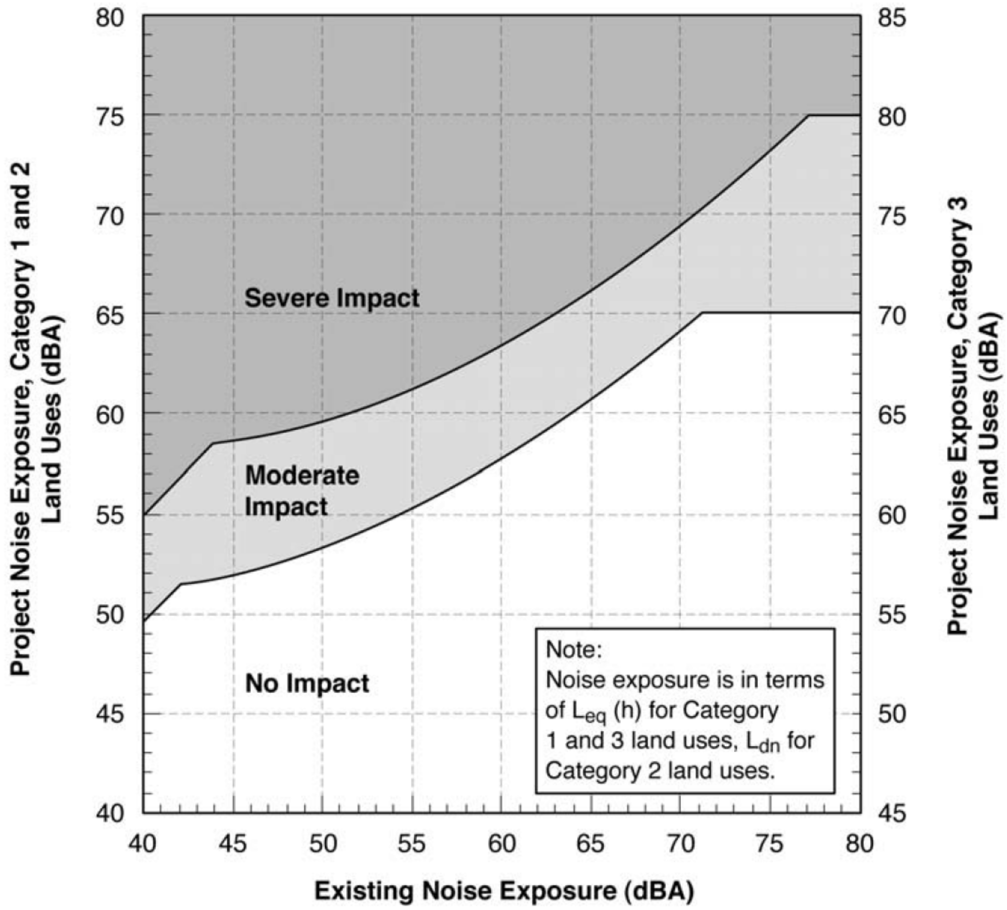

Figure 5. FTA Noise Impact Criteria for Transit Projects

Source: FTA Noise and Vibration Impact Assessment, Figure 3-1

3.2 Predicted Project Noise Levels

Future noise levels were predicted using the Federal Transit Authority (FTA) Noise Impact Assessment Spreadsheet, which incorporates procedures for the General Noise Assessment as outlined in Chapter 5 of the FTA guidance manual, "Transit Noise and Vibration Impact Assessment." The General Noise Assessment assesses noise impact criteria on a sliding scale, which varies according to the measured existing noise exposure at the selected prediction locations.

The following values are worst-case (peak) operation capacities for the turnback facility operation:

- 6 a.m. to 9 a.m. – 60 movements per hour (30 trains roundtrip)
- 9 a.m. to 3 p.m. – 40 movements per hour (20 trains roundtrip)
- 3 p.m. to 7:30 p.m. – 60 movements per hour (30 trains roundtrip)
- 7:30 p.m. – 6 a.m. – 4 movements total (2 trains roundtrip)

The prediction of Project noise levels was conducted using the FTA Noise Impact Assessment Spreadsheet which relies on the input of anticipated hourly average daytime and nighttime operations. The result of splitting the bullet list above into average hourly values for daytime in nighttime events resulted in the following input parameters:

- Daytime (7AM-10PM) average hourly traffic of 42 movements per hour (21 trains roundtrip), 6 railcars long, traveling 10MPH
- Nighttime (10PM-7AM) average hourly traffic of 7 movements per hour (3.5 trains roundtrip), 6 railcars long, traveling 10MPH
- Pair of crossover switches north of turnback facility to be used by all rail traffic entering and exiting turn-back facility (using average hourly daytime and nighttime train traffic volumes above).

Redline vehicles are also equipped with warning horns, and these are frequently used during train movement to warn nearby pedestrians and workers. However, due to the project's location near an apartment complex, alternative methods other than sounding of the horn will be used to announce arrival or departure of trains at the turn back facility. This does not preclude the operator's discretion to occasionally use the horn to avoid or minimize conflicts and hazards, but the noise prediction for this analysis assumes that horn soundings will not occur on a routine basis in the turnback facility. The project design will incorporate features isolating the area from unnecessary human traffic to minimize horn use, and is subject to the approval of the California Public Utilities Commision (CPUC) and other safety considerations, as applicable.

3.3 Noise Impacts

The following predicted impact results presented in Table 4 were calculated using the existing L_{dn} values at associated long-term locations, along with the above-mentioned input parameters with regard to future Project operations.

Table 4. Predicted Noise Levels and Impact Determination

		Noise Exposure, dBA, L_{dn}				
Location	**FTA Land Use Category**	**Existing Noise Exposure**	**Moderate Impact Criterion**	**Severe Impact Criterion**	**Project Noise Exposure**	**Noise Impact**
R1	2	68	63	68	49	None
R2	2	68	63	68	48	None
R3 / LT2	2	68	63	68	44	None
R4	2	65	61	66	40	None
R5 / LT1	2	65	61	66	37	None
R-BBQ / ST2	3	67	62	67	49	None
R-Pool / ST1	3	67	62	67	41	None

As shown above, none of the studied receptors are predicted to experience operational noise impacts.

4 Predicted Vibration Levels and Impacts

4.1 Vibration Impact Criteria

FTA general vibration impact assessment relies on criteria assigned to specific receiver types (Categories) depending on the use of the space, and frequency of vibration and/or ground borne noise events. Impact criteria used in this impact assessment focuses on Category 2 receivers (OSF residences). Table 6 below shows the FTA vibration impact assessment criteria for each receiver type and source event frequency.

Table 5. FTA Vibration Impact Criteria

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

1. “Frequent Events" is defined as more than 70 vibration events of the same source per day. Most rapid transit projects fall into this category.
2. “Occasional Events” is defined as between 30 and 70 vibration events of the same source per day. Most commuter trunk lines have this many operations.
3. "Infrequent Events" is defined as fewer than 30 vibration events of the same kind per day. This category includes most commuter rail branch lines.
4. This criterion limit is based on levels that are acceptable for most moderately sensitive equipment such as optical microscopes. Vibration-sensitive manufacturing or research will require detailed evaluation to define the acceptable vibration levels. Ensuring lower vibration levels in a building often requires special design of the HVAC systems and stiffened floors.
5. Vibration-sensitive equipment is generally not sensitive to ground-borne noise

Source: FTA Noise and Vibration Impact Assessment, Table 8-1

4.2 Vibration Level Prediction Procedure

FTA vibration level predictions are carried out utilizing a generalized ground surface vibration curve, which operates through a function of receiver distance and train speed. Figure 6 below displays this plot, which shows the prediction curve for rapid transit vehicles traveling 50 mph as the centered dashed line (FTA Figure 10-1).

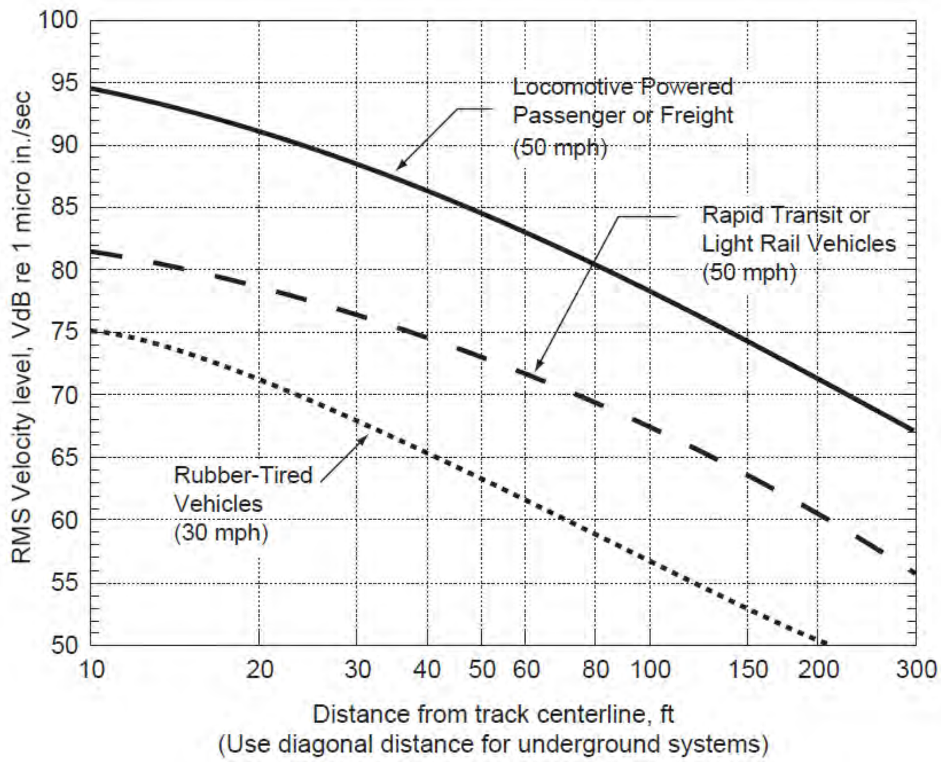

Figure 6. FTA Generalized Ground Surface Vibration Curves

Source: FTA Noise and Vibration Impact Assessment, Figure 10-1

After concluding the RMS velocity level on the Y-axis of Figure 6 for each receiver distance, an adjustment factor is applied to adjust for the difference in train speed from the plots assumed 50 mph to this assessment's anticipated 10 mph speed. This adjustment, represented in the equation $20*log(Speed/Speed_{ref})$, or *20*log(10/50)*, equates to approximately a -14dB adjustment to the levels on the Y-axis of Figure 6.

4.3 Vibration Prediction Impact Results

Table 6 below shows the predicted vibration levels and impact assessment results.

Table 6. Predicted Vibration Levels and Impact Assessment

Receiver ID	Distance From Nearest Track (Feet)	Predicted Vibration Level[1] VdB	Vibration Impact Limit VdB (Cat 2, Frequent)	Identified Impact
R1	141	50	72	None
R2	102	54	72	None
R3	154	50	72	None
R4	438	41	72	None
R5	821	41	72	None
BBQ	117	53	72	None
Pool	218	45	72	None

Vibration levels at all sensitive receptors are well-beneath the FTA vibration impact criteria and thus, vibration impacts from Project operations are not expected.

4.4 Ground Borne Noise Assessment

Ground borne noise will be significantly less than air borne noise. FTA guidance indicates that for typical soil conditions the ground borne noise level would be approximately 35 dBA less than the ground borne vibration velocity level (in VdB). From the range of predicted vibration velocity levels in Table 6, ranging from 41-54 VdB, associated predicted ground borne noise levels would be approximately 6-19 dBA, far below the impact criterion of 35 dBA for Category 2 receivers as given in Table 5. Therefore no Ground Borne Noise impacts are predicted.

5 Recommended Noise and Vibration Mitigation

No operational noise or vibration impacts were identified in this analysis; therefore, no mitigation is recommended for this Project. It is assumed that during construction, methods and timing consistent with the City of Los Angeles noise ordinance will be applied as feasible.

6 Construction Noise and Vibration

Construction operations would abide by City of Los Angeles noise control ordinances where practical. The following summarizes the specific noise restrictions for construction activities:

City of Los Angeles Municipal Code – Chapter IV - Section 41.40

Noise Due to Construction, Excavation Work – When Prohibited

(a) No person shall, between the hours of 9:00 P.M. and 7:00 A.M. of the following day, perform any construction or repair work of any kind upon, or any excavating for, any building or structure, where any of the foregoing entails the use of any power driven drill, riveting machine excavator or any other machine, tool, device or equipment which makes loud noises to the disturbance of persons occupying sleeping quarters in any dwelling hotel or apartment or other place of residence. In addition, the operation, repair or servicing of construction equipment and the job-site delivering of construction materials in such areas shall be prohibited during the hours herein specified. Any person who knowingly and willfully violates the foregoing provision shall be deemed guilty of a misdemeanor punishable as elsewhere provided in this Code.

(b) The provisions of Subsection (a) shall not apply to any person who performs the construction, repair or excavation work involved pursuant to the express written permission of the Board of Police Commissioners through its Executive Director. The Executive Director, on behalf of the Board, may grant this permission, upon application in writing, where the work proposed to be done is in the public interest, or where hardship or injustice, or unreasonable delay would result from its interruption during the hours mentioned above, or where the building or structure involved is devoted or intended to be devoted to a use immediately related to public defense. The provisions of this section shall not in any event apply to construction, repair or excavation work done within any district zoned for manufacturing or industrial uses under the provisions of Chapter I of this Code, nor to emergency work necessitated by any flood, fire or other catastrophe.

(c) No person, other than an individual homeowner engaged in the repair or construction of his single-family dwelling shall perform any construction or repair work of any kind upon, or any earth grading for, any building or structure located on land developed with residential buildings under the provisions of Chapter I of this Code, or perform such work within 500 feet of land so occupied, before 8:00 a.m. or after 6:00 p.m. on any Saturday or national holiday nor at any time on any Sunday. In addition, the operation, repair or servicing of construction equipment and the job-site delivering of construction materials in such areas shall be prohibited on Saturdays and on Sundays during the hours herein specified. The provisions of this subsection shall not apply to persons engaged in the emergency repair of:

1. *Any building or structure.*
2. *Earth supporting or endangering any building or structure.*
3. *Any public utility.*
4. *Any public way or adjacent earth.*

(j) As determined by the Executive Director of the Board, the provisions of Subsection (c) shall not apply to major public works construction by the City of Los Angeles and its proprietary Departments, including all structures and operations necessary to regulate or direct traffic due to construction activities. The Board, through its Executive Director, pursuant to Subsection (b) will grant a variance for this work and construction activities will be subject to all conditions of the variance as granted. Concurrent with the request for a variance, the City Department that will conduct the construction work will notify each affected Council district office and established Neighborhood Council of projects where proposed Sunday and/or Holiday work will occur.

In summary, typical-weekday construction activities are prohibited before 7 a.m. and after 9 p.m. Construction activities on holidays and Saturdays (when occurring with 500-feet of OSF) are prohibited before 8 a.m. and after 6 p.m., and fully prohibited at any time on Sundays. If construction is required outside of the allowable time periods, a variant must be requested by the Executive Director of the Board of Police Commissioners.

7 Conclusions and Recommendations

No operational noise or vibration impacts are predicted for the Project. All predicted levels are well below identified impact criteria. Construction activities would be consistent with City of Los Angeles ordinance requirements as feasible..

8 References

Federal Transit Administration, Transit Noise and Vibration Impact Assessment (FTA-VA-90-1003-06), https://www.transit.dot.gov/regulations-and-guidance/environmental-programs/fta-noise-and-vibration-impact-assessment, May 2006.

County of Los Angeles, Code of Ordinances, Chapter 12 – Environmental Protection, https://www.municode.com /library/ca/los_angeles_county/codes/code_of_ordinances?nodeId=TIT12ENPR_CH12.08NOCO, November 2016

9 Statement of Limitations

This report is for the sole use and benefit of the Los Angeles County Metropolitan Transportation Authority and its authorized representatives. The scope of services performed in execution of this effort may not be appropriate to satisfy the needs of other users, and any use or reuse of this document or the findings, conclusions, or recommendations presented herein is at the sole risk of said user. No expressed or implied representation or warranty is included or intended in this report except that the work was performed within the limits prescribed by LA Metro with the customary thoroughness and competence of professionals working in the same area on similar projects.

10 List of Attachments

The following attachments are included for reference.

Attachment A: Noise Measurement Photo Log

Attachment B: Tabulated Measurement Data