Appendix N

Noise Technical Memorandum

Metro

TECHNICAL MEMORANDUM

Noise

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This technical memorandum summarizes the results of the noise Level II screening analyses for the State Route 710 (SR-710) Study. Noise was not included in the Level I screening analysis; therefore, the Level I analysis is not discussed in this memorandum. The Level II screening analysis evaluated 12 alternatives (with 3 variations) including a TSM/TDM improvement, 3 bus rapid transit, 4 light rail transit, 4 freeway, and 2 highway alternatives along with the No Build conditions.

Regional Setting

Sound, Noise, and Acoustics

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

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

Frequency and Hertz

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

Sound Pressure Level and Decibels

The amplitude of pressure waves generated by a sound source determines the loudness of that source. Sound pressure amplitude is measured in micro-Pascals (µPa). One µPa is approximately one hundred billionth (0.00000000001) of normal atmospheric pressure. Sound pressure amplitudes for different kinds of noise environments can range from less than 100 to 100,000,000 µPa. Because of this huge range of values, sound is rarely expressed in terms of µPa. Instead, a logarithmic scale is used to describe sound pressure level (SPL) in terms of decibels (dB). The threshold of hearing for young people is about 0 dB, which corresponds to 20 µPa.

A-Weighted Decibels

The decibel scale alone does not adequately characterize how humans perceive noise. The dominant frequencies of a sound have a substantial effect on the human response to that sound. Although the intensity (energy per unit area) of the sound is a purely physical quantity, the loudness or human response is determined by the characteristics of the human ear.

Human hearing is limited in the range of audible frequencies as well as in the way it perceives the SPL in that range. In general, people are most sensitive to the frequency range of 1,000–8,000 Hz, and perceive sounds within that range better than sounds of the same amplitude in higher or lower frequencies. To approximate the response of the human ear, sound levels of individual frequency bands are weighted, depending on the human sensitivity to those frequencies. Then, an "A-weighted" sound level (expressed in units of dBA) can be computed based on this information.

The A-weighting network approximates the frequency response of the average young ear when listening to most ordinary sounds. When people make judgments on the relative loudness or annoyance of a sound, their judgments correlate well with the A scale sound levels of those sounds. Other weighting networks have been devised to address high noise levels or other special problems (e.g., B-, C-, and D-scales), but these scales are rarely used in conjunction with highway-traffic noise. Noise levels for traffic noise reports are typically reported in terms of A-weighted decibels or dBA.

Noise Descriptors

Noise in our daily environment fluctuates over time. Some fluctuations are minor, but some are substantial. Some noise levels occur in regular patterns, but others are random. Some noise levels fluctuate rapidly, but others slowly. Some noise levels vary widely, but others are relatively constant. Various noise descriptors have been developed to describe time-varying noise levels. The following is the noise used in this traffic noise analysis.

Equivalent Sound Level (L_{eq}). L_{eq} represents an average of the sound energy occurring over a specified period. In effect, Leq is the steady-state sound level containing the same acoustical energy as the time-varying sound that actually occurs during the same period. The continuous 1-hour A-weighted equivalent sound level ($L_{eq[h]}$) is the energy average of A-weighted sound levels occurring during a 1 hour period and is the basis for NAC used by Caltrans and FHWA.

Local Setting

Federal Regulations

23CFR772. 23 CFR 772 provides procedures for preparing operational and construction noise studies and evaluating noise abatement considered for federal and federal-aid highway projects. Under 23 CFR 772.7, projects are categorized as Type I, Type II, or Type III projects. FHWA defines a Type I project as a proposed federal or federal-aid highway project for the construction of a highway on a new location, or the physical alteration of an existing highway that significantly changes either the horizontal or vertical alignment, or increases the number of through-traffic lanes. A Type II project is a noise barrier retrofit project that involves no changes to highway capacity or alignment. A Type III project is a project that does not meet the classifications of a Type I or Type II project. Type III projects do not require a noise analysis.

Under 23 CFR 772.11, noise abatement must be considered for Type I projects if the project is predicted to result in a traffic noise impact. In such cases, 23 CFR 772 requires that the project sponsor "consider" noise abatement before adoption of the final NEPA document. This process involves identification of noise abatement measures that are reasonable, feasible, and likely to be incorporated into the project, and of noise impacts for which no apparent solution is available.

Traffic noise impacts, as defined in 23 CFR 772.5, occur when the predicted noise level in the design year approaches or exceeds the NAC specified in 23 CFR 772, or a predicted noise level substantially exceeds the existing noise level (i.e., a "substantial" noise increase). 23 CFR 772 does not specifically define the terms "substantial increase" or "approach." These criteria are defined in the Protocol, as described below.

Table A summarizes the noise abatement criteria (NAC) corresponding to various land use activity categories. Activity categories and related traffic noise impacts are determined based on the actual land use in a given area.

Table A. Activity Categories and Noise Abatement Criteria

Activity Category	Activity $L_{eq}(h)$ [1]	Evaluation Location	Description of Activities
A	57	Exterior	Lands on which serenity and quiet are of extraordinary significance and serve an important public need and where the preservation of those qualities is essential if the area is to continue to serve its intended purpose.
B[2]	67	Exterior	Residential
C[2]	67	Exterior	Active sport areas, amphitheaters, auditoriums, campgrounds, cemeteries, day care centers, hospitals, libraries, medical facilities, parks, picnic areas, places of worship, playgrounds, public meeting rooms, public or nonprofit institutional structures, radio studios, recording studios, recreation areas, Section 4(f) sites, schools, television studios, trails, and trail crossings.
D	52	Interior	Auditoriums, day care centers, hospitals, libraries, medical facilities, places of worship, public meeting rooms, public or nonprofit institutional structures, radio studios, recording studios, schools, and television studios.
E	72	Exterior	Hotels, motels, offices, restaurants/bars, and other developed lands properties, or activities not included in A-D or F.
F	—	—	Agriculture, airports, bus yards, emergency services, industrial, logging, maintenance facilities, manufacturing, mining, rail yards, retail facilities, shipyards, utilities (water resources, water treatment, electrical), and warehousing.
G	—	—	Undeveloped lands that are not permitted.

Source: FHWA 23 CFR 772.

[1] The $L_{eq}(h)$ activity criteria values are for impact determination only and are not design standards for noise abatement measures. All values are dBA.

[2] Includes undeveloped lands permitted for this activity category.

dBA = A-weighted decibels

FHWA = Federal Highway Administration

$L_{eq}(h)$ = equivalent continuous sound level per hour

State Regulations

Traffic Noise Analysis Protocol for New Highway Construction and Reconstruction Projects. The Caltrans Protocol specifies the policies, procedures, and practices to be used by agencies that sponsor new construction or reconstruction of federal or federal-aid highway projects. The NAC specified in the Protocol are the same as those specified in 23 CFR 772. The Protocol defines a noise increase as "substantial" when the predicted noise levels with project implementation exceed existing noise levels by 12 dBA. The Protocol also states that a sound level is considered to approach an NAC level when the sound level is within 1 dB of the NAC identified in 23 CFR 772 (e.g., 66 dBA is considered to approach the NAC of 67 dBA, but 65 dBA is not).

Methodology

Level II Screening

The Level II screening analysis calculated the noise impact area associated with each alternative. Descriptions of the alternatives evaluated in the Level II Screening are provided in the summary of potential effects below. The 1-hour equivalent noise levels (L_{eq}) were calculated using the Federal Highway Administration (FHWA) Highway Traffic Noise Prediction Model (FHWA RD-77-108) and the daily traffic volumes prepared by CH2MHill (July 2012).

The effect of each project alternative was evaluated by calculating the change in traffic noise levels from the no build conditions along the following highway segments:

- Interstate 210 (I-210) between State Route 134 (SR-134) and State Route 2 (SR-2)
- I-210 between SR-134 and Interstate 605 (I-605)
- SR-134 between Interstate 5 (I-5) and I-210
- SR-710 between I-210 and California Boulevard
- Interstate 110 (I-110) between I-5 and Glenarm Street
- Interstate 10 (I-10) between I-5 and SR-710
- I-10 between SR-710 and I-605
- SR-710 between I-10 and Valley Boulevard
- I-710 between State Route 60 (SR-60) and I-10
- I-605 between I-210 and I-10
- SR-2 between SR-134 and I-5
- SR-134 between I-5 and SR-2
- I-5 between SR-134 and SR-2
- I-5 between SR-2 and I-110
- I-5 between I-110 and I-10
- SR-2 between SR-134 and I-210

In addition to the roadway segments listed above, the freeway alternative screening analyses included noise impacts associated with the above ground roadway segments. All of the segments included in the Level II Screening analysis are shown in Figure 1.

Land uses located within the 65 dBA L_{eq} noise contours would be potentially exposed to noise levels exceeding the federal and/or State noise standards. As Caltrans considers all land uses, including open space, to be noise sensitive, the potential noise impact areas were calculated by multiplying the length of the roadway segments by the width of the 65 dBA L_{eq} noise contour.

The traffic analysis focused on the effect of increased transit use on on-road vehicles Therefore, there is insufficient information available to accurately estimate the noise impacts associated with the rail, bus, and local improvements. As a result, the screening analysis focused on the effect that these alternatives would have on the on-road traffic volumes on the roadway segments listed above.

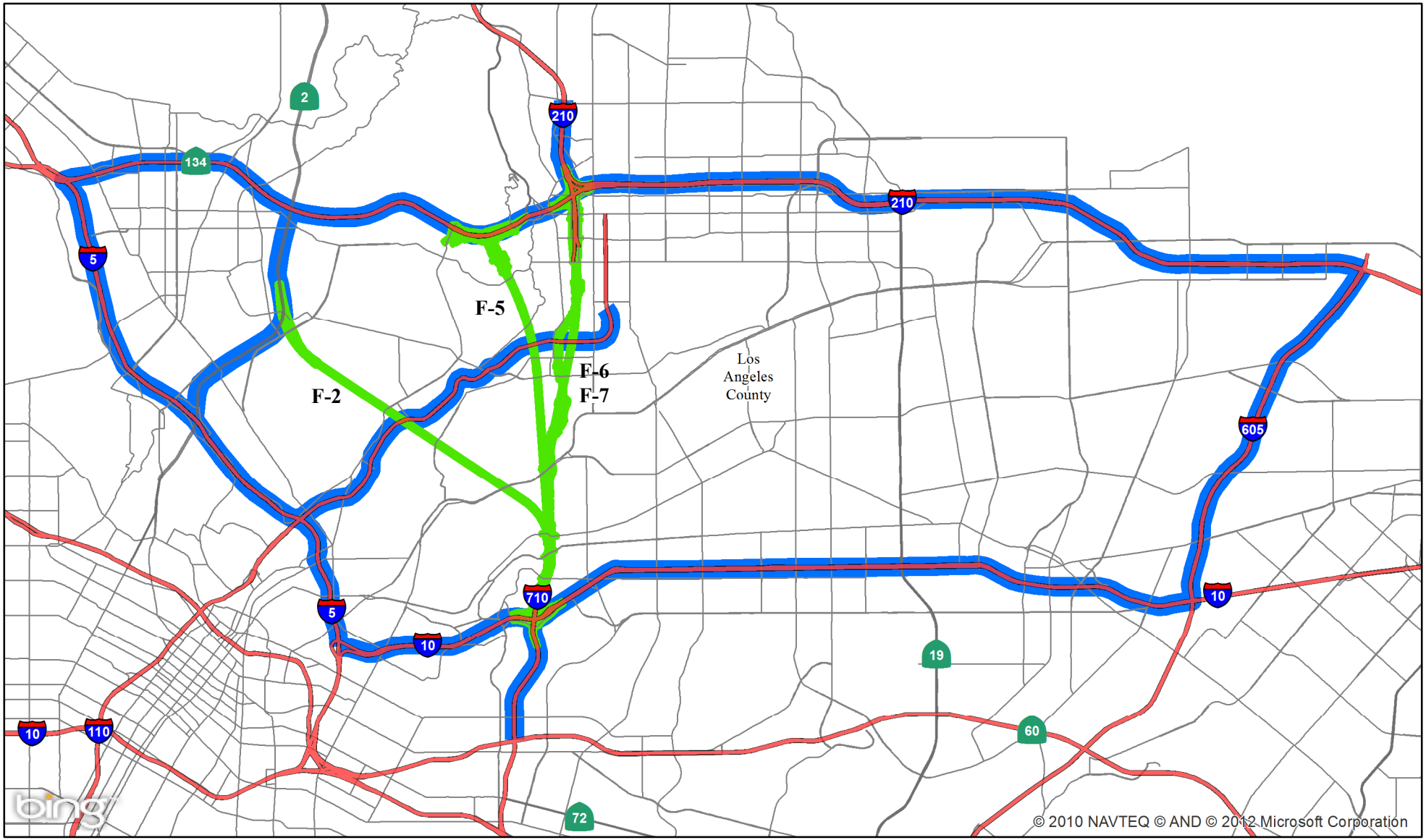

FIGURE 1

LEGEND

Existing Roadway Segments Evaluated in Level II Screening

Proposed SR-710 Freeway Alternatives Evaluated in Level II Screening

N

0 1 2

MILES

SR-710 Study

Screening Analysis Roadway Segments

SOURCE: ESRI (2006); CH2MHill (2012)

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Resources in Study Area

Land uses considered to be noise sensitive receptors include residences, schools, playgrounds, childcare centers, athletic facilities, hospitals, long-term health care facilities, rehabilitation centers, convalescent centers, and retirement homes. The following land uses are located within the vicinity of the project study areas:

I-210 between SR-134 and SR-2. The land uses located within the vicinity of this segment consist primarily of residential developments.

I-210 east of SR134. The land uses located within the vicinity of this segment include a mix of commercial and residential developments.

SR-134 west of I-210. The land uses located within the vicinity of this segment consist primarily of residential developments.

SR-710 south of I-210. The land uses located within the vicinity of this segment consist primarily of commercial developments.

I-110 east of I-5. The land uses located within the vicinity of this segment include a mix of residential developments and open space.

I-10 west of SR-710. The land uses located within the vicinity of this segment include a mix of commercial and residential developments.

I-10 east of SR-710. The land uses located within the vicinity of this segment consist primarily of residential developments.

SR-710 north of I-10. The land uses located within the vicinity of this segment include a mix of residential developments and school uses.

I-710 south of I-10. The land uses located within the vicinity of this segment include a mix of residential developments and open space.

I-605 between I-210 and I-10. The land uses located within the vicinity of this segment include a mix of residential developments and open space.

SR-2 between SR-134 and I-5. The land uses located within the vicinity of this segment consist primarily of residential developments.

SR-134 west of SR-2. The land uses located within the vicinity of this segment consist primarily of residential developments.

I-5 between SR-134 and SR-2. The land uses located within the vicinity of this segment include a mix of residential developments and recreation uses.

I-5 between SR2 and I-110. The land uses located within the vicinity of this segment include a mix of residential developments and recreation uses.

I-5 between I-110 and I-10. The land uses located within the vicinity of this segment include a mix of commercial and residential developments.

SR-2 between SR-134 and I-210. The land uses located within the vicinity of this segment include a mix of residential developments and open space.

Summary of Potential Effects to Resources

Level II Screening

No Build

Within the project area, the no build alternative would expose 14,506.9 acres to traffic noise levels exceeding 65 dBA L_{eq}. The majority of the land uses along the roadway segments evaluated as part of this screening analysis are sensitive residential, school, or open space uses. Traffic volumes for the No Build Alternative are provided in Appendix A.

TSM/TDM

The refined Level II TSM/TSM Alternative proposes expanded transit service, which includes bus service improvements, active transportation, which includes pedestrian and bicycle facilities, ITS improvements, which includes traffic signal synchronization, travel demand analysis, intersection hot spot improvements and local street improvements on the roadways within the study area. Within the project area this alternative would expose 14,503.9 acres to traffic noise levels exceeding 65 dBA L_{eq}, a reduction of 3.1 acres from the no build conditions. The majority of the land uses, along the roadway segments evaluated as part of this screening analysis, are sensitive residential, school, or open space uses. Therefore, this alternative would result in a small reduction in the number of sensitive land uses that would be exposed to noise levels exceeding 65 dBA L_{eq}. Traffic volumes for the TSM/TDM Alternative are provided in Appendix A.

Bus Rapid Transit Alternatives

The two Bus Rapid Transit (BRT) Alternatives, BRT-1 and BRT-6 and a variation of the BRT-6 alternative, labeled BRT-6a, would add two rapid transit bus routes in the study area. These BRT Alternatives would provide at-grade transit routes and would provide transit-dependent populations with decreased travel times for those commuters that would utilize these bus routes for employment and/or commercial uses. Traffic volumes for the BRT Alternatives are provided in Appendix A.

BRT-1

Within the project area this alternative would expose 13,469.3 acres to traffic noise levels exceeding 65 dBA L_{eq}, a reduction of 37.6 acres from the no build conditions. The majority of the land uses along the roadway segments evaluated as part of this screening analysis are sensitive residential, school, or open space uses. Therefore, this alternative would result in a small reduction in the number of sensitive land uses that would be exposed to noise levels exceeding 65 dBA L_{eq}.

BRT-1a

Within the project area this alternative would expose 13,469.3 acres to traffic noise levels exceeding 65 dBA L_{eq}, a reduction of 37.6 acres from the no build conditions. The majority of the land uses along the roadway segments evaluated as part of this screening analysis are sensitive residential, school, or open space uses. Therefore, this alternative would result in a small reduction in the number of sensitive land uses that would be exposed to noise levels exceeding 65 dBA L_{eq}.

BRT-6

Within the project area this alternative would expose 13,469.3 acres to traffic noise levels exceeding 65 dBA L_{eq}, a reduction of 37.6 acres from the no build conditions. The majority of the land uses along the roadway segments evaluated as part of this screening analysis are sensitive residential, school, or open space uses. Therefore, this alternative would result in a small reduction in the number of sensitive land uses that would be exposed to noise levels exceeding 65 dBA L_{eq}.

Light Rail Transit Alternatives

The two Light Rail Transit (LRT) Alternatives, LRT-4 with three variations labeled LRT-4a, LRT-4b and LRT-4d, and LRT-6 would add two light rail alternatives in the study area. These LRT Alternatives would be constructed in a

variety of configurations along their alignments. Variation LRT-4a is configured to be constructed with an aerial segment, an excavated segment, an at-grade segment, and a bored tunnel segment. Variation LRT-4b is configured to be constructed with an aerial segment, an excavated segment, an at-grade segment, and a bored tunnel segment with a second at-grade component and variation LRT-4d is configured to be constructed with a cut and cover segment, an aerial segment, an at-grade segment, and a second cut and cover segment with two at-grade components. Alternative LRT-6 is configured to be constructed with an aerial segment, an at-grade segment, a second aerial segment, a second at-grade segment and a third aerial segment. Traffic volumes for the LRT Alternatives are provided in Appendix A.

LRT-4a

Within the project area this alternative would expose 13,469.3 acres to traffic noise levels exceeding 65 dBA L_{eq}, a reduction of 37.6 acres from the no build conditions. The majority of the land uses along the roadway segments evaluated as part of this screening analysis are sensitive residential, school, or open space uses. Therefore, this alternative would result in a small reduction in the number of sensitive land uses that would be exposed to noise levels exceeding 65 dBA L_{eq}.

LRT-4b

Within the project area this alternative would expose 13,469.3 acres to traffic noise levels exceeding 65 dBA L_{eq}, a reduction of 37.6 acres from the no build conditions. The majority of the land uses along the roadway segments evaluated as part of this screening analysis are sensitive residential, school, or open space uses. Therefore, this alternative would result in a small reduction in the number of sensitive land uses that would be exposed to noise levels exceeding 65 dBA L_{eq}.

LRT-4d

Within the project area this alternative would expose 13,469.3 acres to traffic noise levels exceeding 65 dBA L_{eq}, a reduction of 37.6 acres from the no build conditions. The majority of the land uses along the roadway segments evaluated as part of this screening analysis are sensitive residential, school, or open space uses. Therefore, this alternative would result in a small reduction in the number of sensitive land uses that would be exposed to noise levels exceeding 65 dBA L_{eq}.

LRT-6

Within the project area this alternative would expose 13,469.3 acres to traffic noise levels exceeding 65 dBA L_{eq}, a reduction of 37.6 acres from the no build conditions. The majority of the land uses along the roadway segments evaluated as part of this screening analysis are sensitive residential, school, or open space uses. Therefore, this alternative would result in a small reduction in the number of sensitive land uses that would be exposed to noise levels exceeding 65 dBA L_{eq}.

Freeway Alternatives

The four Freeway Alternatives, F-2, F-5, F-6 and F-7 would construct a new freeway from the Interstate 710/Interstate 10 interchange, to three different northern termini locations. Alternative F-2 would terminate/connect with State Route 2. Alternative F-5 would terminate/connect with State Route 134 and Alternatives F-6 and F-7 both terminate/connect with the State Route 134/Interstate 210 interchange. Traffic volumes for the Freeway Alternatives are provided in Appendix A.

F-2

Within the project area this alternative would expose 15,334.5 acres to traffic noise levels exceeding 65 dBA L_{eq}, an increase of 827.5 acres from the no build conditions. The majority of the land uses along the roadway segments evaluated as part of this screening analysis are sensitive residential, school, or open space uses. Therefore, this alternative would result in an increase in the number of sensitive land uses that would be exposed to noise levels exceeding 65 dBA L_{eq}.

F-5

Within the project area this alternative would expose 14,614.6 acres to traffic noise levels exceeding 65 dBA L_{eq}, an increase of 107.7 acres from the no build conditions. The majority of the land uses along the roadway segments evaluated as part of this screening analysis are sensitive residential, school, or open space uses. Therefore, this alternative would result in an increase in the number of sensitive land uses that would be exposed to noise levels exceeding 65 dBA L_{eq}.

F-6

Within the project area this alternative would expose 15,297.4 acres to traffic noise levels exceeding 65 dBA L_{eq}, an increase of 790.5 acres from the no build conditions. The majority of the land uses along the roadway segments evaluated as part of this screening analysis are sensitive residential, school, or open space uses. Therefore, this alternative would result in an increase in the number of sensitive land uses that would be exposed to noise levels exceeding 65 dBA L_{eq}.

F-7

Within the project area this alternative would expose 14,636.5 acres to traffic noise levels exceeding 65 dBA L_{eq}, an increase of 129.6 acres from the no build conditions. The majority of the land uses along the roadway segments evaluated as part of this screening analysis are sensitive residential, school, or open space uses. Therefore, this alternative would result in an increase in the number of sensitive land uses that would be exposed to noise levels exceeding 65 dBA L_{eq}.

Highway or Arterial Improvement Alternatives

The two Highway/Arterial Alternatives, H-2 and H-6 would provide at-grade improvements to arterial streets and add a connector from the Interstate 710 stub to two different termini in the northern part of the study area. Alternative H-2 would terminate/connect with State Route 134 and Alternative H-6 would terminate/connect with the State Route 134/Interstate 210 interchange. Traffic volumes for the Highway Alternatives are provided in Appendix A.

H-2

Within the project area this alternative would expose 14,567.4 acres to traffic noise levels exceeding 65 dBA L_{eq}, an increase of 60.5 acres from the no build conditions. The majority of the land uses along the roadway segments evaluated as part of this screening analysis are sensitive residential, school, or open space uses. Therefore, this alternative would result in a small increase in the number of sensitive land uses that would be exposed to noise levels exceeding 65 dBA L_{eq}.

H-6

Within the project area this alternative would expose 14,602.1 acres to traffic noise levels exceeding 65 dBA L_{eq}, an increase of 95.2 acres from the no build conditions. The majority of the land uses along the roadway segments evaluated as part of this screening analysis are sensitive residential, school, or open space uses. Therefore, this alternative would result in a small increase in the number of sensitive land uses that would be exposed to noise levels exceeding 65 dBA L_{eq}.

Summary of Potential Effects to Resources by Alternative

Table B summarizes the change in the noise impact area associated with each of the proposed project alternatives.

Noise impacts and abatement measures for each of the alternatives selected for additional analyses in the Draft Environmental Impact Report/Environmental Impact Statement will be evaluated following local, state, and federal roadway and transit guidelines.

Table B: Summary of Noise Impacts

Resources	No Build	TSM/TDM	BRT-1	BRT-1a	BRT-6	LRT-4a	LRT-4b	LRT-4d	LRT-6	F-2	F-5	F-6	F-7	H-2	H-6
Noise Impact Area (Acres)	14,506.9	14503.9	14,469.3	14,469.3	14,469.3	14,469.3	14,469.3	14,469.3	14,469.3	15,334.5	14,614.6	15,297.4	14,636.5	14,567.4	14,602.1
Change from No Build (Acres)	--	-3.1	-37.6	-37.6	-37.6	-37.6	-37.6	-37.6	-37.6	827.5	107.7	790.5	129.6	60.5	95.2
Change from No Build (%)	--	0.0	-0.3	-0.3	-0.3	-0.3	-0.3	-0.3	-0.3	5.7	0.7	5.4	0.9	0.4	0.7

APPENDIX A

LEVEL II SCREENING
Traffic Volumes by Alternative

Traffic Volumes- No Build

Link #	Roadway Link	SB/WB Volume	NB/EB Volume	Total Volume	Segment Length (ft)	Distance to 65 dBA Leq (ft)	Area Within 65 dBA Contour (Acres)
1	210 North of 134	93,772	97,364	191,136	29,650	779	1,059.9
2	210 East of 134	170,880	165,031	335,911	60,720	1,134	3,162.2
3	134 West of 210	128,405	132,029	260,434	22,176	958	975.0
4	710 South of 210	21,577	30,624	52,201	6,336	331	96.3
5	110 East of 5	75,775	73,897	149,672	28,512	663	867.7
6	10 West of 710	138,167	152,937	291,104	14,784	1,031	700.0
7	10 East of 710	131,621	130,066	261,687	50,688	961	2,235.4
8	710 North of 10	24,749	17,981	42,730	4,752	291	63.5
9	710 South of 10	98,296	90,746	189,042	9,504	774	337.7
10	605 Between 210 and 10	67,447	71,326	138,773	28,512	630	825.3
11	2 Between 134 and 5	98,481	94,851	193,332	18,480	786	666.6
12	134 West of 2	122,770	132,910	255,680	16,368	946	710.8
13	5 Between 134 and 2	166,507	169,466	335,973	20,064	1,134	1,044.9
14	5 Between 2 and 110	176,804	189,996	366,800	10,560	1,202	583.0
15	5 Between 110 and 10	152,450	178,550	331,000	11,616	1,123	598.9
16	2 Between 134 and 210	58,642	59,026	117,668	22,340	565	579.7
						Total	14,506.9

Traffic Volumes - Alt TSM/TDM

Link #	Roadway Link	SB/WB Volume	NB/EB Volume	Total Volume	Segment Length (ft)	Distance to 65 dBA Leq (ft)	Area Within 65 dBA Contour (Acres)	Increase from No Build (Acres)
1	210 North of 134	93,504	96,965	190,469	29,650	778	1,058.8	-1.1
2	210 East of 134	170,337	164,428	334,765	60,720	1,132	3,154.7	-7.5
3	134 West of 210	128,022	131,638	259,660	22,176	956	973.0	-2.0
4	710 South of 210	21,591	30,483	52,074	6,336	331	96.2	-0.1
5	110 East of 5	75,479	73,632	149,111	28,512	661	865.8	-1.9
6	10 West of 710	137,150	152,349	289,499	14,784	1,027	697.3	-2.7
7	10 East of 710	131,242	129,734	260,976	50,688	959	2,231.4	-4.0
8	710 North of 10	24,725	17,881	42,606	4,752	290	63.4	-0.1
9	710 South of 10	98,170	110,639	208,809	9,504	827	360.8	23.1
10	605 Between 210 and 10	67,421	71,545	138,966	28,512	631	826.1	0.8
11	2 Between 134 and 5	98,002	94,422	192,424	18,480	783	664.5	-2.1
12	134 West of 2	122,480	132,576	255,056	16,368	944	709.7	-1.1
13	5 Between 134 and 2	165,915	169,338	335,253	20,064	1,133	1,043.4	-1.5
14	5 Between 2 and 110	176,267	189,862	366,129	10,560	1,201	582.4	-0.6
15	5 Between 110 and 10	151,989	178,423	330,412	11,616	1,122	598.3	-0.6
16	2 Between 134 and 210	58,362	58,744	117,106	22,340	564	578.1	-1.6
						Total	14,503.9	-3.1
							Percent Increase above No Build	0.0%

Traffic Volumes - Alt BRT/LRT

Link #	Roadway Link	SB/WB Volume	NB/EB Volume	Total Volume	Segment Length (ft)	Distance to 65 dBA Leq (ft)	Area Within 65 dBA Contour (Acres)	Increase from No Build (Acres)
1	210 North of 134	93,482	96,994	190,476	29,650	778	1,058.8	-1.1
2	210 East of 134	170,221	164,376	334,597	60,720	1,131	3,153.4	-8.8
3	134 West of 210	127,936	131,544	259,480	22,176	955	972.5	-2.5
4	710 South of 210	21,569	30,475	52,044	6,336	331	96.2	-0.1
5	110 East of 5	75,213	73,364	148,577	28,512	660	863.5	-4.2
6	10 West of 710	137,368	151,776	289,144	14,784	1,027	696.8	-3.2
7	10 East of 710	130,869	129,599	260,468	50,688	958	2,228.6	-6.8
8	710 North of 10	24,690	17,919	42,609	4,752	290	63.4	-0.1
9	710 South of 10	97,809	90,349	188,158	9,504	772	336.7	-1.1
10	605 Between 210 and 10	67,188	71,346	138,534	28,512	630	824.5	-0.8
11	2 Between 134 and 5	97,896	94,344	192,240	18,480	783	664.1	-2.5
12	134 West of 2	122,415	132,529	254,944	16,368	944	709.5	-1.3
13	5 Between 134 and 2	166,031	169,189	335,220	20,064	1,133	1,043.4	-1.5
14	5 Between 2 and 110	176,403	189,648	366,051	10,560	1,201	582.3	-0.7
15	5 Between 110 and 10	152,058	178,087	330,145	11,616	1,121	598.0	-1.0
16	2 Between 134 and 210	58,301	58,725	117,026	22,340	563	577.8	-2.0
						Total	14,469.3	-37.6
							Percent Increase above No Build	-0.3%

Traffic Volumes - Alt F-2

Link #	Roadway Link	SB/WB Volume	NB/EB Volume	Total Volume	Segment Length (ft)	Distance to 65 dBA Leq (ft)	Area Within 65 dBA Contour (Acres)	Increase from No Build (Acres)
1	210 North of 134	92,583	93,363	185,946	29,650	766	1,042.2	-17.8
2	210 East of 134	174,390	170,174	344,564	60,720	1,154	3,215.8	53.6
3	134 West of 210	132,469	135,867	268,336	22,176	977	994.6	19.6
4	710 South of 210	20,280	26,857	47,137	6,336	310	90.2	-6.1
5	110 East of 5	79,062	76,736	155,798	28,512	681	891.0	23.3
6	10 West of 710	129,010	141,067	270,077	14,784	981	665.8	-34.2
7	10 East of 710	145,142	142,450	287,592	50,688	1,023	2,380.2	144.8
8	710 North of 10	122,558	105,393	227,951	3,800	876	152.9	89.4
9	710 South of 10	137,211	124,290	261,501	9,504	960	418.9	81.2
10	605 Between 210 and 10	62,468	62,763	125,231	28,512	589	771.2	-54.1
11	2 Between 134 and 5	168,303	157,715	326,018	18,480	1,112	943.4	276.8
12	134 West of 2	142,015	156,407	298,422	16,368	1,048	787.9	77.1
13	5 Between 134 and 2	158,272	161,697	319,969	20,064	1,098	1,011.5	-33.4
14	5 Between 2 and 110	160,932	172,749	333,681	10,560	1,129	547.4	-35.6
15	5 Between 110 and 10	135,986	159,471	295,457	11,616	1,041	555.4	-43.5
16	2 Between 134 and 210	88,244	89,323	177,567	22,340	742	761.5	181.8
17	North end of F-2	122,558	105,393	227,951	2,600	876	104.6	104.6
						Total	15,334.5	827.5
							Percent Increase above No Build	5.7%

Traffic Volumes - Alt F-5

Link #	Roadway Link	SB/WB Volume	NB/EB Volume	Total Volume	Segment Length (ft)	Distance to 65 dBA Leq (ft)	Area Within 65 dBA Contour (Acres)	Increase from No Build (Acres)
1	210 North of 134	98,683	100,317	199,000	29,650	801	1,090.0	30.0
2	210 East of 134	162,939	155,796	318,735	60,720	1,095	3,053.5	-108.7
3	134 West of 210	161,747	163,284	325,031	22,176	1,110	1,129.8	154.8
4	710 South of 210	19,288	25,995	45,283	3,200	302	44.3	-51.9
5	110 East of 5	74,599	71,925	146,524	28,512	654	855.7	-12.0
6	10 West of 710	125,922	139,528	265,450	14,784	970	658.3	-41.7
7	10 East of 710	135,732	132,587	268,319	50,688	977	2,273.3	37.9
8	710 North of 10	118,324	120,172	238,496	3,900	903	161.7	98.2
9	710 South of 10	141,766	148,041	289,807	9,504	1,028	448.7	110.9
10	605 Between 210 and 10	65,184	67,648	132,832	28,512	613	801.9	-23.4
11	2 Between 134 and 5	81,562	75,913	157,475	18,480	686	581.7	-84.9
12	134 West of 2	135,769	145,194	280,963	16,368	1,007	756.8	46.0
13	5 Between 134 and 2	159,458	162,843	322,301	20,064	1,103	1,016.3	-28.5
14	5 Between 2 and 110	165,775	175,784	341,559	10,560	1,147	556.0	-27.0
15	5 Between 110 and 10	138,630	159,952	298,582	11,616	1,049	559.3	-39.7
16	2 Between 134 and 210	66,135	66,424	132,559	22,340	612	627.3	47.6
						Total	14,614.6	107.7
							Percent Increase above No Build	0.7%

Traffic Volumes - Alt F-6

Link #	Roadway Link	SB/WB Volume	NB/EB Volume	Total Volume	Segment Length (ft)	Distance to 65 dBA Leq (ft)	Area Within 65 dBA Contour (Acres)	Increase from No Build (Acres)
1	210 North of 134	121,409	122,977	244,386	29,650	918	1,249.5	189.5
2	210 East of 134	144,418	162,122	306,540	60,720	1,067	2,975.3	-186.9
3	134 West of 210	130,079	133,687	263,766	22,176	966	983.2	8.2
4	710 South of 210	66,305	74,366	140,671	16,100	636	470.2	373.9
5	110 East of 5	70,814	68,564	139,378	28,512	632	827.6	-40.1
6	10 West of 710	134,384	145,406	279,790	14,784	1,004	681.6	-18.3
7	10 East of 710	134,347	129,789	264,136	50,688	967	2,249.6	14.2
8	710 North of 10	118,735	116,350	235,085	16,100	894	661.2	597.7
9	710 South of 10	121,041	127,474	248,515	9,504	928	405.1	67.3
10	605 Between 210 and 10	64,514	66,724	131,238	28,512	608	795.4	-29.8
11	2 Between 134 and 5	85,316	81,190	166,506	18,480	712	603.7	-62.8
12	134 West of 2	124,417	135,199	259,616	16,368	956	718.2	7.4
13	5 Between 134 and 2	164,668	167,380	332,048	20,064	1,125	1,036.8	-8.1
14	5 Between 2 and 110	170,771	181,958	352,729	10,560	1,172	568.1	-14.9
15	5 Between 110 and 10	143,964	165,328	309,292	11,616	1,073	572.5	-26.4
16	2 Between 134 and 210	45,977	47,856	93,833	22,340	487	499.3	-80.4
						Total	15,297.4	790.5
							Percent Increase above No Build	5.4%

Traffic Volumes - Alt F-7

Link #	Roadway Link	SB/WB Volume	NB/EB Volume	Total Volume	Segment Length (ft)	Distance to 65 dBA Leq (ft)	Area Within 65 dBA Contour (Acres)	Increase from No Build (Acres)
1	210 North of 134	126,612	127,302	253,914	29,650	942	1,281.9	222.0
2	210 East of 134	167,621	163,567	331,188	60,720	1,123	3,132.0	-30.1
3	134 West of 210	129,282	135,338	264,620	22,176	968	985.4	10.4
4	710 South of 210	70,477	79,045	149,522	2,300	663	70.0	-26.3
5	110 East of 5	72,165	70,401	142,566	28,512	642	840.2	-27.5
6	10 West of 710	134,784	147,141	281,925	14,784	1,009	685.2	-14.8
7	10 East of 710	133,785	131,577	265,362	50,688	970	2,256.4	21.0
8	710 North of 10	126,207	123,672	249,879	4,150	932	177.5	114.0
9	710 South of 10	128,658	135,496	264,154	9,504	967	421.8	84.1
10	605 Between 210 and 10	64,279	66,764	131,043	28,512	607	794.6	-30.6
11	2 Between 134 and 5	83,358	81,865	165,223	18,480	708	600.6	-66.0
12	134 West of 2	124,322	135,364	259,686	16,368	956	718.2	7.4
13	5 Between 134 and 2	164,605	167,304	331,909	20,064	1,125	1,036.6	-8.3
14	5 Between 2 and 110	169,641	182,641	352,282	10,560	1,171	567.6	-15.4
15	5 Between 110 and 10	142,848	167,979	310,827	11,616	1,077	574.5	-24.5
16	2 Between 134 and 210	45,623	46,714	92,337	22,340	482	494.0	-85.7
						Total	14,636.5	129.6
							Percent Increase above No Build	0.9%

Traffic Volumes - Alt H-2

Link #	Roadway Link	SB/WB Volume	NB/EB Volume	Total Volume	Segment Length (ft)	Distance to 65 dBA Leq (ft)	Area Within 65 dBA Contour (Acres)	Increase from No Build (Acres)
1	210 North of 134	93,636	98,438	192,074	29,650	782	1,064.7	4.8
2	210 East of 134	170,878	164,389	335,267	60,720	1,133	3,157.8	-4.4
3	134 West of 210	127,870	130,925	258,795	22,176	953	970.8	-4.2
4	710 South of 210	21,954	32,072	54,026	6,336	339	98.6	2.3
5	110 East of 5	75,309	72,615	147,924	28,512	658	861.1	-6.5
6	10 West of 710	136,273	149,910	286,183	14,784	1,019	692.0	-8.0
7	10 East of 710	133,012	130,448	263,460	50,688	965	2,245.6	10.2
8	710 North of 10	50,050	63,366	113,416	4,752	552	120.4	56.9
9	710 South of 10	105,841	113,082	218,923	9,504	853	372.3	34.6
10	605 Between 210 and 10	67,089	70,627	137,716	28,512	627	821.3	-3.9
11	2 Between 134 and 5	97,419	92,402	189,821	18,480	776	658.6	-8.0
12	134 West of 2	122,529	132,575	255,104	16,368	945	709.9	-0.9
13	5 Between 134 and 2	166,477	169,300	335,777	20,064	1,134	1,044.5	-0.4
14	5 Between 2 and 110	176,521	188,905	365,426	10,560	1,200	581.6	-1.4
15	5 Between 110 and 10	151,654	175,768	327,422	11,616	1,115	594.7	-4.2
16	2 Between 134 and 210	58,139	57,597	115,736	22,340	559	573.5	-6.2
						Total	14,567.4	60.5
							Percent Increase above No Build	0.4%

Traffic Volumes - Alt H-6

Link #	Roadway Link	SB/WB Volume	NB/EB Volume	Total Volume	Segment Length (ft)	Distance to 65 dBA Leq (ft)	Area Within 65 dBA Contour (Acres)	Increase from No Build (Acres)
1	210 North of 134	102,811	102,677	205,488	29,650	818	1,113.5	53.6
2	210 East of 134	169,692	163,699	333,391	60,720	1,128	3,145.9	-16.3
3	134 West of 210	128,120	131,471	259,591	22,176	955	972.8	-2.2
4	710 South of 210	37,871	41,850	79,721	6,336	437	127.2	30.9
5	110 East of 5	74,930	72,474	147,404	28,512	656	858.8	-8.9
6	10 West of 710	137,059	149,331	286,390	14,784	1,020	692.3	-7.7
7	10 East of 710	133,147	130,133	263,280	50,688	964	2,244.5	9.1
8	710 North of 10	54,989	54,579	109,568	4,752	539	117.6	54.2
9	710 South of 10	106,921	109,923	216,844	9,504	848	370.0	32.2
10	605 Between 210 and 10	66,964	70,331	137,295	28,512	626	819.3	-5.9
11	2 Between 134 and 5	95,193	92,672	187,865	18,480	771	653.9	-12.7
12	134 West of 2	122,660	132,737	255,397	16,368	945	710.3	-0.6
13	5 Between 134 and 2	166,250	169,516	335,766	20,064	1,134	1,044.5	-0.4
14	5 Between 2 and 110	175,571	189,303	364,874	10,560	1,198	581.0	-2.0
15	5 Between 110 and 10	150,640	176,104	326,744	11,616	1,114	593.9	-5.1
16	2 Between 134 and 210	54,410	56,293	110,703	22,340	543	556.7	-23.0
						Total	14,602.1	95.2
							Percent Increase above No Build	0.7%