I-265 and Preston Highway

Louisville, Kentucky

NOISE IMPACT STUDY ADDENDUM

Prepared in accordance with Louisville Development Code Chapter 5 Section1.7.E

Prepared for:

Capstone Developer of Real Estate

September 8, 2019

Prepared by:

Teak Kim, PhD, PE
Raleigh, NC 27614

INTRODUCTION

A study was made of the effects that the operation of I-265 would have on the noise environment at the proposed Queen Apartment located in the southwest quadrant of I-265 and Preston Highway interchange in Louisville, Jefferson County, Kentucky. The study was prepared consistent with the Louisville Development Code Chapter 5 Section1.7.E, which constitutes the noise compatibility requirements for residential development in Metro Louisville.

PROCEDURE

This Noise Impact Study Addendum (Addendum) represents the detailed analysis of traffic noise impact in the vicinity of the project updated. Per e-mail dated Wednesday, August 28, 2019 @ 7:27 p.m. from Mr. Gabe Molnar, Capstone Developers of Real Estate to Teak-Keun Kim, PhD, PE, Tech Engineering Group: "*Please see the attached document. The pink line shows the 250' noise impact area for the Gene Snyder. The area outlined in black is the 3-*

story building that falls within that impact area. The area highlighted in green is the impacted portion of the building within the 250' Gene Snyder area. It represents portions of 6 apartment dwellings. All six units will have decks – the north facing units will have decks within the 250' setback area; the south facing units will not have decks within the 250' setback area. We would simply need to update our report to show the sound readings for these areas. As a point of reference, these units fall within the Gene Snyder limits only because the state assumes the Gene Snyder continues to the complete end of its exit ramp. The site is within 250' of the end of the exit ramp – it really has no proximity to the Gene Snyder heavy traffic."

METHODOLOGY

This Addendum utilized the 2017 FHWA Traffic Noise Model (TNM) created for the 2017 Noise Impact Study prepared by Tech Engineering Group (see the attachment). The TNM was revised to assign 6 receptors to assess traffic noise impact based on the August 2019 Mr. Gabe Molnar EMAIL. It should be noted that Preston Highway traffic was not modeled in the TNM based on the Louisville Development Code Chapter 5 Section1.7.E.

ANALYSIS and CONCLUSION

Figure 1 shows a proposed plan view of the project site, as provided by the August 2019 Mr. Gabe Molnar EMAIL. The figure includes the location of modeled additional receptors. Figure 2 shows the TNM 2.5-generated plan view of the project site. Table 1 shows a summary of the results. In determining traffic noise impacts, a highway agency shall give primary consideration to exterior areas where frequent human use occurs based on CFR 772.11 Analysis of traffic noise impacts. No impacts were predicted by the I-265 mainline and ramps traffic. Therefore, no abatement was warranted.

Table 1: Leq values in dBA

R-1-NewBldg 1st	57
R-1-NewBldg 2nd	59
R-1-NewBldg 3rd	60
R-2-NewBldg 1st	57
R-2-NewBldg 2nd	62
R-2-NewBldg 3rd	63

I-265 and Preston Highway

Louisville, Kentucky

NOISE IMPACT STUDY

Prepared in accordance with Louisville Development Code Chapter 5 Section1.7.F

Prepared for:

Capstone Developer of Real Estate

April 4, 2017

Prepared by:

Teak Kim, PhD, PE
Raleigh, NC 27614

INTRODUCTION

A study was made of the effects that the operation of I-265 would have on the noise environment at the proposed Queen Apartment located in the southwest quadrant of I-265 and Preston HWY interchange in Louisville, Jefferson County, Kentucky. The study was prepared consistent with the Louisville Development Code Chapter 5 Section1.7.F, which constitutes the noise compatibility requirements for residential development in Metro Louisville. This section of the code requires that new residential development approximately 200 feet of an existing I-265 Off-Ramp must not exceed a sound level of 65 dBA Leq. If sound levels at any residential structure exceed 65 dBA Leq, appropriate abatement strategies must be recommended.

METHODOLOGY

Leq is the equivalent energy level, and is similar to an average value of the sound levels occurring over a period of time. The unit for Leq is the A-weighted decibel, abbreviated

"dBA". The dBA unit takes into account the characteristics of the human hearing mechanism as well the acoustic energy generated by the source.

The code requires that the study be based upon projected future traffic data provided by the Planning Commission. The year 2027 was selected as the study year, in accordance with industry practice. Based upon conversations with Mr. Jadie Tomlinson of the KYTC Division of Planning in Frankfort, traffic count data for I-265 and Preston HWY were taken from:

http://transportation.ky.gov/Planning/Pages/count-maps.aspx;
http://datamart.business.transportation.ky.gov/EDSB_SOLUTIONS/CTS/; and
per e-mail dated Monday, March 6, 2017 @ 1:29 p.m. from Mr. Jadie Tomlinson, Kentucky Transportation Cabinet (KYTC) Division of Planning to Teak-Keun Kim, PE: "*Traffic Count Information, etc.*"

The traffic counts were adjusted to 2027 values using a one (1) percent growth factor, based on the 2008 and 2015 traffic counts at the DV03 - Site 056D28. Total two-way 2027 Annual Average Daily Traffic (AADT) for I-265 was determined to be 90,059, with the 3.9% for medium truck and 6.5% for heavy truck for I-265 and the 0.3% for medium truck and 0.2% for heavy truck for the Preston HWY at the south of the interchange. This value was converted to an afternoon peak hour using the conversion factor of approximately 9.6 percent extracted from the websites shown above. Also, a directional split of 52/48 EB/WB was also applied, based on the data found in the websites shown above.

The worst traffic noise conditions shall be evaluated as the lesser of the design hour factor percentage of the AADT or the roadway vehicle Level of Service "C" (LOS C) operating at the free flow speed condition. Numerous empirical evaluations and theoretical assessments have confirmed a widely accepted relationship between the

loudest traffic hour and the "Level of Service" (LOS) C traffic volumes. When traffic volumes exceed LOS C, vehicles must slow down, and noise emissions are reduced (source:

https://www.fhwa.dot.gov/Environment/noise/regulations_and_guidance/analysis_and_abatement_guidance/polguide02.cfm).

Traffic volumes on I-265 exceed LOS C volumes on based on the 2027 AADT. Traffic volumes on other roadways including On- or Off-Ramps in the near vicinity of the proposed project are lesser than LOS C volumes. The number of automobiles, medium trucks, and heavy trucks for a given roadway segment were calculated as the Average Annual Daily Traffic multiplied by the design hour factor.

In order to calculate 2027 Leq values, the currently accepted state-of-the-art noise prediction program was used. That program is the USDOT Federal Highway Administration's (FHWA) Traffic Noise Model, TNM, version 2.5, commonly referred to as TNM 2.5. Information on TNM 2.5 may be found at:

http://www.fhwa.dot.gov/environment/noise/traffic_noise_model/tnm_v25

2017 NOISE MEASUREMENTS

Ambient noise measurements on March 29, 2017 were conducted. The measurements were made with a Larson-Davis SoundTrack LxT Type 1, which was calibrated before and after the measurements. Weather conditions were clear and calm. Measurements were conducted based on the acceptable collection of existing noise level readings according to the FHWA Report, FHWA-PD-96-046, and "Measurement of Highway Related Noise." Ambient noise measurements obtained in the field ranged between 56 and 60 dBA Leq.

ANALYSIS

Figure 1 shows a proposed plan view of the project site, as provided by Milestone Design Group, LLC that is located in Louisville, Kentucky. The figure includes the location of modeled receptor and measurement locations. Figure 2 shows the TNM 2.5-generated plan view of the project site. Table 1 below shows a summary of the results. In determining traffic noise impacts, a highway agency shall give primary consideration to exterior areas where frequent human use occurs based on CFR 772.11 Analysis of traffic noise impacts.

Receptor no.1 - building 1 - 2nd floor balcony and 3rd floor balcony, which are part of the west-most building nearest the western project termini, are predicted to be impacted (see Figure 1). Therefore, appropriate abatement strategies must be recommended. Note that the Leq values have been rounded to the nearest whole number, in accordance with industry practice. Table 2 shows the results of the TNM 2.5 analysis for 2027.

CONCLUSION AND RECOMMENDATION

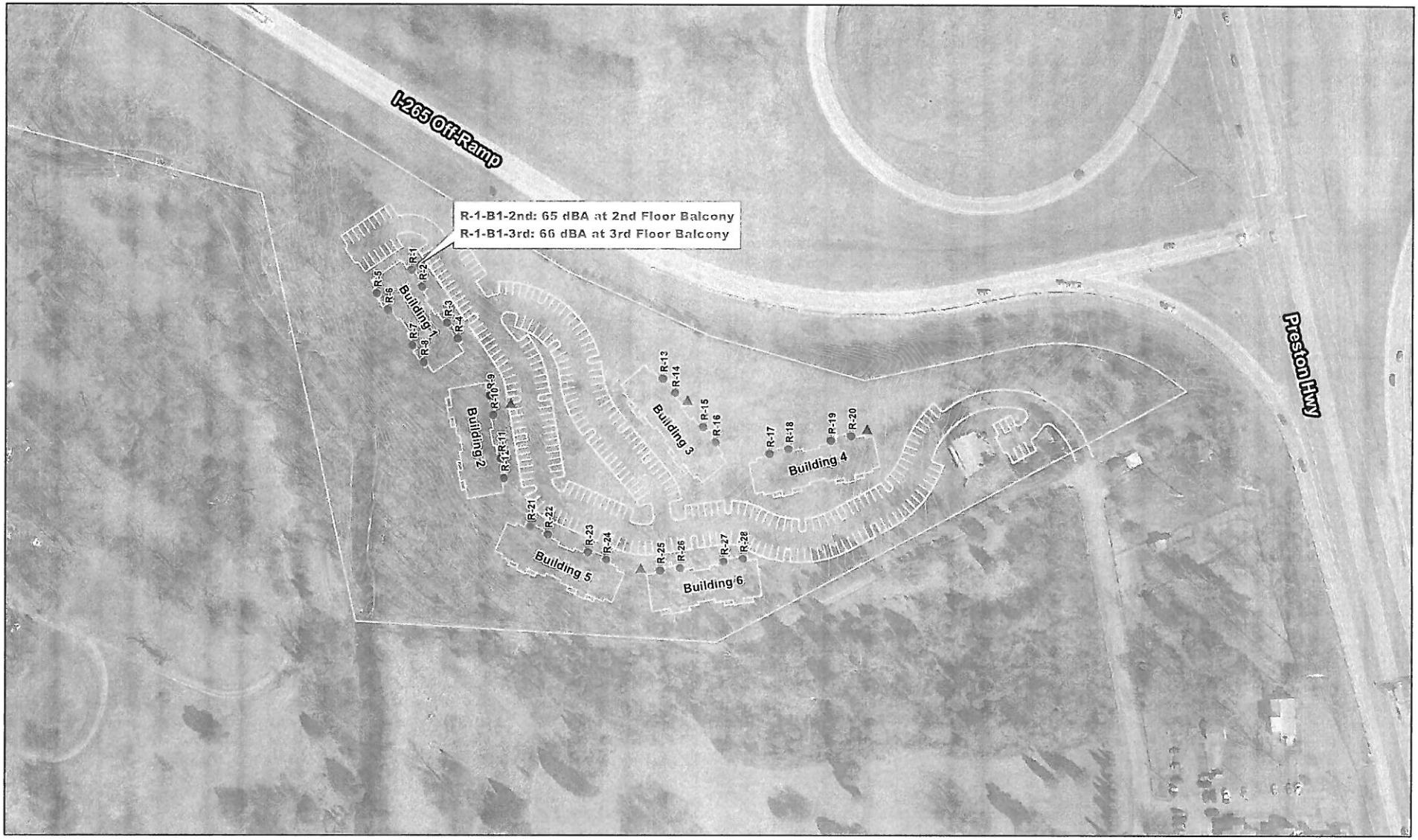
Because two 2027 Leq values exceed the 65 dBA criteria, noise abatement will be required. It should be noted that the abatement of second and third floor impacts are generally not feasible because of required excessive barrier heights. Therefore, Acoustic Curtains are recommended for abatement measures to benefit the predicted traffic noise impacts at the balconies. The impacted balconies would be reduced the noise levels less than 65 dBA Leq to satisfy the Louisville Development Code Chapter 5 Section1.7.F with Acoustic Curtains (refer to http://www.allnoisecontrol.com/products/Acoustic-Curtains.cfm).

Table 1: L_{eq} values in dBA.

Receptor	Leq in dBA	Receptor	Leq in dBA	Receptor	Leq in dBA
R-1-B1-1st	61	R-10-B2-2nd	56	R-19-B4-3rd	62
R-1-B1-2nd	65	R-10-B2-3rd	58	R-20-B4-1st	56
R-1-B1-3rd	66	R-11-B2-1st	51	R-20-B4-2nd	60
R-2-B1-1st	57	R-11-B2-2nd	56	R-20-B4-3rd	62
R-2-B1-2nd	61	R-11-B2-3rd	58	R-21-B5-1st	50
R-2-B1-3rd	62	R-12-B2-1st	49	R-21-B5-2nd	54
R-3-B1-1st	58	R-12-B2-2nd	54	R-21-B5-3rd	56
R-3-B1-2nd	62	R-12-B2-3rd	56	R-22-B5-1st	51
R-3-B1-3rd	64	R-13-B3-1st	59	R-22-B5-2nd	54
R-4-B1-1st	55	R-13-B3-2nd	63	R-22-B5-3rd	57
R-4-B1-2nd	60	R-13-B3-3rd	64	R-23-B5-1st	50
R-4-B1-3rd	61	R-14-B3-1st	56	R-23-B5-2nd	54
R-5-B1-1st	57	R-14-B3-2nd	60	R-23-B5-3rd	56
R-5-B1-2nd	61	R-14-B3-3rd	62	R-24-B5-1st	51
R-5-B1-3rd	63	R-15-B3-1st	57	R-24-B5-2nd	54
R-6-B1-1st	51	R-15-B3-2nd	61	R-24-B5-3rd	57
R-6-B1-2nd	56	R-15-B3-3rd	62	R-25-B6-1st	49
R-6-B1-3rd	58	R-16-B3-1st	54	R-25-B6-2nd	53
R-7-B1-1st	54	R-16-B3-2nd	58	R-25-B6-3rd	55
R-7-B1-2nd	58	R-16-B3-3rd	61	R-26-B6-1st	50
R-7-B1-3rd	60	R-17-B4-1st	55	R-26-B6-2nd	54
R-8-B1-1st	48	R-17-B4-2nd	59	R-26-B6-3rd	56
R-8-B1-2nd	53	R-17-B4-3rd	61	R-27-B6-1st	49
R-8-B1-3rd	55	R-18-B4-1st	56	R-27-B6-2nd	53
R-9-B2-1st	54	R-18-B4-2nd	60	R-27-B6-3rd	55
R-9-B2-2nd	59	R-18-B4-3rd	62	R-28-B6-1st	51
R-9-B2-3rd	61	R-19-B4-1st	55	R-28-B6-2nd	54
R-10-B2-1st	51	R-19-B4-2nd	60	R-28-B6-3rd	56

*R-1-B1-1st = Receptor No.1 - Building No. 1 - 1st floor balcony

XX = 65 dBA Leq or higher



Created by Tech Engineering Group (3-31-2017)

Figure 1

Queen Apartment Noise Study in Louisville, KY

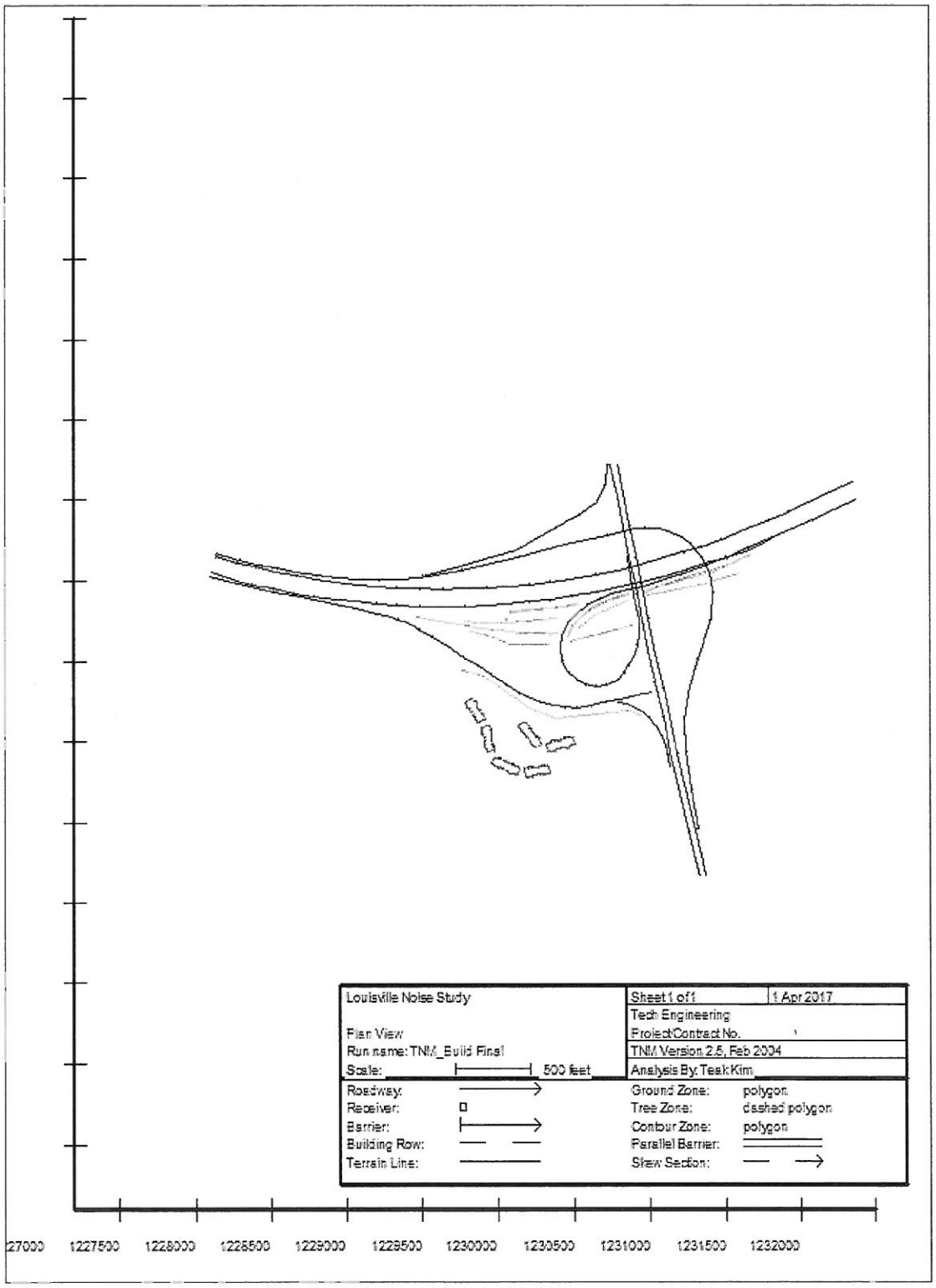


Figure 2: TNM 2.5-generated plan view of the project site.

Table 2: TNM 2.5-generated noise levels results file.

FHWA TNM 2.5 - [Sound Levels : TNM_Build Final:2]

File Edit View Setup Input Calculate Barrier Analysis Parallel Barriers Contours Tables Window Help

Tech Engineering
Teak Klm

3 April 2017
TNM 2.5
Calculated with TNM 2.5

RESULTS: SOUND LEVELS
PROJECT/CONTRACT: <Project Name?>
RUN: Louisville Noise Study
BARRIER DESIGN: INPUT HEIGHTS
ATMOSPHERICS: 68 deg F, 50% RH

Average pavement type shall be used unless a State highway agency substantiates the use of a different type with approval of FHWA.

Receiver Name	No.	#DUs	Existing LAeq1h	No Barrier LAeq1h Calculated	Crit'n	Increase over existing Calculated	Crit'n Sub'l Inc	Type Impact	With Barrier Calculated LAeq1h	Noise Reduction Calculated	Goal	Calculated minus Goal
			dBA	dBA	dBA	dB	dB		dBA	dB	dB	dB
R-1-B1-1st	1	1	0.0	60.6	66	60.6	10	—	60.6	0.0	8	-8.0
R-1-B1-2nd	2	1	0.0	64.5	66	64.5	10	—	64.5	0.0	8	-8.0
R-1-B1-3rd	3	1	0.0	65.9	66	65.9	10	—	65.9	0.0	8	-8.0
R-2-B1-1st	5	1	0.0	57.2	66	57.2	10	—	57.2	0.0	8	-8.0
R-2-B1-2nd	6	1	0.0	61.1	66	61.1	10	—	61.1	0.0	8	-8.0
R-2-B1-3rd	7	1	0.0	62.3	66	62.3	10	—	62.3	0.0	8	-8.0
R-3-B1-1st	8	1	0.0	58.0	66	58.0	10	—	58.0	0.0	8	-8.0
R-3-B1-2nd	9	1	0.0	62.3	66	62.3	10	—	62.3	0.0	8	-8.0
R-3-B1-3rd	10	1	0.0	63.8	66	63.8	10	—	63.8	0.0	8	-8.0
R-4-B1-1st	11	1	0.0	55.0	66	55.0	10	—	55.0	0.0	8	-8.0
R-4-B1-2nd	12	1	0.0	59.9	66	59.9	10	—	59.9	0.0	8	-8.0
R-4-B1-3rd	13	1	0.0	61.1	66	61.1	10	—	61.1	0.0	8	-8.0
R-5-B1-1st	14	1	0.0	56.5	66	56.5	10	—	56.5	0.0	8	-8.0
R-5-B1-2nd	15	1	0.0	61.2	66	61.2	10	—	61.2	0.0	8	-8.0
R-5-B1-3rd	16	1	0.0	63.0	66	63.0	10	—	63.0	0.0	8	-8.0
R-6-B1-1st	17	1	0.0	51.3	66	51.3	10	—	51.3	0.0	8	-8.0
R-6-B1-2nd	18	1	0.0	56.4	66	56.4	10	—	56.4	0.0	8	-8.0
R-6-B1-3rd	19	1	0.0	58.2	66	58.2	10	—	58.2	0.0	8	-8.0
R-7-B1-1st	20	1	0.0	54.0	66	54.0	10	—	54.0	0.0	8	-8.0
R-7-B1-2nd	21	1	0.0	57.9	66	57.9	10	—	57.9	0.0	8	-8.0
R-7-B1-3rd	22	1	0.0	60.3	66	60.3	10	—	60.3	0.0	8	-8.0
R-8-B1-1st	23	1	0.0	47.9	66	47.9	10	—	47.9	0.0	8	-8.0
R-8-B1-2nd	24	1	0.0	53.0	66	53.0	10	—	53.0	0.0	8	-8.0
R-8-B1-3rd	25	1	0.0	55.3	66	55.3	10	—	55.3	0.0	8	-8.0
R-9-B2-1st	27	1	0.0	54.4	66	54.4	10	—	54.4	0.0	8	-8.0
R-9-B2-2nd	28	1	0.0	59.1	66	59.1	10	—	59.1	0.0	8	-8.0
R-9-B2-3rd	29	1	0.0	60.6	66	60.6	10	—	60.6	0.0	8	-8.0
R-10-B2-1st	30	1	0.0	50.9	66	50.9	10	—	50.9	0.0	8	-8.0
R-10-B2-2nd	31	1	0.0	56.4	66	56.4	10	—	56.4	0.0	8	-8.0
R-10-B2-3rd	32	1	0.0	57.9	66	57.9	10	—	57.9	0.0	8	-8.0
R-11-B2-1st	33	1	0.0	51.4	66	51.4	10	—	51.4	0.0	8	-8.0
R-11-B2-2nd	34	1	0.0	56.4	66	56.4	10	—	56.4	0.0	8	-8.0

FHWA TNM 2.5 - [Sound Levels : TNM_Build Final:2]

File Edit View Setup Input Calculate Barrier Analysis Parallel Barriers Contours Tables Window Help

R-11-B2-3rd	35	1	0.0	58.1	66	58.1	10	—	58.1	0.0	8	-8.0
R-12-B2-1st	36	1	0.0	49.1	66	49.1	10	—	49.1	0.0	8	-8.0
R-12-B2-2nd	37	1	0.0	53.9	66	53.9	10	—	53.9	0.0	8	-8.0
R-12-B2-3rd	38	1	0.0	56.2	66	56.2	10	—	56.2	0.0	8	-8.0
R-13-B3-1st	39	1	0.0	59.2	66	59.2	10	—	59.2	0.0	8	-8.0
R-13-B3-2nd	40	1	0.0	62.9	66	62.9	10	—	62.9	0.0	8	-8.0
R-13-B3-3rd	41	1	0.0	64.3	66	64.3	10	—	64.3	0.0	8	-8.0
R-14-B3-1st	42	1	0.0	55.6	66	55.6	10	—	55.6	0.0	8	-8.0
R-14-B3-2nd	43	1	0.0	60.3	66	60.3	10	—	60.3	0.0	8	-8.0
R-14-B3-3rd	44	1	0.0	62.0	66	62.0	10	—	62.0	0.0	8	-8.0
R-15-B3-1st	45	1	0.0	56.5	66	56.5	10	—	56.5	0.0	8	-8.0
R-15-B3-2nd	46	1	0.0	60.5	66	60.5	10	—	60.5	0.0	8	-8.0
R-15-B3-3rd	47	1	0.0	62.3	66	62.3	10	—	62.3	0.0	8	-8.0
R-16-B3-1st	48	1	0.0	53.9	66	53.9	10	—	53.9	0.0	8	-8.0
R-16-B3-2nd	49	1	0.0	58.3	66	58.3	10	—	58.3	0.0	8	-8.0
R-16-B3-3rd	50	1	0.0	60.9	66	60.9	10	—	60.9	0.0	8	-8.0
R-17-B4-1st	51	1	0.0	54.6	66	54.6	10	—	54.6	0.0	8	-8.0
R-17-B4-2nd	52	1	0.0	59.4	66	59.4	10	—	59.4	0.0	8	-8.0
R-17-B4-3rd	53	1	0.0	61.0	66	61.0	10	—	61.0	0.0	8	-8.0
R-18-B4-1st	54	1	0.0	55.6	66	55.6	10	—	55.6	0.0	8	-8.0
R-18-B4-2nd	55	1	0.0	59.9	66	59.9	10	—	59.9	0.0	8	-8.0
R-18-B4-3rd	56	1	0.0	62.0	66	62.0	10	—	62.0	0.0	8	-8.0
R-19-B4-1st	57	1	0.0	55.4	66	55.4	10	—	55.4	0.0	8	-8.0
R-19-B4-2nd	58	1	0.0	59.6	66	59.6	10	—	59.6	0.0	8	-8.0
R-19-B4-3rd	59	1	0.0	61.8	66	61.8	10	—	61.8	0.0	8	-8.0
R-20-B4-1st	60	1	0.0	55.9	66	55.9	10	—	55.9	0.0	8	-8.0
R-20-B4-2nd	61	1	0.0	60.0	66	60.0	10	—	60.0	0.0	8	-8.0
R-20-B4-3rd	62	1	0.0	62.4	66	62.4	10	—	62.4	0.0	8	-8.0
R-21-B5-1st	63	1	0.0	49.8	66	49.8	10	—	49.8	0.0	8	-8.0
R-21-B5-2nd	64	1	0.0	53.9	66	53.9	10	—	53.9	0.0	8	-8.0
R-21-B5-3rd	65	1	0.0	56.0	66	56.0	10	—	56.0	0.0	8	-8.0
R-22-B5-1st	66	1	0.0	50.5	66	50.5	10	—	50.5	0.0	8	-8.0
R-22-B5-2nd	67	1	0.0	54.4	66	54.4	10	—	54.4	0.0	8	-8.0
R-22-B5-3rd	68	1	0.0	56.7	66	56.7	10	—	56.7	0.0	8	-8.0
R-23-B5-1st	69	1	0.0	50.3	66	50.3	10	—	50.3	0.0	8	-8.0
R-23-B5-2nd	70	1	0.0	54.1	66	54.1	10	—	54.1	0.0	8	-8.0
R-23-B5-3rd	71	1	0.0	56.1	66	56.1	10	—	56.1	0.0	8	-8.0
R-24-B5-1st	72	1	0.0	50.8	66	50.8	10	—	50.8	0.0	8	-8.0
R-24-B5-2nd	73	1	0.0	54.3	66	54.3	10	—	54.3	0.0	8	-8.0
R-24-B5-3rd	74	1	0.0	56.7	66	56.7	10	—	56.7	0.0	8	-8.0
R-25-B6-1st	86	1	0.0	49.3	66	49.3	10	—	49.3	0.0	8	-8.0
R-25-B6-2nd	87	1	0.0	53.1	66	53.1	10	—	53.1	0.0	8	-8.0
R-25-B6-3rd	88	1	0.0	55.2	66	55.2	10	—	55.2	0.0	8	-8.0
R-26-B6-1st	89	1	0.0	50.1	66	50.1	10	—	50.1	0.0	8	-8.0
R-26-B6-2nd	90	1	0.0	53.5	66	53.5	10	—	53.5	0.0	8	-8.0
R-26-B6-3rd	91	1	0.0	55.8	66	55.8	10	—	55.8	0.0	8	-8.0
R-27-B6-1st	92	1	0.0	49.4	66	49.4	10	—	49.4	0.0	8	-8.0
R-27-B6-2nd	93	1	0.0	52.8	66	52.8	10	—	52.8	0.0	8	-8.0
R-27-B6-3rd	94	1	0.0	55.4	66	55.4	10	—	55.4	0.0	8	-8.0
R-28-B6-1st	95	1	0.0	50.7	66	50.7	10	—	50.7	0.0	8	-8.0
R-28-B6-2nd	96	1	0.0	53.5	66	53.5	10	—	53.5	0.0	8	-8.0
R-28-B6-3rd	97	1	0.0	56.2	66	56.2	10	—	56.2	0.0	8	-8.0