Appendix C

Energy Calculations

Construction Source Noise Prediction Model

Receptor	Distance to Nearest Receptor in feet	Combined Predicted Noise Level (L_{eq} dBA)
Single-family residence to the south	930	52.4

Equipment	Reference Noise Levels (L_{max}) at 50 feet[1]	Usage Factor[1]
Dozer	85	0.4
Excavator	85	0.4
Grader	85	0.4

Ground Type	soft
Source Height	8
Receiver Height	5
Ground Factor[2]	0.63

Predicted Noise Level [3]	L_{eq} dBA at 50 feet[3]
Dozer	81.0
Excavator	81.0
Grader	81.0

Combined Predicted Noise Level (L_{eq} dBA at 50 feet)
85.8

Equipment Description	Acoustical Usage Factor (%)	Spec 721.560 Lmax @ 50ft (dBA slow)	Actual Measured Lmax @ 50ft (dBA slow)	No. of Actual Data Samples (count)	Spec 721.560 LmaxCalc	Spec 721.560 Leq	Distance	Actual Measured LmaxCalc	Actual Measured Leq
Auger Drill Rig	20	85	84	36	79.0	72.0	100	78.0	71.0
Backhoe	40	80	78	372	74.0	70.0	100	72.0	68.0
Bar Bender	20	80	na	0	74.0	67.0	100		
Blasting	na	94	na	0	88.0		100		
Boring Jack Power Unit	50	80	83	1	74.0	71.0	100	77.0	74.0
Chain Saw	20	85	84	46	79.0	72.0	100	78.0	71.0
Clam Shovel (dropping)	20	93	87	4	87.0	80.0	100	81.0	74.0
Compactor (ground)	20	80	83	57	74.0	67.0	100	77.0	70.0
Compressor (air)	40	80	78	18	74.0	70.0	100	72.0	68.0
Concrete Batch Plant	15	83	na	0	77.0	68.7	100		
Concrete Mixer Truck	40	85	79	40	79.0	75.0	100	73.0	69.0
Concrete Pump Truck	20	82	81	30	76.0	69.0	100	75.0	68.0
Concrete Saw	20	90	90	55	84.0	77.0	100	84.0	77.0
Crane	16	85	81	405	79.0	71.0	100	75.0	67.0
Dozer	40	85	82	55	79.0	75.0	100	76.0	72.0
Drill Rig Truck	20	84	79	22	78.0	71.0	100	73.0	66.0
Drum Mixer	50	80	80	1	74.0	71.0	100	74.0	71.0
Dump Truck	40	84	76	31	78.0	74.0	100	70.0	66.0
Excavator	40	85	81	170	79.0	75.0	100	75.0	71.0
Flat Bed Truck	40	84	74	4	78.0	74.0	100	68.0	64.0
Front End Loader	40	80	79	96	74.0	70.0	100	73.0	69.0
Generator	50	82	81	19	76.0	73.0	100	75.0	72.0
Generator (<25KVA, VMS s	50	70	73	74	64.0	61.0	100	67.0	64.0
Gradall	40	85	83	70	79.0	75.0	100	77.0	73.0
Grader	40	85	na	0	79.0	75.0	100		
Grapple (on Backhoe)	40	85	87	1	79.0	75.0	100	81.0	77.0
Horizontal Boring Hydr. Jac	25	80	82	6	74.0	68.0	100	76.0	70.0
Hydra Break Ram	10	90	na	0	84.0	74.0	100		
Impact Pile Driver	20	95	101	11	89.0	82.0	100	95.0	88.0
Jackhammer	20	85	89	133	79.0	72.0	100	83.0	76.0
Man Lift	20	85	75	23	79.0	72.0	100	69.0	62.0
Mounted Impact Hammer (	20	90	90	212	84.0	77.0	100	84.0	77.0
Pavement Scarafier	20	85	90	2	79.0	72.0	100	84.0	77.0
Paver	50	85	77	9	79.0	76.0	100	71.0	68.0
Pickup Truck	40	55	75	1	49.0	45.0	100	69.0	65.0
Pneumatic Tools	50	85	85	90	79.0	76.0	100	79.0	76.0
Pumps	50	77	81	17	71.0	68.0	100	75.0	72.0
Refrigerator Unit	100	82	73	3	76.0	76.0	100	67.0	67.0
Rivit Buster/chipping gun	20	85	79	19	79.0	72.0	100	73.0	66.0
Rock Drill	20	85	81	3	79.0	72.0	100	75.0	68.0
Roller	20	85	80	16	79.0	72.0	100	74.0	67.0
Sand Blasting (Single Nozzle	20	85	96	9	79.0	72.0	100	90.0	83.0
Scraper	40	85	84	12	79.0	75.0	100	78.0	74.0
Shears (on backhoe)	40	85	96	5	79.0	75.0	100	90.0	86.0
Slurry Plant	100	78	78	1	72.0	72.0	100	72.0	72.0
Slurry Trenching Machine	50	82	80	75	76.0	73.0	100	74.0	71.0
Soil Mix Drill Rig	50	80	na	0	74.0	71.0	100		
Tractor	40	84	na	0	78.0	74.0	100		
Vacuum Excavator (Vac-tru	40	85	85	149	79.0	75.0	100	79.0	75.0
Vacuum Street Sweeper	10	80	82	19	74.0	64.0	100	76.0	66.0
Ventilation Fan	100	85	79	13	79.0	79.0	100	73.0	73.0
Vibrating Hopper	50	85	87	1	79.0	76.0	100	81.0	78.0
Vibratory Concrete Mixer	20	80	80	1	74.0	67.0	100	74.0	67.0

Equipment Description	Acoustical Usage Factor (%)	Spec 721.560 Lmax @ 50ft (dBA slow)	Actual Measured Lmax @ 50ft (dBA slow)	No. of Actual Data Samples (count)	Spec 721.560 LmaxCalc	Spec 721.560 Leq	Distance	Actual Measured LmaxCalc	Actual Measured Leq
Vibratory Pile Driver	20	95	101	44	89.0	82.0	100	95.0	88.0
Warning Horn	5	85	83	12	79.0	66.0	100	77.0	64.0
Welder / Torch	40	73	74	5	67.0	63.0	100	68.0	64.0

Source:
FHWA Roadway Construction Noise Model, January 2006. Table 9.1
U.S. Department of Transportation
CA/T Construction Spec. 721.560

Addition of Noise Levels from Multiple Sources at a Discrete Receptor

OBJECTIVE: This work sheet is designed to estiamte the combined level of noise exposure at a single discrete receptor from multiple point sources.

KEY: Orange cells are for input.

Grey cells are intermediate calculations performed by the model.

Green cells are data to present in a written analysis (output).

Receptor Name: **Houses on East Side of West Taron Drive (back yards) Close to Riparian Court During Daytime and Nighttime Hours**

STEP 1: Identify the noise sources and enter the reference noise levels (dBA and distance).
STEP 2: Select the ground type (hard or soft), and enter the source and receiver heights.
STEP 3: Select the distance to the receptor and the reduction provided by any intervening barrier.

Step 1.				Step 2.				Step 3.			
Noise Source	**Reference Noise Level**			**Attenuation Characteristics**				**Attenuated Noise Level at Receptor**			
	Reference Noise Level (dBA)	@	Reference Distance (ft)	Ground Type (soft/hard)	Source Height (ft)	Receiver Height (ft)	Ground Factor	Noise Level (dBA)	@	Distance to Receptor (ft)	Reduction Provided by Barrier, if any (dBA)
Construction Equipment 1	81.0	@	50	soft	8	5	0.63	81.0	@	50	0
Construction Equipment 2	81.0	@	50	soft	8	5	0.63	81.0	@	50	0
Construction Equipment 3	81.0	@	50	soft	8	5	0.63	81.0	@	50	0
							0.66				

Combined level of noise exposure at receptor from all noise sources (dBA): **85.8**

Notes:
1 - Computation of the attenuated noise level is based on the equation presented on pg. 176 and 177 of FTA 2018.
2 - Computation of the ground factor is based on the equation presentd in Table 4-26 on pg. 86 of FTA 2018, where the distance of the reference noise leve can be adjusted and
3 - Summation of noise levels from different stationary noise sources at the same receptor is based on the equation presented on page 201 of FTA 2018.

Sources:
Federal Transit Association (FTA). 2018 (September). Transit Noise and Vibration Impact Assessment. Washington, D.C. Available:

Sources:
Federal Transit Association (FTA). 2006 (May). Transit Noise and Vibration Impact Assessment. FTA-VA-90-1003-06. Washington, D.C. Available:

Long-Term Noise Measurement Summary

KEY: Orange cells are for input.
Grey cells are intermediate calculations performed by the model.
Green cells are data to present in a written analysis (output).

Measurement Site: Proposed site of Edgewood hotel complex
Measurement Date: 8/21/2009
Project Name: Edgewood

Computation of CNEL

Hour of Day (military time)	Sound Level Leq (dBA)	Sound Power =10*Log(dBA/10)	Period of 24-Hour Day (1=included, 0=not) Day	Evening	Night	Sound Power Breakdown by Period of Day Day	Evening	Night
0:00	45.0	31,623	0	0	1	0	0	31,623
1:00	45.0	31,623	0	0	1	0	0	31,623
2:00	45.0	31,623	0	0	1	0	0	31,623
3:00	45.0	31,623	0	0	1	0	0	31,623
4:00	45.0	31,623	0	0	1	0	0	31,623
5:00	45.0	31,623	0	0	1	0	0	31,623
6:00	85.8	377,677,624	0	0	1	0	0	377,677,624
7:00	85.8	377,677,624	1	0	0	377,677,624	0	0
8:00	85.8	377,677,624	1	0	0	377,677,624	0	0
9:00	85.8	377,677,624	1	0	0	377,677,624	0	0
10:00	85.8	377,677,624	1	0	0	377,677,624	0	0
11:00	85.8	377,677,624	1	0	0	377,677,624	0	0
12:00	85.8	377,677,624	1	0	0	377,677,624	0	0
13:00	85.8	377,677,624	1	0	0	377,677,624	0	0
14:00	85.8	377,677,624	1	0	0	377,677,624	0	0
15:00	85.8	377,677,624	1	0	0	377,677,624	0	0
16:00	85.8	377,677,624	1	0	0	377,677,624	0	0
17:00	85.8	377,677,624	1	0	0	377,677,624	0	0
18:00	45.0	31,623	1	0	0	31,623	0	0
19:00	45.0	31,623	0	1	0	0	31,623	0
20:00	45.0	31,623	0	1	0	0	31,623	0
21:00	45.0	31,623	0	1	0	0	31,623	0
22:00	45.0	31,623	0	0	1	0	0	31,623
23:00	45.0	31,623	0	0	1	0	0	31,623

	Day	Evening	Night
Sum of Sound Power during Period wo/penalty	4,154,485,482	94,868	377,930,606
Log Factor for CNEL Penalty (i.e., 10*log(x))	1	3	10
Sound Power during Period with penalty	4,154,485,482	284,605	3,779,306,058

Total Daily Sound Power, with penalties	7,934,076,144
Hours per Day	24
Average Hourly Sound Power, with penalties	330,586,506
CNEL	85.2

Ldn computation on next page.

Computation of Ldn

Period of 24-Hour Day (1=included, 0=not)		Sound Power Breakdown by Period of Day	
Day	Night	Day	Night
0	1	0	31,623
0	1	0	31,623
0	1	0	31,623
0	1	0	31,623
0	1	0	31,623
0	1	0	31,623
0	1	0	377,677,624
1	0	377,677,624	0
1	0	377,677,624	0
1	0	377,677,624	0
1	0	377,677,624	0
1	0	377,677,624	0
1	0	377,677,624	0
1	0	377,677,624	0
1	0	377,677,624	0
1	0	377,677,624	0
1	0	377,677,624	0
1	0	377,677,624	0
1	0	31,623	0
1	0	31,623	0
1	0	31,623	0
1	0	31,623	0
0	1	0	31,623
0	1	0	31,623

	Day	Night
Sum of Sound Power during Period wo/penalty	4,154,580,350	377,930,606
Log Factor for Penalty (i.e., 10*log(x))	1	10
Sound Power during Period with penalty	4,154,580,350	3,779,306,058

Total Daily Sound Power, with penalties	7,933,886,408
Hours per Day	24
Average Hourly Sound Power, with penalties	330,578,600
Ldn	85.2

Notes:

Computation of the CNEL based on 1-hour Leq measurements for each hour of a day are based on equation 2-27 on pg. 2-57 of Caltrans 2009.

Computation of the Ldn based on 1-hour Leq measurements for each hour of a day are based on equation 2-26 on pg. 2-56 of Caltrans 2009.

Log factors for the Ldn and CNEL penalties are provided in Table 2-12 on pg. 2-52 of Caltrans 2009.

Source:

California Deaprtment of Transportation (Caltrans), Divisiong of Environmental Analysis. 2009 (November). *2009 Technical Noise Supplement* . Sacramento, CA. Available: <http://www.dot.ca.gov/hq/env/noise/>. Accessed September 24, 2010.

Attenuation of Day-Night Noise Level

Noise Source	Reference Noise Level			Attenuation Characteristics				Attenuated Noise Level at Receptor			
	Reference Noise Level (dBA)	@	Reference Distance (ft)	Ground Type (soft/hard)	Source Height (ft)	Receiver Height (ft)	Ground Factor	Noise Level (dBA)	@	Distance to Receptor (ft)	Reduction Provided by Barrier, if any (dBA)
Construction Equipment Combined Ldn	85.2	@	50	soft	8	5	0.63	74.7	@	125	0
Construction Equipment Combined Ldn	85.2	@	50	soft	8	5	0.63	51.8	@	930	0

Notes:

1 - Computation of the attenuated noise level is based on the equation presented on pg. 176 and 177 of FTA 2018.

2 - Computation of the ground factor is based on the equation presentd in Table 4-26 on pg. 86 of FTA 2018, where the distance of the reference noise leve can be adjusted and

3 - Summation of noise levels from different stationary noise sources at the same receptor is based on the equation presented on page 201 of FTA 2018.

Sources:

Federal Transit Association (FTA). 2018 (September). Transit Noise and Vibration Impact Assessment. Washington, D.C. Available:

Sources:

Federal Transit Association (FTA). 2006 (May). Transit Noise and Vibration Impact Assessment. FTA-VA-90-1003-06. Washington, D.C. Available:

Long-Term Noise Measurement Summary

ASCENT ENVIRONMENTAL

KEY: Orange cells are for input.
Grey cells are intermediate calculations performed by the model.
Green cells are data to present in a written analysis (output).

Modeling Date: 11/25/2020
Project Name: GCI Cannabis Project

Computation of CNEL

Hour of Day (military time)	Sound Level Leq (dBA)	Sound Power =10*Log(dBA/10)	Period of 24-Hour Day (1=included, 0=not) Day	Evening	Night	Sound Power Breakdown by Period of Day Day	Evening	Night
0:00	52.0	158,489	0	0	1	0	0	158,489
1:00	52.0	158,489	0	0	1	0	0	158,489
2:00	52.0	158,489	0	0	1	0	0	158,489
3:00	52.0	158,489	0	0	1	0	0	158,489
4:00	52.0	158,489	0	0	1	0	0	158,489
5:00	52.0	158,489	0	0	1	0	0	158,489
6:00	52.0	158,489	0	0	1	0	0	158,489
7:00	52.0	158,489	1	0	0	158,489	0	0
8:00	52.0	158,489	1	0	0	158,489	0	0
9:00	52.0	158,489	1	0	0	158,489	0	0
10:00	52.0	158,489	1	0	0	158,489	0	0
11:00	52.0	158,489	1	0	0	158,489	0	0
12:00	52.0	158,489	1	0	0	158,489	0	0
13:00	52.0	158,489	1	0	0	158,489	0	0
14:00	52.0	158,489	1	0	0	158,489	0	0
15:00	52.0	158,489	1	0	0	158,489	0	0
16:00	52.0	158,489	1	0	0	158,489	0	0
17:00	52.0	158,489	1	0	0	158,489	0	0
18:00	52.0	158,489	1	0	0	158,489	0	0
19:00	52.0	158,489	0	1	0	0	158,489	0
20:00	52.0	158,489	0	1	0	0	158,489	0
21:00	52.0	158,489	0	1	0	0	158,489	0
22:00	52.0	158,489	0	0	1	0	0	158,489
23:00	52.0	158,489	0	0	1	0	0	158,489

	Day	Evening	Night
Sum of Sound Power during Period wo/penalty	1,901,872	475,468	1,426,404
Log Factor for CNEL Penalty (i.e., 10*log(x))	1	3	10
Sound Power during Period with penalty	1,901,872	1,426,404	14,264,039

Total Daily Sound Power, with penalties	17,592,314
Hours per Day	24
Average Hourly Sound Power, with penalties	733,013

Ldn compu-tation on next

CNEL	58.7

page.

Computation of Ldn

Period of 24-Hour Day (1=included, 0=not)		Sound Power Breakdown by Period of Day	
Day	**Night**	**Day**	**Night**
0	1	0	158,489
0	1	0	158,489
0	1	0	158,489
0	1	0	158,489
0	1	0	158,489
0	1	0	158,489
0	1	0	158,489
1	0	158,489	0
1	0	158,489	0
1	0	158,489	0
1	0	158,489	0
1	0	158,489	0
1	0	158,489	0
1	0	158,489	0
1	0	158,489	0
1	0	158,489	0
1	0	158,489	0
1	0	158,489	0
1	0	158,489	0
1	0	158,489	0
1	0	158,489	0
1	0	158,489	0
0	1	0	158,489
0	1	0	158,489

	Day	Night
Sum of Sound Power during Period wo/penalty	2,377,340	1,426,404
Log Factor for Penalty (i.e., 10*log(x))	1	10
Sound Power during Period with penalty	2,377,340	14,264,039

Total Daily Sound Power, with penalties	16,641,379
Hours per Day	24
Average Hourly Sound Power, with penalties	693,391
Ldn	58.4

Notes:

Computation of the CNEL based on 1-hour Leq measurements for each hour of a day are based on equation 2-27 on pg. 2-57 of Caltrans 2009.

Computation of the Ldn based on 1-hour Leq measurements for each hour of a day are based on equation 2-26 on pg. 2-56 of Caltrans 2009.

Log factors for the Ldn and CNEL penalties are provided in Table 2-12 on pg. 2-52 of Caltrans 2009.

Source:

California Deaprtment of Transportation (Caltrans), Divisiong of Environmental Analysis. 2009 (November). *2009 Technical Noise Supplement* . Sacramento, CA. Available: <http://www.dot.ca.gov/hq/env/noise/>. Accessed September 24, 2010.

Addition of Noise Levels from Multiple Sources at a Discrete Receptor

OBJECTIVE: This work sheet is designed to estiamte the combined level of noise exposure at a single discrete receptor from multiple point sources.

KEY: Orange cells are for input.
Grey cells are intermediate calculations performed by the model.
Green cells are data to present in a written analysis (output).

Receptor Name: Residential receptors south of the Bay Drive Drainage Ditch

STEP 1: Identify the noise sources and enter the reference noise levels (dBA and distance).
STEP 2: Select the ground type (hard or soft), and enter the source and receiver heights.
STEP 3: Select the distance to the receptor and the reduction provided by any intervening barrier.

Step 1.				Step 2.				Step 3.			
Noise Source	**Reference Noise Level**			**Attenuation Characteristics**				**Attenuated Noise Level at Receptor**			
	Reference Noise Level (dBA)	@	Reference Distance (ft)	Ground Type (soft/hard)	Source Height (ft)	Receiver Height (ft)	Ground Factor	Noise Level (dBA)	@	Distance to Receptor (ft)	Reduction Provided by Barrier, if any (dBA)
Electrical transformer	74.0	@	20	hard	8	5	0.00	34.3	@	122	24
							0.66				
							0.66				
							0.66				
							0.66				

Combined level of noise exposure at receptor from all noise sources (dBA): 34.3

Notes:

1 - Computation of the attenuated noise level is based on the equation presented on pg. 176 and 177 of FTA 2018.

2 - Computation of the ground factor is based on the equation presentd in Table 4-26 on pg. 86 of FTA 2018, where the distance of the reference noise leve can be adjusted and the usage factor is not applied (i.e., the usage factor is equal to 1).

3 - Summation of noise levels from different stationary noise sources at the same receptor is based on the equation presented on page 201 of FTA 2018.

Sources:

Federal Transit Association (FTA). 2018 (September). Transit Noise and Vibration Impact Assessment. Washington, D.C. Available: <http://www.transit.dot.gov/sites/fta.dot.gov/files/docs/research-innovation/118131/transit-noise-and-vibration-impact-assessment-manual-fta-report-no-0123_0.pdf>Accessed:

Addition of Noise Levels from Multiple Sources at a Discrete Receptor

OBJECTIVE: This work sheet is designed to estiamte the combined level of noise exposure at a single discrete receptor from multiple point sources.

KEY: Orange cells are for input.
Grey cells are intermediate calculations performed by the model.
Green cells are data to present in a written analysis (output).

Receptor Name: **Rural residential receptor**

STEP 1: Identify the noise sources and enter the reference noise levels (dBA and distance).
STEP 2: Select the ground type (hard or soft), and enter the source and receiver heights.
STEP 3: Select the distance to the receptor and the reduction provided by any intervening barrier.

Step 1.				Step 2.				Step 3.			
Noise Source	**Reference Noise Level**			**Attenuation Characteristics**				**Attenuated Noise Level at Receptor**			
	Reference Noise Level (dBA)	@	Reference Distance (ft)	Ground Type (soft/hard)	Source Height (ft)	Receiver Height (ft)	Ground Factor	Noise Level (dBA)	@	Distance to Receptor (ft)	Reduction Provided by Barrier, if any (dBA)
Electric fan	75.5	@	5	soft	8	5	0.63	49.2	@	50	0
Electric fan	75.5	@	5	soft	8	5	0.63	49.2	@	50	0
Electric fan	75.5	@	5	soft	8	5	0.63	49.2	@	50	0

Combined level of noise exposure at receptor from all noise sources (dBA): **53.9**

Notes:

1 - Computation of the attenuated noise level is based on the equation presented on pg. 176 and 177 of FTA 2018.

2 - Computation of the ground factor is based on the equation presentd in Table 4-26 on pg. 86 of FTA 2018, where the distance of the reference noise leve can be adjusted and the usage factor is not applied (i.e., the usage factor is equal to 1).

3 - Summation of noise levels from different stationary noise sources at the same receptor is based on the equation presented on page 201 of FTA 2018.

Sources:

Federal Transit Association (FTA). 2018 (September). Transit Noise and Vibration Impact Assessment. Washington, D.C. Available: <http://www.transit.dot.gov/sites/fta.dot.gov/files/docs/research-innovation/118131/transit-noise-and-vibration-impact-assessment-manual-fta-report-no-0123_0.pdf>Accessed:

Long-Term Noise Measurement Summary

KEY: Orange cells are for input.
Grey cells are intermediate calculations performed by the model.
Green cells are data to present in a written analysis (output).

Measurement Site: Proposed site of Edgewood hotel complex
Measurement Date: 8/21/2009
Project Name: Edgewood

Computation of CNEL

Hour of Day (military time)	Sound Level Leq (dBA)	Sound Power =10*Log(dBA/10)	Period of 24-Hour Day (1=included, 0=not) Day	Evening	Night	Sound Power Breakdown by Period of Day Day	Evening	Night
0:00	53.9	247,282	0	0	1	0	0	247,282
1:00	53.9	247,282	0	0	1	0	0	247,282
2:00	53.9	247,282	0	0	1	0	0	247,282
3:00	53.9	247,282	0	0	1	0	0	247,282
4:00	53.9	247,282	0	0	1	0	0	247,282
5:00	53.9	247,282	0	0	1	0	0	247,282
6:00	53.9	247,282	0	0	1	0	0	247,282
7:00	53.9	247,282	1	0	0	247,282	0	0
8:00	53.9	247,282	1	0	0	247,282	0	0
9:00	53.9	247,282	1	0	0	247,282	0	0
10:00	53.9	247,282	1	0	0	247,282	0	0
11:00	53.9	247,282	1	0	0	247,282	0	0
12:00	53.9	247,282	1	0	0	247,282	0	0
13:00	53.9	247,282	1	0	0	247,282	0	0
14:00	53.9	247,282	1	0	0	247,282	0	0
15:00	53.9	247,282	1	0	0	247,282	0	0
16:00	53.9	247,282	1	0	0	247,282	0	0
17:00	53.9	247,282	1	0	0	247,282	0	0
18:00	53.9	247,282	1	0	0	247,282	0	0
19:00	53.9	247,282	0	1	0	0	247,282	0
20:00	53.9	247,282	0	1	0	0	247,282	0
21:00	53.9	247,282	0	1	0	0	247,282	0
22:00	53.9	247,282	0	0	1	0	0	247,282
23:00	53.9	247,282	0	0	1	0	0	247,282

	Day	Evening	Night
Sum of Sound Power during Period wo/penalty	2,967,385	741,846	2,225,539
Log Factor for CNEL Penalty (i.e., 10*log(x))	1	3	10
Sound Power during Period with penalty	2,967,385	2,225,539	22,255,389

Total Daily Sound Power, with penalties	27,448,313
Hours per Day	24
Average Hourly Sound Power, with penalties	1,143,680
CNEL	60.6

Ldn computation on next page.

Computation of Ldn

Period of 24-Hour Day (1=included, 0=not)		Sound Power Breakdown by Period of Day	
Day	Night	Day	Night
0	1	0	247,282
0	1	0	247,282
0	1	0	247,282
0	1	0	247,282
0	1	0	247,282
0	1	0	247,282
0	1	0	247,282
1	0	247,282	0
1	0	247,282	0
1	0	247,282	0
1	0	247,282	0
1	0	247,282	0
1	0	247,282	0
1	0	247,282	0
1	0	247,282	0
1	0	247,282	0
1	0	247,282	0
1	0	247,282	0
1	0	247,282	0
1	0	247,282	0
1	0	247,282	0
1	0	247,282	0
0	1	0	247,282
0	1	0	247,282

	Day	Night
Sum of Sound Power during Period wo/penalty	3,709,232	2,225,539
Log Factor for Penalty (i.e., 10*log(x))	1	10
Sound Power during Period with penalty	3,709,232	22,255,389

Total Daily Sound Power, with penalties	25,964,621
Hours per Day	24
Average Hourly Sound Power, with penalties	1,081,859
Ldn	60.3

Notes:

Computation of the CNEL based on 1-hour Leq measurements for each hour of a day are based on equation 2-27 on pg. 2-57 of Caltrans 2009.

Computation of the Ldn based on 1-hour Leq measurements for each hour of a day are based on equation 2-26 on pg. 2-56 of Caltrans 2009.

Log factors for the Ldn and CNEL penalties are provided in Table 2-12 on pg. 2-52 of Caltrans 2009.

Source:

California Deaprtment of Transportation (Caltrans), Divisiong of Environmental Analysis. 2009 (November). *2009 Technical Noise Supplement* . Sacramento, CA. Available: <http://www.dot.ca.gov/hq/env/noise/>. Accessed September 24, 2010.

Attenuation of Day-Night Noise Level at Offsite Single-Family Residence

Noise Source	Reference Noise Level			Attenuation Characteristics				Attenuated Noise Level at Receptor			
	Reference Noise Level (dBA)	@	Reference Distance (ft)	Ground Type (soft/hard)	Source Height (ft)	Receiver Height (ft)	Ground Factor	Noise Level (dBA)	@	Distance to Receptor (ft)	Reduction Provided by Barrier, if any (dBA)
Fans for odor control system	60.3	@	50	soft	8	5	0.63	26.9	@	930	0

Notes:

1 - Computation of the attenuated noise level is based on the equation presented on pg. 176 and 177 of FTA 2018.

2 - Computation of the ground factor is based on the equation presentd in Table 4-26 on pg. 86 of FTA 2018, where the distance of the reference noise leve can be adjusted and

3 - Summation of noise levels from different stationary noise sources at the same receptor is based on the equation presented on page 201 of FTA 2018.

Sources:

Federal Transit Association (FTA). 2018 (September). Transit Noise and Vibration Impact Assessment. Washington, D.C. Available:

Sources:

Federal Transit Association (FTA). 2006 (May). Transit Noise and Vibration Impact Assessment. FTA-VA-90-1003-06. Washington, D.C. Available:

Traffic Noise Spreadsheet Calculator

Project: #REF!

Noise Level Descriptor: Ldn
Site Conditions: Soft
Traffic Input: ADT
Traffic K-Factor:

Segment Description and Location				Input											Output				
						Distance to Directional Centerline, (feet)[4]		Traffic Distribution Characteristics							Ldn,	Distance to Contour, (feet)[3]			
Number	Name	From	To	ADT	Speed (mph)	Near	Far	% Auto	% Medium	% Heavy	% Day	% Eve	% Night		(dBA)[5,6,7]	70 dBA	65 dBA	60 dBA	55 dBA
1	County Road 17	project site enterance	County Road 90A	5,500	55	160	160	84.6%	10.3%	5.1%	80.0%	15.0%	5.0%		60.0	34	74	159	343

Citation #	Citations	
1	Caltrans Technical Noise Supplement. 2009 (November). Table (5-11), Pg 5-60.	Caltrans Technical Noise Supplement. 2013 (September). Table (4-2), Pg 4-17.
2	Caltrans Technical Noise Supplement. 2009 (November). Equation (5-26), Pg 5-60.	Caltrans Technical Noise Supplement. 2013 (September). Equation (4-5), Pg 4-17.
3	Caltrans Technical Noise Supplement. 2009 (November). Equation (2-16), Pg 2-32.	FHWA 2004 TNM Version 2.5
4	Caltrans Technical Noise Supplement. 2009 (November). Equation (5-11), Pg 5-47, 48.	FHWA 2004 TNM Version 2.5
5	Caltrans Technical Noise Supplement. 2009 (November). Equation (2-26), Pg 2-55, 56.	Caltrans Technical Noise Supplement. 2013 (September). Equation (2-23), Pg 2-51, 52.
6	Caltrans Technical Noise Supplement. 2009 (November). Equation (2-27), Pg 2-57.	Caltrans Technical Noise Supplement. 2013 (September). Equation (2-24), Pg 2-53.
7	Caltrans Technical Noise Supplement. 2009 (November). Pg 2-53.	Caltrans Technical Noise Supplement. 2013 (September). Pg 2-57.
8	Caltrans Technical Noise Supplement. 2009 (November). Equation (5-7), Pg 5-45.	FHWA 2004 TNM Version 2.5
9	Caltrans Technical Noise Supplement. 2009 (November). Equation (5-8), Pg 5-45.	FHWA 2004 TNM Version 2.5
10	Caltrans Technical Noise Supplement. 2009 (November). Equation (5-9), Pg 5-45.	FHWA 2004 TNM Version 2.5
11	Caltrans Technical Noise Supplement. 2009 (November). Equation (5-13), Pg 5-49.	FHWA 2004 TNM Version 2.5
12	Caltrans Technical Noise Supplement. 2009 (November). Equation (5-14), Pg 5-49.	FHWA 2004 TNM Version 2.5
13	Federal Highway Administration Traffic Noise Model Technical Manual. Report No. FHWA-PD-96-010. 1998 (January). Equation (16), Pg 67	
14	Federal Highway Administration Traffic Noise Model Technical Manual. Report No. FHWA-PD-96-010. 1998 (January). Equation (20), Pg 69	
15	Federal Highway Administration Traffic Noise Model Technical Manual. Report No. FHWA-PD-96-010. 1998 (January). Equation (18), Pg 69	

References

California Department of Transportation (Caltrans). 2009 (November). Technical Noise Supplement. Available: http://www.dot.ca.gov/hq/env/noise/pub/tens_complete.pdf. Accessed August 17, 2017.

California Department of Transportation (Caltrans). 2013 (September). Technical Noise Supplement. Available: http://www.dot.ca.gov/hq/env/noise/pub/TeNS_Sept_2013A.pdf. Accessed August 17, 2017.

Federal Highway Administration. 2004. Traffic Noise Model Version 2.5. Available: https://www.fhwa.dot.gov/environment/noise/traffic_noise_model/tnm_v25/. Accessed August 17, 2017.

Distance Propagation Calculations for Stationary Sources of Ground Vibration

ASCENT ENVIRONMENTAL

KEY: Orange cells are for input.
Grey cells are intermediate calculations performed by the model.
Green cells are data to present in a written analysis (output).

STEP 1: Determine units in which to perform calculation.
— If vibration decibels (VdB), then use Table A and proceed to Steps 2A and 3A.
— If peak particle velocity (PPV), then use Table B and proceed to Steps 2B and 3B.

STEP 2A: Identify the vibration source and enter the reference vibration level (VdB) and distance.

STEP 3A: Select the distance to the receiver.

Table A. Propagation of vibration decibels (VdB) with distance

Noise Source/ID	Reference Noise Level			Attenuated Noise Level at Receptor		
	vibration level (VdB)	@	distance (ft)	vibration level (VdB)	@	distance (ft)
Large bulldozer	87	@	25	39.9	@	930

The Lv metric (VdB) is used to assess the likelihood for vibration to result in human annoyance.

STEP 2B: Identify the vibration source and enter the reference peak particle velocity (PPV) and distance.

STEP 3B: Select the distance to the receiver.

Table B. Propagation of peak particle velocity (PPV) with distance

Noise Source/ID	Reference Noise Level			Attenuated Noise Level at Receptor		
	vibration level (PPV)	@	distance (ft)	vibration level (PPV)	@	distance (ft)
Large bulldozer	0.089	@	25	0.492	@	8

The PPV metric (in/sec) is used for assessing the likelihood for the potential of structural damage.

Notes:
Computation of propagated vibration levels is based on the equations presented on pg. 185 of FTA 2018. Estimates of attenuated vibration levels do not account for reductions from intervening underground barriers or other underground structures of any type, or changes in soil type.

Sources:
Federal Transit Administration. 2018. Transit Noise and Vibration Impact Assessment. FTA Report No. 0123. Prepared by John A. Volpe National Transportation Systems Center, Cambridge, MA. Available: https://www.transit.dot.gov/sites/fta.dot.gov/files/docs/research-innovation/118131/transit-noise-and-vibration-impact-assessment-manual-fta-report-no-0123_0.pdf. Accessed April 8, 2020.