Appendix D

Noise Modeling Results

Representative Construction Equipment and Levels Site Preparation (LEQ)

Location	Distance to Nearest Receptor in feet	Combined Predicted Noise Level (L_{eq} dBA)
threshold	741	55.0
2590 Eye Street	50	84.3

Equipment	Reference Emission Noise Levels (L_{max}) at 50 feet[1]	Usage Factor[1]
Backhoe	80	0.4
Excavator	85	0.4
Dump Truck	84	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]
Backhoe	76.0
Excavator	81.0
Dump Truck	80.0

Combined Predicted Noise Level (L_{eq} dBA at 50 feet)
84.3

Sources:

[1] Obtained from the FHWA Roadway Construction Noise Model, January 2006. Table 1.

[2] Based on Figure 6-5 from the Federal Transit Noise and Vibration Impact Assessment, 2006 (pg 6-23).

[3] Based on the following from the Federal Transit Noise and Vibration Impact Assessment, 2006 (pg 12-3).

$L_{eq}(equip) = E.L.+10*\log(U.F.) - 20*\log(D/50) - 10*G*\log(D/50)$

Where: E.L. = Emission Level;

U.F.= Usage Factor;

G = Constant that accounts for topography and ground effects (FTA 2006: pg 6-23); and

D = Distance from source to receiver.

Representative Construction Equipment and Levels Site Preparation (LEQ)

Location	Distance to Nearest Receptor in feet	Combined Predicted Noise Level (L_{eq} dBA)
threshold	1,068	55.0
2590 Eye Street	50	88.2

Equipment	Reference Emission Noise Levels (L_{max}) at 50 feet[1]	Usage Factor[1]
Backhoe	80	1
Excavator	85	1
Dump Truck	84	1

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]
Backhoe	80.0
Excavator	85.0
Dump Truck	84.0

Combined Predicted Noise Level (L_{eq} dBA at 50 feet)
88.2

Sources:

[1] Obtained from the FHWA Roadway Construction Noise Model, January 2006. Table 1.

[2] Based on Figure 6-5 from the Federal Transit Noise and Vibration Impact Assessment, 2006 (pg 6-23).

[3] Based on the following from the Federal Transit Noise and Vibration Impact Assessment, 2006 (pg 12-3).

$L_{eq}(equip) = E.L.+10*\log(U.F.) - 20*\log(D/50) - 10*G*\log(D/50)$

Where: E.L. = Emission Level;

U.F.= Usage Factor;

G = Constant that accounts for topography and ground effects (FTA 2006: pg 6-23); and

D = Distance from source to receiver.

Representative Construction Equipment and Levels Grading (LEQ)

Location	Distance to Nearest Receptor in feet	Combined Predicted Noise Level (L_{eq} dBA)
threshold	852	55.0
2590 Eye Street	50	85.8

Equipment	Reference Emission Noise Levels (L_{max}) at 50 feet[1]	Usage Factor[1]
Dozer	85	0.4
Grader	85	0.4
Excavator	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
Grader	81.0
Excavator	81.0

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

Sources:

[1] Obtained from the FHWA Roadway Construction Noise Model, January 2006. Table 1.

[2] Based on Figure 6-5 from the Federal Transit Noise and Vibration Impact Assessment, 2006 (pg 6-23).

[3] Based on the following from the Federal Transit Noise and Vibration Impact Assessment, 2006 (pg 12-3).

$L_{eq}(equip) = E.L.+10*\log(U.F.) - 20*\log(D/50) - 10*G*\log(D/50)$

Where: E.L. = Emission Level;

U.F.= Usage Factor;

G = Constant that accounts for topography and ground effects (FTA 2006: pg 6-23); and

D = Distance from source to receiver.

Representative Construction Equipment and Levels Grading (LMAX)

Location	Distance to Nearest Receptor in feet	Combined Predicted Noise Level (L_{eq} dBA)
threshold	1,230	55.0
2590 Eye Street	50	89.8

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

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	85.0
Grader	85.0
Excavator	85.0

Combined Predicted Noise Level (L_{eq} dBA at 50 feet)
89.8

Sources:

[1] Obtained from the FHWA Roadway Construction Noise Model, January 2006. Table 1.

[2] Based on Figure 6-5 from the Federal Transit Noise and Vibration Impact Assessment, 2006 (pg 6-23).

[3] Based on the following from the Federal Transit Noise and Vibration Impact Assessment, 2006 (pg 12-3).

$L_{eq}(equip) = E.L.+10*\log(U.F.) - 20*\log(D/50) - 10*G*\log(D/50)$

Where: E.L. = Emission Level;

U.F.= Usage Factor;

G = Constant that accounts for topography and ground effects (FTA 2006: pg 6-23); and

D = Distance from source to receiver.

Representative Building Construction Equipment and Levels (LEQ)

Location	Distance to Nearest Receptor in feet	Combined Predicted Noise Level (L_{eq} dBA)
threshold	2,085	45.0
2590 Eye Street	50	85.5

Equipment	Reference Emission Noise Levels (L_{max}) at 50 feet[1]	Usage Factor[1]
Flat Bed Truck	84	0.4
Generator	82	0.4
Crane	85	0.16
Dump Truck	84	0.4
Front End Loader	80	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]
Flat Bed Truck	80.0
Generator	78.0
Crane	77.0
Dump Truck	80.0
Front End Loader	76.0

Combined Predicted Noise Level (L_{eq} dBA at 50 feet)
85.5

Sources:

[1] Obtained from the FHWA Roadway Construction Noise Model, January 2006. Table 1.

[2] Based on Figure 6-5 from the Federal Transit Noise and Vibration Impact Assessment, 2006 (pg 6-23).

[3] Based on the following from the Federal Transit Noise and Vibration Impact Assessment, 2006 (pg 12-3).

$L_{eq}(equip) = E.L.+10*\log(U.F.) - 20*\log(D/50) - 10*G*\log(D/50)$

Where: E.L. = Emission Level;

U.F.= Usage Factor;

G = Constant that accounts for topography and ground effects (FTA 2006: pg 6-23); and

D = Distance from source to receiver.

Representative Building Construction Equipment and Levels (LEQ)

Location	Distance to Nearest Receptor in feet	Combined Predicted Noise Level (L_{eq} dBA)
threshold	1,294	55.0
2590 Eye Street	50	90.3

Equipment	Reference Emission Noise Levels (L_{max}) at 50 feet[1]	Usage Factor[1]
Flat Bed Truck	84	1
Generator	82	1
Crane	85	1
Dump Truck	84	1
Front End Loader	80	1

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]
Flat Bed Truck	84.0
Generator	82.0
Crane	85.0
Dump Truck	84.0
Front End Loader	80.0

Combined Predicted Noise Level (L_{eq} dBA at 50 feet)
90.3

Sources:

[1] Obtained from the FHWA Roadway Construction Noise Model, January 2006. Table 1.

[2] Based on Figure 6-5 from the Federal Transit Noise and Vibration Impact Assessment, 2006 (pg 6-23).

[3] Based on the following from the Federal Transit Noise and Vibration Impact Assessment, 2006 (pg 12-3).

$L_{eq}(equip) = E.L.+10*\log(U.F.) - 20*\log(D/50) - 10*G*\log(D/50)$

Where: E.L. = Emission Level;

U.F.= Usage Factor;

G = Constant that accounts for topography and ground effects (FTA 2006: pg 6-23); and

D = Distance from source to receiver.

Representative Construction Equipment and Levels Paving (LEQ)

Location	Distance to Nearest Receptor in feet	Combined Predicted Noise Level (L_{eq} dBA)
threshold	852	55.0
2590 Eye Street	70	81.9
	150	73.2

Equipment	Reference Emission Noise Levels (L_{max}) at 50 feet[1]	Usage Factor[1]
Paver	85	0.4
Roller	85	0.4
Concrete Mixer Truck	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]
Paver	81.0
Roller	81.0
Concrete Mixer Truck	81.0

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

Sources:

[1] Obtained from the FHWA Roadway Construction Noise Model, January 2006. Table 1.

[2] Based on Figure 6-5 from the Federal Transit Noise and Vibration Impact Assessment, 2006 (pg 6-23).

[3] Based on the following from the Federal Transit Noise and Vibration Impact Assessment, 2006 (pg 12-3).

$L_{eq}(equip) = E.L.+10*\log(U.F.) - 20*\log(D/50) - 10*G*\log(D/50)$

Where: E.L. = Emission Level;

U.F.= Usage Factor;

G = Constant that accounts for topography and ground effects (FTA 2006: pg 6-23); and

D = Distance from source to receiver.

Representative Construction Equipment and Levels Paving (LEQ)

Location	Distance to Nearest Receptor in feet	Combined Predicted Noise Level (L_{eq} dBA)
threshold	1,230	55.0
2590 Eye Street	50	89.8
		#NUM!

Equipment	Reference Emission Noise Levels (L_{max}) at 50 feet[1]	Usage Factor[1]
Paver	85	1
Roller	85	1
Concrete Mixer Truck	85	1

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]
Paver	85.0
Roller	85.0
Concrete Mixer Truck	85.0

Combined Predicted Noise Level (L_{eq} dBA at 50 feet)
89.8

Sources:

[1] Obtained from the FHWA Roadway Construction Noise Model, January 2006. Table 1.

[2] Based on Figure 6-5 from the Federal Transit Noise and Vibration Impact Assessment, 2006 (pg 6-23).

[3] Based on the following from the Federal Transit Noise and Vibration Impact Assessment, 2006 (pg 12-3).

$L_{eq}(equip) = E.L.+10*\log(U.F.) - 20*\log(D/50) - 10*G*\log(D/50)$

Where: E.L. = Emission Level;

U.F.= Usage Factor;

G = Constant that accounts for topography and ground effects (FTA 2006: pg 6-23); and

D = Distance from source to receiver.

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 si	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

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
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
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

Distance Propagation Calculations for Stationary Sources of Ground Vibration

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		
2590 Eye Street	vibration level (VdB)	@	distance (ft)	vibration level (VdB)	@	distance (ft)
Vibratory Roller	94	@	25	91.6	@	30
Hoe Ram	87	@	25	84.6	@	30
Large Bulldozer	87.0	@	25	84.6	@	30
Loaded Trucks	86	@	25	83.6	@	30
Jackhammer	79.0	@	25	76.6	@	30

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		
2590 Eye Street	vibration level (PPV)	@	distance (ft)	vibration level (PPV)	@	distance (ft)
Vibratory Roller	0.210	@	25	0.160	@	30
Hoe Ram	0.089	@	25	0.068	@	30
Large Bulldozer	0.089	@	25	0.068	@	30
Loaded Trucks	0.076	@	25	0.058	@	30
Jackhammer	0.035	@	25	0.027	@	30

Notes:

Computation of propagated vibration levels is based on the equations presented on pg. 12-11 of FTA 2006. 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 Association (FTA). 2006 (May). Transit Noise and Vibration Impact Assessment. FTA-VA-90-1003-06. Washington, D.C. Available: <http://www.fta.dot.gov/documents/FTA_Noise_and_Vibration_Manual.pdf>. Accessed: September 24, 2010.

Distance Propagation Calculations for Stationary Sources of Ground Vibration

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		
2925 Saint Louis Road	vibration level (VdB)	@	distance (ft)	vibration level (VdB)	@	distance (ft)
Vibratory Roller	94	@	25	91.6	@	30

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		
2925 Saint Louis Road	vibration level (PPV)	@	distance (ft)	vibration level (PPV)	@	distance (ft)
Vibratory Roller	0.210	@	25	0.160	@	30

Notes:

Computation of propagated vibration levels is based on the equations presented on pg. 12-11 of FTA 2006. 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 Association (FTA). 2006 (May). Transit Noise and Vibration Impact Assessment. FTA-VA-90-1003-06. Washington, D.C. Available: <http://www.fta.dot.gov/documents/FTA_Noise_and_Vibration_Manual.pdf>. Accessed: September 24, 2010.

Traffic Noise Spreadsheet Calculator

Project: **CSU Humboldt**

Number	Name	Segment Description and Location From	To	Existing Conditions	Existing + Project Conditions	Δ Existing – Existing + Project	Cumulative Conditions	Cumulative +Project Conditions	Δ Cumulative – Cumulative + Project
Summary of Net Changes									
1	Spear Ave	Alliance Rd	West End Road	62.7	63.4	0.7	63.2	63.8	0.7
2	West End Road	Spear Avenue	West End Court	62.9	63.4	0.5	63.4	63.8	0.4
3	St Louis Road	West End Road	US 101 Overcrossing	62.7	63.9	1.2	63.2	64.3	1.1
4	US 101 overcrossing	St Louis Rd	LK Wood Blvd	63.1	65.8	2.6	63.6	66.0	2.4
5	LK Wood Blvd	Granite ave	Sunset Ave	66.3	67.3	1.0	66.6	67.6	1.0
6	LK Wood Blvd	Sunset Ave	Plaza Ave	67.0	67.5	0.5	67.3	67.7	0.4
7	Sunset Ave	G St	LK Wood blvd	67.3	67.7	0.4	67.7	68.1	0.4

*All modeling assumes average pavement, level roadways (less than 1.5% grade), constant traffic flow and does not account for shielding of any type or finite roadway adjustments. All levels are reported as A-weighted noise levels.

Traffic Noise Spreadsheet Calculator

Project: CSU Humboldt

Noise Level Descriptor: CNEL
Site Conditions: Hard
Traffic Input: ADT
Traffic K-Factor:

Segment Description and Location				Input										Output				
						Distance to Directional Centerline, (feet)[4]		Traffic Distribution Characteristics						CNEL,	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
Existing Conditions																		
1	Spear Ave	Alliance Rd	West End Road	3,040	45	45	55	97.5%	1.5%	1.0%	85.0%	7.5%	7.5%	62.7	9	29	92	291
2	West End Road	Spear Avenue	West End Court	3,220	45	45	55	97.5%	1.5%	1.0%	85.0%	7.5%	7.5%	62.9	10	31	97	308
3	St Louis Road	West End Road	US 101 Overcrossing	3,070	45	45	55	97.5%	1.5%	1.0%	85.0%	7.5%	7.5%	62.7	9	29	93	294
4	US 101 overcrossing	St Louis Rd	LK Wood Blvd	3,390	45	45	55	97.5%	1.5%	1.0%	85.0%	7.5%	7.5%	63.1	10	32	103	324
5	LK Wood Blvd	Granite ave	Sunset Ave	7,010	45	45	55	97.5%	1.5%	1.0%	85.0%	7.5%	7.5%	66.3	21	67	212	671
6	LK Wood Blvd	Sunset Ave	Plaza Ave	8,220	45	45	55	97.5%	1.5%	1.0%	85.0%	7.5%	7.5%	67.0	25	79	249	787
7	Sunset Ave	G St	LK Wood blvd	8,750	45	45	55	97.5%	1.5%	1.0%	85.0%	7.5%	7.5%	67.3	26	84	265	837

*All modeling assumes average pavement, level roadways (less than 1.5% grade), constant traffic flow and does not account for shielding of any type or finite roadway adjustments. All levels are reported as A-weighted noise levels.

Traffic Noise Spreadsheet Calculator

Project: CSU Humboldt

Noise Level Descriptor: CNEL
Site Conditions: Hard
Traffic Input: ADT
Traffic K-Factor:

	Segment Description and Location			Input											Output				
						Distance to Directional Centerline, (feet)[4]		Traffic Distribution Characteristics						CNEL,	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
Existing + Project Conditions																		
1	Spear Ave	Alliance Rd	West End Road	3,610	45	45	55	97.5%	1.5%	1.0%	85.0%	7.5%	7.5%	63.4	11	35	109	345
2	West End Road	Spear Avenue	West End Court	3,600	45	45	55	97.5%	1.5%	1.0%	85.0%	7.5%	7.5%	63.4	11	34	109	344
3	St Louis Road	West End Road	US 101 Overcrossing	4,020	45	45	55	97.5%	1.5%	1.0%	85.0%	7.5%	7.5%	63.9	12	38	122	385
4	US 101 overcrossing	St Louis Rd	LK Wood Blvd	6,240	45	45	55	97.5%	1.5%	1.0%	85.0%	7.5%	7.5%	65.8	19	60	189	597
5	LK Wood Blvd	Granite ave	Sunset Ave	8,910	45	45	55	97.5%	1.5%	1.0%	85.0%	7.5%	7.5%	67.3	27	85	270	853
6	LK Wood Blvd	Sunset Ave	Plaza Ave	9,170	45	45	55	97.5%	1.5%	1.0%	85.0%	7.5%	7.5%	67.5	28	88	277	877
7	Sunset Ave	G St	LK Wood blvd	9,700	45	45	55	97.5%	1.5%	1.0%	85.0%	7.5%	7.5%	67.7	29	93	294	928

*All modeling assumes average pavement, level roadways (less than 1.5% grade), constant traffic flow and does not account for shielding of any type or finite roadway adjustments. All levels are reported as A-weighted noise levels.

Traffic Noise Spreadsheet Calculator

Project: CSU Humboldt

Noise Level Descriptor: CNEL
Site Conditions: Hard
Traffic Input: ADT
Traffic K-Factor:

Number	Segment Description and Location: Name	From	To	Input: ADT	Speed (mph)	Distance to Directional Centerline, (feet)[4] Near	Far	Traffic Distribution Characteristics: % Auto	% Medium	% Heavy	% Day	% Eve	% Night	Output: CNEL, (dBA)[5,6,7]	Distance to Contour, (feet)[3] 70 dBA	65 dBA	60 dBA	55 dBA
Cumulative Conditions																		
1	Spear Ave	Alliance Rd	West End Road	3,400	45	45	55	97.5%	1.5%	1.0%	85.0%	7.5%	7.5%	63.2	10	33	103	325
2	West End Road	Spear Avenue	West End Court	3,590	45	45	55	97.5%	1.5%	1.0%	85.0%	7.5%	7.5%	63.4	11	34	109	344
3	St Louis Road	West End Road	US 101 Overcrossing	3,440	45	45	55	97.5%	1.5%	1.0%	85.0%	7.5%	7.5%	63.2	10	33	104	329
4	US 101 overcrossing	St Louis Rd	LK Wood Blvd	3,770	45	45	55	97.5%	1.5%	1.0%	85.0%	7.5%	7.5%	63.6	11	36	114	361
5	LK Wood Blvd	Granite ave	Sunset Ave	7,490	45	45	55	97.5%	1.5%	1.0%	85.0%	7.5%	7.5%	66.6	23	72	227	717
6	LK Wood Blvd	Sunset Ave	Plaza Ave	8,780	45	45	55	97.5%	1.5%	1.0%	85.0%	7.5%	7.5%	67.3	27	84	266	840
7	Sunset Ave	G St	LK Wood blvd	9,780	45	45	55	97.5%	1.5%	1.0%	85.0%	7.5%	7.5%	67.7	30	94	296	936

*All modeling assumes average pavement, level roadways (less than 1.5% grade), constant traffic flow and does not account for shielding of any type or finite roadway adjustments. All levels are reported as A-weighted noise levels.

Traffic Noise Spreadsheet Calculator

Project: CSU Humboldt

Noise Level Descriptor: CNEL
Site Conditions: Hard
Traffic Input: ADT
Traffic K-Factor:

	Segment Description and Location			Input										Output				
						Distance to Directional Centerline, (feet)[4]		Traffic Distribution Characteristics							Distance to Contour, (feet)[3]			
Number	Name	From	To	ADT	Speed (mph)	Near	Far	% Auto	% Medium	% Heavy	% Day	% Eve	% Night	CNEL, (dBA)[5,6,7]	70 dBA	65 dBA	60 dBA	55 dBA
Cumulative +Project Conditions																		
1	Spear Ave	Alliance Rd	West End Road	3,970	45	45	55	97.5%	1.5%	1.0%	85.0%	7.5%	7.5%	63.8	12	38	120	380
2	West End Road	Spear Avenue	West End Court	3,970	45	45	55	97.5%	1.5%	1.0%	85.0%	7.5%	7.5%	63.8	12	38	120	380
3	St Louis Road	West End Road	US 101 Overcrossing	4,390	45	45	55	97.5%	1.5%	1.0%	85.0%	7.5%	7.5%	64.3	13	42	133	420
4	US 101 overcrossing	St Louis Rd	LK Wood Blvd	6,620	45	45	55	97.5%	1.5%	1.0%	85.0%	7.5%	7.5%	66.0	20	63	200	633
5	LK Wood Blvd	Granite ave	Sunset Ave	9,390	45	45	55	97.5%	1.5%	1.0%	85.0%	7.5%	7.5%	67.6	28	90	284	898
6	LK Wood Blvd	Sunset Ave	Plaza Ave	9,730	45	45	55	97.5%	1.5%	1.0%	85.0%	7.5%	7.5%	67.7	29	93	294	931
7	Sunset Ave	G St	LK Wood blvd	10,730	45	45	55	97.5%	1.5%	1.0%	85.0%	7.5%	7.5%	68.1	32	103	325	1027

*All modeling assumes average pavement, level roadways (less than 1.5% grade), constant traffic flow and does not account for shielding of any type or finite roadway adjustments. All levels are reported as A-weighted noise levels.

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.

Attenuation Calculations for Stationary Noise 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).

STEP 1: Identify the noise source and enter the reference noise level (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 receiver.

Noise Source/ID	Reference Noise Level			Attenuation Characteristics				Attenuated Noise Level at Receptor			
	noise level (dBA)	@	distance (ft)	Ground Type (soft/hard)	Source Height (ft)	Receiver Height (ft)	Ground Factor	noise level (dBA)	@	distance (ft)	
HVAC LEQ	75.0	@	3	soft	8	5	0.63	44.8	@	42	
HVAC LEQ	75.0	@	3	soft	8	5	0.63	50.7	@	25	
				hard	8	5	0.00	#DIV/0!	@	50	
				hard	8	5	0.00	#DIV/0!	@	50	
				hard	8	5	0.00	#DIV/0!	@	71	
				soft	8	5	0.63	#DIV/0!	@	80	
				soft	8	5	0.63	#DIV/0!	@	80	
				soft	8	5	0.63	#DIV/0!	@	1000	
							0.66				
							0.66				
							0.66				
							0.66				
							0.66				
							0.66				

Notes:

Estimates of attenuated noise levels do not account for reductions from intervening barriers, including walls, trees, vegetation, or structures of any type.

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

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).

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: March 5, 2020.

Parking Lot Noise Calculation

KEY: Orange cells are for input.

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

Number of automobiles per hour	20
Number of buses per hour	0
Distance to sensitive receptor (feet)	50

# of spaces within 50 feet of Receptor		
	Activity %	# of autos per hour
40	50%	20

	distance	sound level
Leq @	50	**45.4**
Leq @	25	**51.4**

Source

Federal Transit Administration. 2018 (September). Transit Noise and Vibration Impact Assessment. Washington, D.C. 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 February 4, 2019. See pages 45–47, including Equation 4-14.

Existing Noise Combined with Parking Lot Noise

Hourly Leq Noise Level by Noise Source	Existing Measured Noise Levels	Parking Lot Noise Levels	Combined Hourly Leq
Hour of Day			
0:00	52.4	0.0	52.4
1:00	50.6	0.0	50.6
2:00	49.2	0.0	49.2
3:00	46.5	0.0	46.5
4:00	48.5	0.0	48.5
5:00	56.2	45.4	56.5
6:00	63.6	45.4	63.7
7:00	64.0	45.4	64.1
8:00	63.8	45.4	63.9
9:00	63.0	45.4	63.1
10:00	63.1	45.4	63.2
11:00	63.3	45.4	63.4
12:00	63.2	45.4	63.3
13:00	63.4	45.4	63.5
14:00	63.9	45.4	64.0
15:00	64.2	45.4	64.3
16:00	64.0	45.4	64.1
17:00	64.4	45.4	64.5
18:00	62.9	45.4	63.0
19:00	61.7	45.4	61.8
20:00	58.9	45.4	59.1
21:00	58.1	0.0	58.1
22:00	56.7	0.0	56.7
23:00	55.8	0.0	55.8

Notes

Parking activity is assumed to occur during summer daylight hours only (i.e., 5 AM- 9 PM)

Existing Noise level values are shown in Appendix X, Long-term Noise Measurement Summary worksheet

Parking Lot CNEL Calculation

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: North Demo Northern Terminus near Tunnel Creek Road
Measurement Date: 8/23/2011
Project Name: North Demo

Hour of Day (military time)	Sound Level Leq (dBA)	Sound Power =10*Log(dBA/10)	Computation of CNEL: Period of 24-Hour Day (1=included, 0=not) Day	Evening	Night	Sound Power Breakdown by Period of Day Day	Evening	Night
0:00	52.4	173,781	0	0	1	0	0	173,781
1:00	50.6	114,816	0	0	1	0	0	114,816
2:00	49.2	83,177	0	0	1	0	0	83,177
3:00	46.5	44,669	0	0	1	0	0	44,669
4:00	48.5	70,796	0	0	1	0	0	70,796
5:00	56.5	451,543	0	0	1	0	0	451,543
6:00	63.7	2,325,541	0	0	1	0	0	2,325,541
7:00	64.1	2,546,560	1	0	0	2,546,560	0	0
8:00	63.9	2,433,507	1	0	0	2,433,507	0	0
9:00	63.1	2,029,936	1	0	0	2,029,936	0	0
10:00	63.2	2,076,412	1	0	0	2,076,412	0	0
11:00	63.4	2,172,636	1	0	0	2,172,636	0	0
12:00	63.3	2,123,970	1	0	0	2,123,970	0	0
13:00	63.5	2,222,435	1	0	0	2,222,435	0	0
14:00	64.0	2,489,383	1	0	0	2,489,383	0	0
15:00	64.3	2,664,942	1	0	0	2,664,942	0	0
16:00	64.1	2,546,560	1	0	0	2,546,560	0	0
17:00	64.5	2,788,902	1	0	0	2,788,902	0	0
18:00	63.0	1,984,518	1	0	0	1,984,518	0	0
19:00	61.8	1,513,782	0	1	0	0	1,513,782	0
20:00	59.1	810,921	0	1	0	0	810,921	0
21:00	58.1	645,655	0	1	0	0	645,655	0
22:00	56.7	467,736	0	0	1	0	0	467,736
23:00	55.8	380,190	0	0	1	0	0	380,190

Sum of Sound Power during Period wo/penalty	28,079,760	2,970,358	4,112,251
Log Factor for CNEL Penalty (i.e., 10*log(x))	1	3	10
Sound Power during Period with penalty	28,079,760	8,911,074	41,122,507

Total Daily Sound Power, with penalties	78,113,342
Hours per Day	24
Average Hourly Sound Power, with penalties	3,254,723
CNEL	65.1

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	173,781
0	1	0	114,816
0	1	0	83,177
0	1	0	44,669
0	1	0	70,796
0	1	0	451,543
0	1	0	2,325,541
1	0	2,546,560	0
1	0	2,433,507	0
1	0	2,029,936	0
1	0	2,076,412	0
1	0	2,172,636	0
1	0	2,123,970	0
1	0	2,222,435	0
1	0	2,489,383	0
1	0	2,664,942	0
1	0	2,546,560	0
1	0	2,788,902	0
1	0	1,984,518	0
1	0	1,513,782	0
1	0	810,921	0
1	0	645,655	0
0	1	0	467,736
0	1	0	380,190

Sum of Sound Power during Period wo/penalty	31,050,118	4,112,251
Log Factor for Penalty (i.e., 10*log(x))	1	10
Sound Power during Period with penalty	31,050,118	41,122,507

Total Daily Sound Power, with penalties	72,172,625
Hours per Day	24
Average Hourly Sound Power, with penalties	3,007,193
Ldn	64.8

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.