Appendix G

Noise Worksheets

Traffic Noise Spreadsheet Calculator

Project: New Zoo at Elk Grove

Noise Level Descriptor: Ldn
Site Conditions: Hard
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]	75 dBA	70 dBA	65 dBA	60 dBA
Existing Conditions																		
	Weekday																	
1	Lotz Parkway	N of Classical Way		1,057	35	35	35	97.0%	2.0%	1.0%	80.0%	15.0%	5.0%	55.6		1	4	13
2	Kammerer Road	W of Lotz Parkway		10,685	50	50	50	97.0%	2.0%	1.0%	80.0%	15.0%	5.0%	68.5	11	35	112	354
3	Kammerer Road	Lotz Parkway	Lent Ranch Parkway	11,026	50	50	50	97.0%	2.0%	1.0%	80.0%	15.0%	5.0%	68.6	12	37	116	365
4	Kammerer Road	Lent Ranch Parkway	Promenade Parkway	10,952	50	50	50	97.0%	2.0%	1.0%	80.0%	15.0%	5.0%	68.6		36	115	363
5	Kammerer Road	Promenade Parkway	SR 99 SB Ramps	28,349	50	50	50	97.0%	2.0%	1.0%	80.0%	15.0%	5.0%	72.7		94	297	940
6	**Weekend**																	
1	Lotz Parkway	N of Classical Way		1,018	35	35	35	97.0%	2.0%	1.0%	80.0%	15.0%	5.0%	55.5			4	12
2	Kammerer Road	W of Lotz Parkway		10,295	50	50	50	97.0%	2.0%	1.0%	80.0%	15.0%	5.0%	68.3	11	34	108	341
3	Kammerer Road	Lotz Parkway	Lent Ranch Parkway	10,624	50	50	50	97.0%	2.0%	1.0%	80.0%	15.0%	5.0%	68.5	11	35	111	352
4	Kammerer Road	Lent Ranch Parkway	Promenade Parkway	10,553	50	50	50	97.0%	2.0%	1.0%	80.0%	15.0%	5.0%	68.4	11	35	111	350
5	Kammerer Road	Promenade Parkway	SR 99 SB Ramps	27,315	50	50	50	97.0%	2.0%	1.0%	80.0%	15.0%	5.0%	72.6	29	91	286	905

*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: New Zoo at Elk Grove

Noise Level Descriptor: Ldn
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	Ldn, (dBA)[5,6,7]	75 dBA	70 dBA	65 dBA	60 dBA
Opening Year 2028																		
	Weekday																	
1	Lotz Parkway	N of Classical Way		5,568	35	35	35	97.0%	2.0%	1.0%	80.0%	15.0%	5.0%	62.8	2	7	21	67
2	Kammerer Road	W of Lotz Parkway		18,109	50	50	50	97.0%	2.0%	1.0%	80.0%	15.0%	5.0%	70.8	19	60	190	600
3	Kammerer Road	Lotz Parkway	Lent Ranch Parkway	18,795	50	50	50	97.0%	2.0%	1.0%	80.0%	15.0%	5.0%	71.0	20	62	197	623
4	Kammerer Road	Lent Ranch Parkway	Promenade Parkway	20,741	50	50	50	97.0%	2.0%	1.0%	80.0%	15.0%	5.0%	71.4		69	217	687
5	Kammerer Road	Promenade Parkway	SR 99 SB Ramps	40,906	50	50	50	97.0%	2.0%	1.0%	80.0%	15.0%	5.0%	74.3		136	429	1356
	Weekend																	
1	Lotz Parkway	N of Classical Way		5,365	35	35	35	97.0%	2.0%	1.0%	80.0%	15.0%	5.0%	62.7	2		21	65
2	Kammerer Road	W of Lotz Parkway		17,448	50	50	50	97.0%	2.0%	1.0%	80.0%	15.0%	5.0%	70.6	18	58	183	578
3	Kammerer Road	Lotz Parkway	Lent Ranch Parkway	18,110	50	50	50	97.0%	2.0%	1.0%	80.0%	15.0%	5.0%	70.8	19	60	190	600
4	Kammerer Road	Lent Ranch Parkway	Promenade Parkway	19,985	50	50	50	97.0%	2.0%	1.0%	80.0%	15.0%	5.0%	71.2	21	66	209	662
5	Kammerer Road	Promenade Parkway	SR 99 SB Ramps	39,414	50	50	50	97.0%	2.0%	1.0%	80.0%	15.0%	5.0%	74.2	41	131	413	1306

*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: New Zoo at Elk Grove

Noise Level Descriptor: Ldn
Site Conditions: Hard
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
Existing + Project Conditions																		
1	Lotz Parkway	N of Classical Way		5,728	35	35	35	97.0%	2.0%	1.0%	80.0%	15.0%	5.0%	63.0	7	22	69	219
2	Kammerer Road	W of Lotz Parkway		18,109	50	50	50	97.0%	2.0%	1.0%	80.0%	15.0%	5.0%	70.8	60	190	600	1898
3	Kammerer Road	Lotz Parkway	Lent Ranch Parkway	19,865	50	50	50	97.0%	2.0%	1.0%	80.0%	15.0%	5.0%	71.2	66	208	658	2082
4	Kammerer Road	Lent Ranch Parkway	Promenade Parkway	21,811	50	50	50	97.0%	2.0%	1.0%	80.0%	15.0%	5.0%	71.6	72	229	723	2286
5	Kammerer Road	Promenade Parkway	SR 99 SB Ramps	41,976	50	50	50	97.0%	2.0%	1.0%	80.0%	15.0%	5.0%	74.4	139	440	1391	4399
	Weekend																	
1	Lotz Parkway	N of Classical Way		5,794	35	35	35	97.0%	2.0%	1.0%	80.0%	15.0%	5.0%	63.0	7	22	70	221
2	Kammerer Road	W of Lotz Parkway		17,448	50	50	50	97.0%	2.0%	1.0%	80.0%	15.0%	5.0%	70.6	58	183	578	1829
3	Kammerer Road	Lotz Parkway	Lent Ranch Parkway	21,597	50	50	50	97.0%	2.0%	1.0%	80.0%	15.0%	5.0%	71.6	72	226	716	2263
4	Kammerer Road	Lent Ranch Parkway	Promenade Parkway	23,472	50	50	50	97.0%	2.0%	1.0%	80.0%	15.0%	5.0%	71.9	78	246	778	2460
5	Kammerer Road	Promenade Parkway	SR 99 SB Ramps	42,901	50	50	50	97.0%	2.0%	1.0%	80.0%	15.0%	5.0%	74.5	142	450	1422	4496

*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: New Zoo at Elk Grove

Noise Level Descriptor: Ldn
Site Conditions: Hard
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
Cumulative 2050																		
1	Lotz Parkway	N of Classical Way		30,678	35	35	35	97.0%	2.0%	1.0%	80.0%	15.0%	5.0%	70.2	37	117	371	1172
2	Kammerer Road	W of Lotz Parkway		54,205	50	50	50	97.0%	2.0%	1.0%	80.0%	15.0%	5.0%	75.6	180	568	1796	5681
3	Kammerer Road	Lotz Parkway	Lent Ranch Parkway	57,452	50	50	50	97.0%	2.0%	1.0%	80.0%	15.0%	5.0%	75.8	190	602	1904	6021
4	Kammerer Road	Lent Ranch Parkway	Promenade Parkway	71,085	50	50	50	97.0%	2.0%	1.0%	80.0%	15.0%	5.0%	76.7	236	745	2356	7450
5	Kammerer Road	Promenade Parkway	SR 99 SB Ramps	94,206	50	50	50	97.0%	2.0%	1.0%	80.0%	15.0%	5.0%	78.0	312	987	3122	9873
	Weekend																	
1	Lotz Parkway	N of Classical Way		29,559	35	35	35	97.0%	2.0%	1.0%	80.0%	15.0%	5.0%	70.1	36	113	357	1130
2	Kammerer Road	W of Lotz Parkway		52,228	50	50	50	97.0%	2.0%	1.0%	80.0%	15.0%	5.0%	75.4	173	547	1731	5474
3	Kammerer Road	Lotz Parkway	Lent Ranch Parkway	55,357	50	50	50	97.0%	2.0%	1.0%	80.0%	15.0%	5.0%	75.6	183	580	1835	5802
4	Kammerer Road	Lent Ranch Parkway	Promenade Parkway	68,493	50	50	50	97.0%	2.0%	1.0%	80.0%	15.0%	5.0%	76.6	227	718	2270	7178
5	Kammerer Road	Promenade Parkway	SR 99 SB Ramps	90,770	50	50	50	97.0%	2.0%	1.0%	80.0%	15.0%	5.0%	77.8	301	951	3008	9513

*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: New Zoo at Elk Grove

Noise Level Descriptor: Ldn
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	Ldn, (dBA)[5,6,7]	75 dBA	70 dBA	65 dBA	60 dBA
Cumulative + Project																		
	Weekday																	
1	Lotz Parkway	N of Classical Way		30,898	35	35	35	97.0%	2.0%	1.0%	80.0%	15.0%	5.0%	70.3	12	37	118	373
2	Kammerer Road	W of Lotz Parkway		54,205	50	50	50	97.0%	2.0%	1.0%	80.0%	15.0%	5.0%	75.6	57	180	568	1796
3	Kammerer Road	Lotz Parkway	Lent Ranch Parkway	58,425	50	50	50	97.0%	2.0%	1.0%	80.0%	15.0%	5.0%	75.9	61	194	612	1936
4	Kammerer Road	Lent Ranch Parkway	Promenade Parkway	72,058	50	50	50	97.0%	2.0%	1.0%	80.0%	15.0%	5.0%	76.8		239	755	2388
5	Kammerer Road	Promenade Parkway	SR 99 SB Ramps	95,179	50	50	50	97.0%	2.0%	1.0%	80.0%	15.0%	5.0%	78.0		315	997	3154
	Weekend																	
1	Lotz Parkway	N of Classical Way		30,215	35	35	35	97.0%	2.0%	1.0%	80.0%	15.0%	5.0%	70.2	12		115	365
2	Kammerer Road	W of Lotz Parkway		52,228	50	50	50	97.0%	2.0%	1.0%	80.0%	15.0%	5.0%	75.4	55	173	547	1731
3	Kammerer Road	Lotz Parkway	Lent Ranch Parkway	58,367	50	50	50	97.0%	2.0%	1.0%	80.0%	15.0%	5.0%	75.9	61	193	612	1934
4	Kammerer Road	Lent Ranch Parkway	Promenade Parkway	71,503	50	50	50	97.0%	2.0%	1.0%	80.0%	15.0%	5.0%	76.8	75	237	749	2370
5	Kammerer Road	Promenade Parkway	SR 99 SB Ramps	93,780	50	50	50	97.0%	2.0%	1.0%	80.0%	15.0%	5.0%	77.9	98	311	983	3108

*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.

Demo - Phase 31

Location	Distance to Nearest Receptor in feet	Combined Predicted Noise Level (L_{eq} dBA)
Threshold	52	90.0
Residence	150	80.8

Equipment	Reference Emission Noise Levels (L_{max}) at 50 feet[1]	Usage Factor[1]
Excavator	80	1
Dozer	85	1
Dozer	85	1
Concrete Saw	76	1
Excavator	85	1
Excavator	85	1

Ground Type	hard
Source Height	8
Receiver Height	5
Ground Factor[2]	0.00

Predicted Noise Level [3]	L_{eq} dBA at 50 feet[3]
Excavator	80.0
Dozer	85.0
Dozer	85.0
Concrete Saw	76.0
Excavator	85.0
Excavator	85.0

Combined Predicted Noise Level (L_{eq} dBA at 50 feet)
90.4

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.

Demo - Phase 1

Location	Distance to Nearest Receptor in feet	Combined Predicted Noise Level (L_{eq} dBA)
Threshold	595	65.0
Residence 1	150	77.0

Equipment	Reference Emission Noise Levels (L_{max}) at 50 feet[1]	Usage Factor[1]
Excavator	80	0.4
Dozer	85	0.4
Dozer	85	0.4
Concrete Saw	76	0.7
Excavator	85	0.4
Excavator	85	0.4

Ground Type	hard
Source Height	8
Receiver Height	5
Ground Factor[2]	0.00

Predicted Noise Level [3]	L_{eq} dBA at 50 feet[3]
Excavator	76.0
Dozer	81.0
Dozer	81.0
Concrete Saw	74.5
Excavator	81.0
Excavator	81.0

Combined Predicted Noise Level (L_{eq} dBA at 50 feet)
86.5

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.

Arch Coating - Phase 1

Location	Distance to Nearest Receptor in feet	Combined Predicted Noise Level (L_{eq} dBA)
Threshold	16	90.0
Residence	150	70.5

Equipment	Reference Emission Noise Levels (L_{max}) at 50 feet[1]	Usage Factor[1]
Compressor (air)	80	1

Ground Type	hard
Source Height	8
Receiver Height	5
Ground Factor[2]	0.00

Predicted Noise Level [3]	L_{eq} dBA at 50 feet[3]
Compressor (air)	80.0

Combined Predicted Noise Level (L_{eq} dBA at 50 feet)
80.0

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.

Arch Coating - Phase 1

Location	Distance to Nearest Receptor in feet	Combined Predicted Noise Level (L_{eq} dBA)
Threshold	199	65.0
Residence 1	150	67.4

Equipment	Reference Emission Noise Levels (L_{max}) at 50 feet[1]	Usage Factor[1]
Compressor (air)	80	0.5

Ground Type	hard
Source Height	8
Receiver Height	5
Ground Factor[2]	0.00

Predicted Noise Level [3]	L_{eq} dBA at 50 feet[3]
Compressor (air)	77.0

Combined Predicted Noise Level (L_{eq} dBA at 50 feet)
77.0

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.

Paving - Phase 1

Location	Distance to Nearest Receptor in feet	Combined Predicted Noise Level (L_{eq} dBA)
Threshold	63	90.0
Residence	150	82.4

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

Ground Type	hard
Source Height	8
Receiver Height	5
Ground Factor[2]	0.00

Predicted Noise Level [3]	L_{eq} dBA at 50 feet[3]
Paver	85.0
Paver	85.0
Paver	85.0
Paver	85.0
Roller	85.0
Roller	85.0

Combined Predicted Noise Level (L_{eq} dBA at 50 feet)
92.0

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.

Paving - Phase 1

Location	Distance to Nearest Receptor in feet	Combined Predicted Noise Level (L_{eq} dBA)
Threshold	707	65.0
Residence 1	150	78.5

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

Ground Type	hard
Source Height	8
Receiver Height	5
Ground Factor[2]	0.00

Predicted Noise Level [3]	L_{eq} dBA at 50 feet[3]
Paver	81.0
Paver	81.0
Paver	81.0
Paver	81.0
Roller	81.0
Roller	81.0

Combined Predicted Noise Level (L_{eq} dBA at 50 feet)
88.0

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.

Building Construciton - Phase 1

Location	Distance to Nearest Receptor in feet	Combined Predicted Noise Level (L_{eq} dBA)
Threshold	34	90.0
Residence	150	77.1

Equipment	Reference Emission Noise Levels (L_{max}) at 50 feet[1]	Usage Factor[1]
Man Lift	75	1
Man Lift	75	1
Crane	83	1
Backhoe	80	1
Backhoe	80	1
Backhoe	80	1
Man Lift	75	1
Generator	82	1
Welder / Torch	74	1

Ground Type	hard
Source Height	8
Receiver Height	5
Ground Factor[2]	0.00

Predicted Noise Level [3]	L_{eq} dBA at 50 feet[3]
Man Lift	75.0
Man Lift	75.0
Crane	83.0
Backhoe	80.0
Backhoe	80.0
Backhoe	80.0
Man Lift	75.0
Generator	82.0
Welder / Torch	74.0

Combined Predicted Noise Level (L_{eq} dBA at 50 feet)
86.7

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.

Building Construction - Phase 1

Location	Distance to Nearest Receptor in feet	Combined Predicted Noise Level (L_{eq} dBA)
Threshold	347	65.0
Residence 1	150	72.3

Equipment	Reference Emission Noise Levels (L_{max}) at 50 feet[1]	Usage Factor[1]
Man Lift	75	0.2
Man Lift	75	0.2
Crane	83	0.3
Backhoe	80	0.4
Backhoe	80	0.4
Backhoe	80	0.4
Man Lift	75	0.2
Generator	82	0.5
Welder / Torch	74	0.4

Ground Type	hard
Source Height	8
Receiver Height	5
Ground Factor[2]	0.00

Predicted Noise Level [3]	L_{eq} dBA at 50 feet[3]
Man Lift	68.0
Man Lift	68.0
Crane	77.8
Backhoe	76.0
Backhoe	76.0
Backhoe	76.0
Man Lift	68.0
Generator	79.0
Welder / Torch	70.0

Combined Predicted Noise Level (L_{eq} dBA at 50 feet)
81.8

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.

Grading - Phase 1

Location	Distance to Nearest Receptor in feet	Combined Predicted Noise Level (L_{eq} dBA)
Threshold	54	90.0
Residence	150	81.1

Equipment	Reference Emission Noise Levels (L_{max}) at 50 feet[1]	Usage Factor[1]
Grader	85	1
Backhoe	80	1
Backhoe	80	1
Excavator	85	1
Excavator	85	1
Scraper	85	1
Scraper	85	1
Dozer	85	1

Ground Type	hard
Source Height	8
Receiver Height	5
Ground Factor[2]	0.00

Predicted Noise Level [3]	L_{eq} dBA at 50 feet[3]
Grader	85.0
Backhoe	80.0
Backhoe	80.0
Excavator	85.0
Excavator	85.0
Scraper	85.0
Scraper	85.0
Dozer	85.0

Combined Predicted Noise Level (L_{eq} dBA at 50 feet)
90.6

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.

Grading - Phase 1

Location	Distance to Nearest Receptor in feet	Combined Predicted Noise Level (L_{eq} dBA)
Threshold	603	65.0
Residence 1	150	77.1

Equipment	Reference Emission Noise Levels (L_{max}) at 50 feet[1]	Usage Factor[1]
Grader	85	0.4
Backhoe	80	0.4
Backhoe	80	0.4
Excavator	85	0.4
Excavator	85	0.4
Scraper	85	0.4
Scraper	85	0.4
Dozer	85	0.4

Ground Type	hard
Source Height	8
Receiver Height	5
Ground Factor[2]	0.00

Predicted Noise Level [3]	L_{eq} dBA at 50 feet[3]
Grader	81.0
Backhoe	76.0
Backhoe	76.0
Excavator	81.0
Excavator	81.0
Scraper	81.0
Scraper	81.0
Dozer	81.0

Combined Predicted Noise Level (L_{eq} dBA at 50 feet)
86.6

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.

Site Prep - Phase 1

Location	Distance to Nearest Receptor in feet	Combined Predicted Noise Level (L_{eq} dBA)
Threshold	476	65.0
Residence 1	150	75.0

Equipment	Reference Emission Noise Levels (L_{max}) at 50 feet[1]	Usage Factor[1]
Backhoe	80	0.4
Backhoe	80	0.4
Backhoe	80	0.4
Backhoe	80	0.4
Dozer	85	0.4
Dozer	85	0.4
Dozer	85	0.4

Ground Type	hard
Source Height	8
Receiver Height	5
Ground Factor[2]	0.00

Predicted Noise Level [3]	L_{eq} dBA at 50 feet[3]
Backhoe	76.0
Backhoe	76.0
Backhoe	76.0
Backhoe	76.0
Dozer	81.0
Dozer	81.0
Dozer	81.0

Combined Predicted Noise Level (L_{eq} dBA at 50 feet)
84.6

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.

Site Prep - Phase 1

Location	Distance to Nearest Receptor in feet	Combined Predicted Noise Level (L_{eq} dBA)
Threshold	42	90.0
Residence	150	79.0

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

Ground Type	hard
Source Height	8
Receiver Height	5
Ground Factor[2]	0.00

Predicted Noise Level [3]	L_{eq} dBA at 50 feet[3]
Backhoe	80.0
Backhoe	80.0
Backhoe	80.0
Backhoe	80.0
Dozer	85.0
Dozer	85.0
Dozer	85.0

Combined Predicted Noise Level (L_{eq} dBA at 50 feet)
88.6

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.

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)
Helicopter	79.5	@	50	soft	6	5	0.65	79.5	@	50
chipper	99.0	@	3	soft	6	5	0.65	67.7	@	50
blasting (night lmax)	94.0	@	50	soft	6	5	0.65	65.0	@	620
helicopter (night leq)	68.0	@	492.00	soft	6	5	0.65	45.1	@	3600
blasting (day lmax)	94.0	@	50	soft	6	5	0.65	70.1	@	400
helicopter (day leq)	68.0	@	492	soft	6	5	0.65	55.0	@	1520
Blasting (SF Res)	94.0	@	50	soft	6	5	0.65	79.6	@	175
blasting	94.0	@	50	soft	6	5	0.65	86.0	@	100
construction	85.0	@	50	soft	6	5	0.65	93.0	@	25
construction	95.0	@	50	soft	6	5	0.65	103.0	@	25
							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. 12-3 and 12-4 of FTA 2006.

Computation of the ground factor is based on the equation presentd in Figure 6-23 on pg. 6-23 of FTA 2006, 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). 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.

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 signs)	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. Jack	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 (hoe ram)	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-truck)	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
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
chipper		75							

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

Day Cable Crossing Equipment (no helicopter)

Location	Distance to Nearest Receptor in feet	Combined Predicted Noise Level (L_{eq} dBA)
Threshold	16	90.0
Residence	230	66.7

Equipment	Reference Emission Noise Levels (L_{max}) at 50 feet[1]	Usage Factor[1]
Compressor (air)	80	1

Ground Type	hard
Source Height	8
Receiver Height	5
Ground Factor[2]	0.00

Predicted Noise Level [3]	L_{eq} dBA at 50 feet[3]
Compressor (air)	80.0

Combined Predicted Noise Level (L_{eq} dBA at 50 feet)
80.0

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.

Day Cable Crossing Equipment (no helicopter)

Location	Distance to Nearest Receptor in feet	Combined Predicted Noise Level (L_{eq} dBA)
Threshold	199	65.0
Residence 1	230	63.7

Equipment	Reference Emission Noise Levels (L_{max}) at 50 feet[1]	Usage Factor[1]
Compressor (air)	80	0.5

Ground Type	hard
Source Height	8
Receiver Height	5
Ground Factor[2]	0.00

Predicted Noise Level [3]	L_{eq} dBA at 50 feet[3]
Compressor (air)	77.0

Combined Predicted Noise Level (L_{eq} dBA at 50 feet)
77.0

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.

Day Cable Crossing Equipment (no helicopter)

Location	Distance to Nearest Receptor in feet	Combined Predicted Noise Level (L_{eq} dBA)
Threshold	63	90.0
Residence	230	78.7

Equipment	Reference Emission Noise Levels (L_{max}) at 50 feet[1]	Usage Factor[1]
Concrete Mixer Truck	85	1
Concrete Mixer Truck	85	1
Paver	85	1
Paver	85	1
Roller	85	1
Roller	85	1
Backhoe	80	1
Paver	85	1
Paver	85	1

Ground Type	hard
Source Height	8
Receiver Height	5
Ground Factor[2]	0.00

Predicted Noise Level [3]	L_{eq} dBA at 50 feet[3]
Concrete Mixer Truck	85.0
Concrete Mixer Truck	85.0
Paver	85.0
Paver	85.0
Roller	85.0
Roller	85.0
Backhoe	80.0
Paver	85.0
Paver	85.0

Combined Predicted Noise Level (L_{eq} dBA at 50 feet)
92.0

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.

Day Cable Crossing Equipment (no helicopter)

Location	Distance to Nearest Receptor in feet	Combined Predicted Noise Level (L_{eq} dBA)
Threshold	707	65.0
Residence 1	230	74.8

Equipment	Reference Emission Noise Levels (L_{max}) at 50 feet[1]	Usage Factor[1]
Concrete Mixer Truck	85	0.4
Concrete Mixer Truck	85	0.4
Paver	85	0.4
Paver	85	0.4
Roller	85	0.4
Roller	85	0.4
Backhoe	80	0.4
Paver	85	0.4
Paver	85	0.4

Ground Type	hard
Source Height	8
Receiver Height	5
Ground Factor[2]	0.00

Predicted Noise Level [3]	L_{eq} dBA at 50 feet[3]
Concrete Mixer Truck	81.0
Concrete Mixer Truck	81.0
Paver	81.0
Paver	81.0
Roller	81.0
Roller	81.0
Backhoe	76.0
Paver	81.0
Paver	81.0

Combined Predicted Noise Level (L_{eq} dBA at 50 feet)
88.0

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.

Day Cable Crossing Equipment (no helicopter)

Location	Distance to Nearest Receptor in feet	Combined Predicted Noise Level (L_{eq} dBA)
Threshold	43	90.0
Residence	230	75.4

Equipment	Reference Emission Noise Levels (L_{max}) at 50 feet[1]	Usage Factor[1]
Man Lift	85	1
Man Lift	75	1
Man Lift	75	1
Generator	82	1
Crane	83	1
Welder / Torch	78	1
Backhoe	80	1
Backhoe	80	1
Backhoe	80	1

Ground Type	hard
Source Height	8
Receiver Height	5
Ground Factor[2]	0.00

Predicted Noise Level [3]	L_{eq} dBA at 50 feet[3]
Man Lift	85.0
Man Lift	75.0
Man Lift	75.0
Generator	82.0
Crane	83.0
Welder / Torch	78.0
Backhoe	80.0
Backhoe	80.0
Backhoe	80.0

Combined Predicted Noise Level (L_{eq} dBA at 50 feet)
88.7

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.

Day Cable Crossing Equipment (no helicopter)

Location	Distance to Nearest Receptor in feet	Combined Predicted Noise Level (L_{eq} dBA)
Threshold	442	65.0
Residence 1	230	70.7

Equipment	Reference Emission Noise Levels (L_{max}) at 50 feet[1]	Usage Factor[1]
Man Lift	85	0.2
Man Lift	75	0.2
Man Lift	75	0.2
Generator	82	0.7
Crane	83	0.3
Welder / Torch	78	0.5
Backhoe	80	0.4
Backhoe	80	0.4
Backhoe	80	0.4

Ground Type	hard
Source Height	8
Receiver Height	5
Ground Factor[2]	0.00

Predicted Noise Level [3]	L_{eq} dBA at 50 feet[3]
Man Lift	78.0
Man Lift	68.0
Man Lift	68.0
Generator	80.5
Crane	77.8
Welder / Torch	75.0
Backhoe	76.0
Backhoe	76.0
Backhoe	76.0

Combined Predicted Noise Level (L_{eq} dBA at 50 feet)
83.9

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.

Day Cable Crossing Equipment (no helicopter)

Location	Distance to Nearest Receptor in feet	Combined Predicted Noise Level (L_{eq} dBA)
Threshold	45	90.0
Residence	230	75.8

Equipment	Reference Emission Noise Levels (L_{max}) at 50 feet[1]	Usage Factor[1]
Grader	85	1
Excavator	81	1
Dozer	82	1
Backhoe	80	1
Backhoe	80	1
Backhoe	80	1

Ground Type	hard
Source Height	8
Receiver Height	5
Ground Factor[2]	0.00

Predicted Noise Level [3]	L_{eq} dBA at 50 feet[3]
Grader	85.0
Excavator	81.0
Dozer	82.0
Backhoe	80.0
Backhoe	80.0
Backhoe	80.0

Combined Predicted Noise Level (L_{eq} dBA at 50 feet)
89.0

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.

Day Cable Crossing Equipment (no helicopter)

Location	Distance to Nearest Receptor in feet	Combined Predicted Noise Level (L_{eq} dBA)
Threshold	503	65.0
Residence 1	230	71.8

Equipment	Reference Emission Noise Levels (L_{max}) at 50 feet[1]	Usage Factor[1]
Grader	85	0.4
Excavator	81	0.4
Dozer	82	0.4
Backhoe	80	0.4
Backhoe	80	0.4
Backhoe	80	0.4

Ground Type	hard
Source Height	8
Receiver Height	5
Ground Factor[2]	0.00

Predicted Noise Level [3]	L_{eq} dBA at 50 feet[3]
Grader	81.0
Excavator	77.0
Dozer	78.0
Backhoe	76.0
Backhoe	76.0
Backhoe	76.0

Combined Predicted Noise Level (L_{eq} dBA at 50 feet)
85.1

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.

Day Cable Crossing Equipment (no helicopter)

Location	Distance to Nearest Receptor in feet	Combined Predicted Noise Level (L_{eq} dBA)
Threshold	462	65.0
Residence 1	230	71.1

Equipment	Reference Emission Noise Levels (L_{max}) at 50 feet[1]	Usage Factor[1]
Dozer	82	0.4
Dozer	82	0.4
Dozer	82	0.4
Backhoe	80	0.4
Backhoe	80	0.4
Backhoe	80	0.4
Backhoe	80	0.4

Ground Type	hard
Source Height	8
Receiver Height	5
Ground Factor[2]	0.00

Predicted Noise Level [3]	L_{eq} dBA at 50 feet[3]
Dozer	78.0
Dozer	78.0
Dozer	78.0
Backhoe	76.0
Backhoe	76.0
Backhoe	76.0
Backhoe	76.0

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.

Day Cable Crossing Equipment (no helicopter)

Location	Distance to Nearest Receptor in feet	Combined Predicted Noise Level (L_{eq} dBA)
Threshold	41	90.0
Residence	230	75.0

Equipment	Reference Emission Noise Levels (L_{max}) at 50 feet[1]	Usage Factor[1]
Dozer	82	1
Dozer	82	1
Dozer	82	1
Backhoe	80	1
Backhoe	80	1
Backhoe	80	1
Backhoe	80	1

Ground Type	hard
Source Height	8
Receiver Height	5
Ground Factor[2]	0.00

Predicted Noise Level [3]	L_{eq} dBA at 50 feet[3]
Dozer	82.0
Dozer	82.0
Dozer	82.0
Backhoe	80.0
Backhoe	80.0
Backhoe	80.0
Backhoe	80.0

Combined Predicted Noise Level (L_{eq} dBA at 50 feet)
88.3

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.

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)
Helicopter	79.5	@	50	soft	6	5	0.65	79.5	@	50
chipper	99.0	@	3	soft	6	5	0.65	67.7	@	50
blasting (night lmax)	94.0	@	50	soft	6	5	0.65	65.0	@	620
helicopter (night leq)	68.0	@	492.00	soft	6	5	0.65	45.1	@	3600
blasting (day lmax)	94.0	@	50	soft	6	5	0.65	70.1	@	400
helicopter (day leq)	68.0	@	492	soft	6	5	0.65	55.0	@	1520
Blasting (SF Res)	94.0	@	50	soft	6	5	0.65	79.6	@	175
blasting	94.0	@	50	soft	6	5	0.65	86.0	@	100
construction	85.0	@	50	soft	6	5	0.65	93.0	@	25
construction	95.0	@	50	soft	6	5	0.65	103.0	@	25
							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. 12-3 and 12-4 of FTA 2006.

Computation of the ground factor is based on the equation presentd in Figure 6-23 on pg. 6-23 of FTA 2006, 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). 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.

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 signs)	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. Jack	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 (hoe ram)	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-truck)	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
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
chipper		75							

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

Demo - Phase 3

Location	Distance to Nearest Receptor in feet	Combined Predicted Noise Level (L_{eq} dBA)
Threshold	37	90.0
Residence	515	67.2

Equipment	Reference Emission Noise Levels (L_{max}) at 50 feet[1]	Usage Factor[1]
Backhoe	80	1
Backhoe	80	1
Dozer	85	1
Concrete Saw	76	1

Ground Type	hard
Source Height	8
Receiver Height	5
Ground Factor[2]	0.00

Predicted Noise Level [3]	L_{eq} dBA at 50 feet[3]
Backhoe	80.0
Backhoe	80.0
Dozer	85.0
Concrete Saw	76.0

Combined Predicted Noise Level (L_{eq} dBA at 50 feet)
87.5

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.

Demo - Phase 3

Location	Distance to Nearest Receptor in feet	Combined Predicted Noise Level (L_{eq} dBA)
Threshold	430	65.0
Residence 1	515	63.4

Equipment	Reference Emission Noise Levels (L_{max}) at 50 feet[1]	Usage Factor[1]
Backhoe	80	0.4
Backhoe	80	0.4
Dozer	85	0.4
Concrete Saw	76	0.7

Ground Type	hard
Source Height	8
Receiver Height	5
Ground Factor[2]	0.00

Predicted Noise Level [3]	L_{eq} dBA at 50 feet[3]
Backhoe	76.0
Backhoe	76.0
Dozer	81.0
Concrete Saw	74.5

Combined Predicted Noise Level (L_{eq} dBA at 50 feet)
83.7

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.

Arch Coating - Phase 3

Location	Distance to Nearest Receptor in feet	Combined Predicted Noise Level (L_{eq} dBA)
Threshold	16	90.0
Residence	515	59.7

Equipment	Reference Emission Noise Levels (L_{max}) at 50 feet[1]	Usage Factor[1]
Compressor (air)	80	1

Ground Type	hard
Source Height	8
Receiver Height	5
Ground Factor[2]	0.00

Predicted Noise Level [3]	L_{eq} dBA at 50 feet[3]
Compressor (air)	80.0

Combined Predicted Noise Level (L_{eq} dBA at 50 feet)
80.0

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.

Arch Coating - Phase 3

Location	Distance to Nearest Receptor in feet	Combined Predicted Noise Level (L_{eq} dBA)
Threshold	199	65.0
Residence 1	515	56.7

Equipment	Reference Emission Noise Levels (L_{max}) at 50 feet[1]	Usage Factor[1]
Compressor (air)	80	0.5

Ground Type	hard
Source Height	8
Receiver Height	5
Ground Factor[2]	0.00

Predicted Noise Level [3]	L_{eq} dBA at 50 feet[3]
Compressor (air)	77.0

Combined Predicted Noise Level (L_{eq} dBA at 50 feet)
77.0

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.

Paving - Phase 3

Location	Distance to Nearest Receptor in feet	Combined Predicted Noise Level (L_{eq} dBA)
Threshold	63	90.0
Residence	515	71.7

Equipment	Reference Emission Noise Levels (L_{max}) at 50 feet[1]	Usage Factor[1]
Concrete Mixer Truck	85	1
Concrete Mixer Truck	85	1
Concrete Mixer Truck	85	1
Concrete Mixer Truck	85	1
Paver	85	1
Roller	85	1
Backhoe	80	1

Ground Type	hard
Source Height	8
Receiver Height	5
Ground Factor[2]	0.00

Predicted Noise Level [3]	L_{eq} dBA at 50 feet[3]
Concrete Mixer Truck	85.0
Concrete Mixer Truck	85.0
Concrete Mixer Truck	85.0
Concrete Mixer Truck	85.0
Paver	85.0
Roller	85.0
Backhoe	80.0

Combined Predicted Noise Level (L_{eq} dBA at 50 feet)
92.0

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.

Paving - Phase 3

Location	Distance to Nearest Receptor in feet	Combined Predicted Noise Level (L_{eq} dBA)
Threshold	707	65.0
Residence 1	515	67.8

Equipment	Reference Emission Noise Levels (L_{max}) at 50 feet[1]	Usage Factor[1]
Concrete Mixer Truck	85	0.4
Concrete Mixer Truck	85	0.4
Concrete Mixer Truck	85	0.4
Concrete Mixer Truck	85	0.4
Paver	85	0.4
Roller	85	0.4
Backhoe	80	0.4

Ground Type	hard
Source Height	8
Receiver Height	5
Ground Factor[2]	0.00

Predicted Noise Level [3]	L_{eq} dBA at 50 feet[3]
Concrete Mixer Truck	81.0
Concrete Mixer Truck	81.0
Concrete Mixer Truck	81.0
Concrete Mixer Truck	81.0
Paver	81.0
Roller	81.0
Backhoe	76.0

Combined Predicted Noise Level (L_{eq} dBA at 50 feet)
88.0

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.

Building Construciton - Phase 3

Location	Distance to Nearest Receptor in feet	Combined Predicted Noise Level (L_{eq} dBA)
Threshold	43	90.0
Residence	515	68.5

Equipment	Reference Emission Noise Levels (L_{max}) at 50 feet[1]	Usage Factor[1]
Man Lift	85	1
Man Lift	75	1
Crane	83	1
Backhoe	80	1
Backhoe	80	1

Ground Type	hard
Source Height	8
Receiver Height	5
Ground Factor[2]	0.00

Predicted Noise Level [3]	L_{eq} dBA at 50 feet[3]
Man Lift	85.0
Man Lift	75.0
Crane	83.0
Backhoe	80.0
Backhoe	80.0

Combined Predicted Noise Level (L_{eq} dBA at 50 feet)
88.7

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.

Building Construction - Phase 3

Location	Distance to Nearest Receptor in feet	Combined Predicted Noise Level (L_{eq} dBA)
Threshold	407	65.0
Residence 1	515	63.0

Equipment	Reference Emission Noise Levels (L_{max}) at 50 feet[1]	Usage Factor[1]
Man Lift	85	0.2
Man Lift	75	0.2
Crane	83	0.3
Backhoe	80	0.4
Backhoe	80	0.4

Ground Type	hard
Source Height	8
Receiver Height	5
Ground Factor[2]	0.00

Predicted Noise Level [3]	L_{eq} dBA at 50 feet[3]
Man Lift	78.0
Man Lift	68.0
Crane	77.8
Backhoe	76.0
Backhoe	76.0

Combined Predicted Noise Level (L_{eq} dBA at 50 feet)
83.2

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.

Grading - Phase 3

Location	Distance to Nearest Receptor in feet	Combined Predicted Noise Level (L_{eq} dBA)
Threshold	38	90.0
Residence	515	67.3

Equipment	Reference Emission Noise Levels (L_{max}) at 50 feet[1]	Usage Factor[1]
Grader	85	1
Backhoe	80	1
Dozer	82	1

Ground Type	hard
Source Height	8
Receiver Height	5
Ground Factor[2]	0.00

Predicted Noise Level [3]	L_{eq} dBA at 50 feet[3]
Grader	85.0
Backhoe	80.0
Dozer	82.0

Combined Predicted Noise Level (L_{eq} dBA at 50 feet)
87.6

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.

Grading - Phase 3

Location	Distance to Nearest Receptor in feet	Combined Predicted Noise Level (L_{eq} dBA)
Threshold	426	65.0
Residence 1	515	63.4

Equipment	Reference Emission Noise Levels (L_{max}) at 50 feet[1]	Usage Factor[1]
Grader	85	0.4
Backhoe	80	0.4
Dozer	82	0.4

Ground Type	hard
Source Height	8
Receiver Height	5
Ground Factor[2]	0.00

Predicted Noise Level [3]	L_{eq} dBA at 50 feet[3]
Grader	81.0
Backhoe	76.0
Dozer	78.0

Combined Predicted Noise Level (L_{eq} dBA at 50 feet)
83.6

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.

Site Prep - Phase 3

Location	Distance to Nearest Receptor in feet	Combined Predicted Noise Level (L_{eq} dBA)
Threshold	363	65.0
Residence 1	515	62.0

Equipment	Reference Emission Noise Levels (L_{max}) at 50 feet[1]	Usage Factor[1]
Grader	85	0.4
Backhoe	80	0.4

Ground Type	hard
Source Height	8
Receiver Height	5
Ground Factor[2]	0.00

Predicted Noise Level [3]	L_{eq} dBA at 50 feet[3]
Grader	81.0
Backhoe	76.0

Combined Predicted Noise Level (L_{eq} dBA at 50 feet)
82.2

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.

Site Prep - Phase 3

Location	Distance to Nearest Receptor in feet	Combined Predicted Noise Level (L_{eq} dBA)	Equipment	Reference Emission Noise Levels (L_{max}) at 50 feet[1]	Usage Factor[1]
Threshold	32	90.0	Grader	85	1
Residence	515	65.9	Backhoe	80	1

Ground Type	hard
Source Height	8
Receiver Height	5
Ground Factor[2]	0.00

Predicted Noise Level [3]	L_{eq} dBA at 50 feet[3]
Grader	85.0
Backhoe	80.0

Combined Predicted Noise Level (L_{eq} dBA at 50 feet)
86.2

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.

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)
Helicopter	79.5	@	50	soft	6	5	0.65	79.5	@	50
chipper	99.0	@	3	soft	6	5	0.65	67.7	@	50
blasting (night lmax)	94.0	@	50	soft	6	5	0.65	65.0	@	620
helicopter (night leq)	68.0	@	492.00	soft	6	5	0.65	45.1	@	3600
blasting (day lmax)	94.0	@	50	soft	6	5	0.65	70.1	@	400
helicopter (day leq)	68.0	@	492	soft	6	5	0.65	55.0	@	1520
Blasting (SF Res)	94.0	@	50	soft	6	5	0.65	79.6	@	175
blasting	94.0	@	50	soft	6	5	0.65	86.0	@	100
construction	85.0	@	50	soft	6	5	0.65	93.0	@	25
construction	95.0	@	50	soft	6	5	0.65	103.0	@	25
							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. 12-3 and 12-4 of FTA 2006.

Computation of the ground factor is based on the equation presentd in Figure 6-23 on pg. 6-23 of FTA 2006, 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). 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.

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 signs)	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. Jack	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 (hoe ram)	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-truck)	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
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
chipper		75							

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

Day Cable Crossing Equipment (no helicopter)

Location	Distance to Nearest Receptor in feet	Combined Predicted Noise Level (L_{eq} dBA)
Threshold	16	90.0
Residence	560	59.0

Equipment	Reference Emission Noise Levels (L_{max}) at 50 feet[1]	Usage Factor[1]
Compressor (air)	80	1

Ground Type	hard
Source Height	8
Receiver Height	5
Ground Factor[2]	0.00

Predicted Noise Level [3]	L_{eq} dBA at 50 feet[3]
Compressor (air)	80.0

Combined Predicted Noise Level (L_{eq} dBA at 50 feet)
80.0

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.

Day Cable Crossing Equipment (no helicopter)

Location	Distance to Nearest Receptor in feet	Combined Predicted Noise Level (L_{eq} dBA)
Threshold	199	65.0
Residence 1	560	56.0

Equipment	Reference Emission Noise Levels (L_{max}) at 50 feet[1]	Usage Factor[1]
Compressor (air)	80	0.5

Ground Type	hard
Source Height	8
Receiver Height	5
Ground Factor[2]	0.00

Predicted Noise Level [3]	L_{eq} dBA at 50 feet[3]
Compressor (air)	77.0

Combined Predicted Noise Level (L_{eq} dBA at 50 feet)
77.0

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.

Day Cable Crossing Equipment (no helicopter)

Location	Distance to Nearest Receptor in feet	Combined Predicted Noise Level (L_{eq} dBA)
Threshold	63	90.0
Residence	560	71.0

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

Ground Type	hard
Source Height	8
Receiver Height	5
Ground Factor[2]	0.00

Predicted Noise Level [3]	L_{eq} dBA at 50 feet[3]
Paver	85.0
Paver	85.0
Paver	85.0
Paver	85.0
Roller	85.0
Roller	85.0

Combined Predicted Noise Level (L_{eq} dBA at 50 feet)
92.0

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.

Day Cable Crossing Equipment (no helicopter)

Location	Distance to Nearest Receptor in feet	Combined Predicted Noise Level (L_{eq} dBA)
Threshold	707	65.0
Residence 1	560	67.0

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

Ground Type	hard
Source Height	8
Receiver Height	5
Ground Factor[2]	0.00

Predicted Noise Level [3]	L_{eq} dBA at 50 feet[3]
Paver	81.0
Paver	81.0
Paver	81.0
Paver	81.0
Roller	81.0
Roller	81.0

Combined Predicted Noise Level (L_{eq} dBA at 50 feet)
88.0

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.

Day Cable Crossing Equipment (no helicopter)

Location	Distance to Nearest Receptor in feet	Combined Predicted Noise Level (L_{eq} dBA)
Threshold	43	90.0
Residence	560	67.7

Equipment	Reference Emission Noise Levels (L_{max}) at 50 feet[1]	Usage Factor[1]
Man Lift	85	1
Man Lift	75	1
Man Lift	75	1
Generator	82	1
Crane	83	1
Welder / Torch	78	1
Backhoe	80	1
Backhoe	80	1
Backhoe	80	1

Ground Type	hard
Source Height	8
Receiver Height	5
Ground Factor[2]	0.00

Predicted Noise Level [3]	L_{eq} dBA at 50 feet[3]
Man Lift	85.0
Man Lift	75.0
Man Lift	75.0
Generator	82.0
Crane	83.0
Welder / Torch	78.0
Backhoe	80.0
Backhoe	80.0
Backhoe	80.0

Combined Predicted Noise Level (L_{eq} dBA at 50 feet)
88.7

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.

Day Cable Crossing Equipment (no helicopter)

Location	Distance to Nearest Receptor in feet	Combined Predicted Noise Level (L_{eq} dBA)
Threshold	442	65.0
Residence 1	560	62.9

Equipment	Reference Emission Noise Levels (L_{max}) at 50 feet[1]	Usage Factor[1]
Man Lift	85	0.2
Man Lift	75	0.2
Man Lift	75	0.2
Generator	82	0.7
Crane	83	0.3
Welder / Torch	78	0.5
Backhoe	80	0.4
Backhoe	80	0.4
Backhoe	80	0.4

Ground Type	hard
Source Height	8
Receiver Height	5
Ground Factor[2]	0.00

Predicted Noise Level [3]	L_{eq} dBA at 50 feet[3]
Man Lift	78.0
Man Lift	68.0
Man Lift	68.0
Generator	80.5
Crane	77.8
Welder / Torch	75.0
Backhoe	76.0
Backhoe	76.0
Backhoe	76.0

Combined Predicted Noise Level (L_{eq} dBA at 50 feet)
83.9

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.

Day Cable Crossing Equipment (no helicopter)

Location	Distance to Nearest Receptor in feet	Combined Predicted Noise Level (L_{eq} dBA)
Threshold	45	90.0
Residence	560	68.0

Equipment	Reference Emission Noise Levels (L_{max}) at 50 feet[1]	Usage Factor[1]
Grader	85	1
Excavator	81	1
Dozer	82	1
Backhoe	80	1
Backhoe	80	1
Backhoe	80	1

Ground Type	hard
Source Height	8
Receiver Height	5
Ground Factor[2]	0.00

Predicted Noise Level [3]	L_{eq} dBA at 50 feet[3]
Grader	85.0
Excavator	81.0
Dozer	82.0
Backhoe	80.0
Backhoe	80.0
Backhoe	80.0

Combined Predicted Noise Level (L_{eq} dBA at 50 feet)
89.0

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.

Day Cable Crossing Equipment (no helicopter)

Location	Distance to Nearest Receptor in feet	Combined Predicted Noise Level (L_{eq} dBA)
Threshold	503	65.0
Residence 1	560	64.1

Equipment	Reference Emission Noise Levels (L_{max}) at 50 feet[1]	Usage Factor[1]
Grader	85	0.4
Excavator	81	0.4
Dozer	82	0.4
Backhoe	80	0.4
Backhoe	80	0.4
Backhoe	80	0.4

Ground Type	hard
Source Height	8
Receiver Height	5
Ground Factor[2]	0.00

Predicted Noise Level [3]	L_{eq} dBA at 50 feet[3]
Grader	81.0
Excavator	77.0
Dozer	78.0
Backhoe	76.0
Backhoe	76.0
Backhoe	76.0

Combined Predicted Noise Level (L_{eq} dBA at 50 feet)
85.1

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.

Day Cable Crossing Equipment (no helicopter)

Location	Distance to Nearest Receptor in feet	Combined Predicted Noise Level (L_{eq} dBA)
Threshold	462	65.0
Residence 1	560	63.3

Equipment	Reference Emission Noise Levels (L_{max}) at 50 feet[1]	Usage Factor[1]
Dozer	82	0.4
Dozer	82	0.4
Dozer	82	0.4
Backhoe	80	0.4
Backhoe	80	0.4
Backhoe	80	0.4
Backhoe	80	0.4

Ground Type	hard
Source Height	8
Receiver Height	5
Ground Factor[2]	0.00

Predicted Noise Level [3]	L_{eq} dBA at 50 feet[3]
Dozer	78.0
Dozer	78.0
Dozer	78.0
Backhoe	76.0
Backhoe	76.0
Backhoe	76.0
Backhoe	76.0

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.

Day Cable Crossing Equipment (no helicopter)

Location	Distance to Nearest Receptor in feet	Combined Predicted Noise Level (L_{eq} dBA)
Threshold	41	90.0
Residence	560	67.3

Equipment	Reference Emission Noise Levels (L_{max}) at 50 feet[1]	Usage Factor[1]
Dozer	82	1
Dozer	82	1
Dozer	82	1
Backhoe	80	1
Backhoe	80	1
Backhoe	80	1
Backhoe	80	1

Ground Type	hard
Source Height	8
Receiver Height	5
Ground Factor[2]	0.00

Predicted Noise Level [3]	L_{eq} dBA at 50 feet[3]
Dozer	82.0
Dozer	82.0
Dozer	82.0
Backhoe	80.0
Backhoe	80.0
Backhoe	80.0
Backhoe	80.0

Combined Predicted Noise Level (L_{eq} dBA at 50 feet)
88.3

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.

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)
Helicopter	79.5	@	50	soft	6	5	0.65	79.5	@	50
chipper	99.0	@	3	soft	6	5	0.65	67.7	@	50
blasting (night lmax)	94.0	@	50	soft	6	5	0.65	65.0	@	620
helicopter (night leq)	68.0	@	492.00	soft	6	5	0.65	45.1	@	3600
blasting (day lmax)	94.0	@	50	soft	6	5	0.65	70.1	@	400
helicopter (day leq)	68.0	@	492	soft	6	5	0.65	55.0	@	1520
Blasting (SF Res)	94.0	@	50	soft	6	5	0.65	79.6	@	175
blasting	94.0	@	50	soft	6	5	0.65	86.0	@	100
construction	85.0	@	50	soft	6	5	0.65	93.0	@	25
construction	95.0	@	50	soft	6	5	0.65	103.0	@	25
							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. 12-3 and 12-4 of FTA 2006.

Computation of the ground factor is based on the equation presentd in Figure 6-23 on pg. 6-23 of FTA 2006, 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). 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.

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 signs)	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. Jack	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 (hoe ram)	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-truck)	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
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
chipper		75							

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

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:	New Zoo Site
Measurement Date:	7/13/2023
Project Name:	New Zoo

			Computation of CNEL					
			Period of 24-Hour Day (1=included, 0=not)			Sound Power Breakdown by Period of Day		
Hour of Day (military time)	**Sound Level Leq (dBA)**	**Sound Power =10*Log(dBA /10)**	**Day**	**Evening**	**Night**	**Day**	**Evening**	**Night**
0:00	63.7	2,344,229	0	0	1	0	0	2,344,229
1:00	66.0	3,981,072	0	0	1	0	0	3,981,072
2:00	59.5	891,251	0	0	1	0	0	891,251
3:00	57.8	602,560	0	0	1	0	0	602,560
4:00	53.1	204,174	0	0	1	0	0	204,174
5:00	55.4	346,737	0	0	1	0	0	346,737
6:00	49.8	95,499	0	0	1	0	0	95,499
7:00	40.4	10,965	1	0	0	10,965	0	0
8:00	49.0	79,433	1	0	0	79,433	0	0
9:00	51.2	131,826	1	0	0	131,826	0	0
10:00	49.3	85,114	1	0	0	85,114	0	0
11:00	57.9	616,595	1	0	0	616,595	0	0
12:00	63.4	2,187,762	1	0	0	2,187,762	0	0
13:00	64.0	2,511,886	1	0	0	2,511,886	0	0
14:00	68.6	7,244,360	1	0	0	7,244,360	0	0
15:00	67.9	6,165,950	1	0	0	6,165,950	0	0
16:00	68.7	7,413,102	1	0	0	7,413,102	0	0
17:00	69.4	8,709,636	1	0	0	8,709,636	0	0
18:00	68.8	7,585,776	1	0	0	7,585,776	0	0
19:00	68.3	6,760,830	0	1	0	0	6,760,830	0
20:00	69.6	9,120,108	0	1	0	0	9,120,108	0
21:00	68.9	7,762,471	0	1	0	0	7,762,471	0
22:00	68.6	7,244,360	0	0	1	0	0	7,244,360
23:00	67.0	5,011,872	0	0	1	0	0	5,011,872
		Sum of Sound Power during Period wo/penalty				42,742,404	23,643,409	20,721,753
		Log Factor for CNEL Penalty (i.e., 10*log(x))				1	3	10
		Sound Power during Period with penalty				42,742,404	70,930,228	207,217,529

Total Daily Sound Power, with penalties	320,890,161
Hours per Day	24
Average Hourly Sound Power, with penalties	13,370,423

Ldn computation on next

CNEL	71.3

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	2,344,229
0	1	0	3,981,072
0	1	0	891,251
0	1	0	602,560
0	1	0	204,174
0	1	0	346,737
0	1	0	95,499
1	0	10,965	0
1	0	79,433	0
1	0	131,826	0
1	0	85,114	0
1	0	616,595	0
1	0	2,187,762	0
1	0	2,511,886	0
1	0	7,244,360	0
1	0	6,165,950	0
1	0	7,413,102	0
1	0	8,709,636	0
1	0	7,585,776	0
1	0	6,760,830	0
1	0	9,120,108	0
1	0	7,762,471	0
0	1	0	7,244,360
0	1	0	5,011,872

Sum of Sound Power during Period wo/penalty	66,385,813	20,721,753
Log Factor for Penalty (i.e., 10*log(x))	1	10
Sound Power during Period with penalty	66,385,813	207,217,529

Total Daily Sound Power, with penalties	273,603,342
Hours per Day	24
Average Hourly Sound Power, with penalties	11,400,139
Ldn	70.6

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.

Long-Term Noise Measurement Summary - Sacramento Zoo

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: Sacramento Zoo Lion Exhibit
Measurement Date: 6/2/2023
Project Name: Edgewood

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	48.4	69,183	0	0	1	0	0	69,183
1:00	47.6	57,544	0	0	1	0	0	57,544
2:00	45.9	38,905	0	0	1	0	0	38,905
3:00	45.7	37,154	0	0	1	0	0	37,154
4:00	45.1	32,359	0	0	1	0	0	32,359
5:00	44.8	30,200	0	0	1	0	0	30,200
6:00	46.6	45,709	0	0	1	0	0	45,709
7:00	53.3	213,796	1	0	0	213,796	0	0
8:00	48.9	77,625	1	0	0	77,625	0	0
9:00	51.2	131,826	1	0	0	131,826	0	0
10:00	55.5	354,813	1	0	0	354,813	0	0
11:00	61.8	1,513,561	1	0	0	1,513,561	0	0
12:00	65.1	3,235,937	1	0	0	3,235,937	0	0
13:00	59.8	954,993	1	0	0	954,993	0	0
14:00	55.0	316,228	1	0	0	316,228	0	0
15:00	53.5	223,872	1	0	0	223,872	0	0
16:00	54.3	269,153	1	0	0	269,153	0	0
17:00	52.1	162,181	1	0	0	162,181	0	0
18:00	49.1	81,283	1	0	0	81,283	0	0
19:00	48.5	70,795	0	1	0	0	70,795	0
20:00	50.3	107,152	0	1	0	0	107,152	0
21:00	52.3	169,824	0	1	0	0	169,824	0
22:00	49.6	91,201	0	0	1	0	0	91,201
23:00	47.9	61,660	0	0	1	0	0	61,660
		Sum of Sound Power during Period wo/penalty				7,535,268	347,771	463,913
		Log Factor for CNEL Penalty (i.e., 10*log(x))				1	3	10
		Sound Power during Period with penalty				7,535,268	1,043,313	4,639,134

Total Daily Sound Power, with penalties	13,217,715
Hours per Day	24
Average Hourly Sound Power, with penalties	550,738

Ldn computation on next

CNEL	57.4

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	69,183
0	1	0	57,544
0	1	0	38,905
0	1	0	37,154
0	1	0	32,359
0	1	0	30,200
0	1	0	45,709
1	0	213,796	0
1	0	77,625	0
1	0	131,826	0
1	0	354,813	0
1	0	1,513,561	0
1	0	3,235,937	0
1	0	954,993	0
1	0	316,228	0
1	0	223,872	0
1	0	269,153	0
1	0	162,181	0
1	0	81,283	0
1	0	70,795	0
1	0	107,152	0
1	0	169,824	0
0	1	0	91,201
0	1	0	61,660

Sum of Sound Power during Period wo/penalty	7,883,039	463,913
Log Factor for Penalty (i.e., 10*log(x))	1	10
Sound Power during Period with penalty	7,883,039	4,639,134

Total Daily Sound Power, with penalties	12,522,173
Hours per Day	24
Average Hourly Sound Power, with penalties	521,757
Ldn	57.2

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.

Summary

File Name on Meter	LxT_Data.147.s
File Name on PC	LxT_0003285-20230602 093504-LxT_Data.147.ldbin
Serial Number	0003285
Model	SoundTrack LxT®
Firmware Version	2.302
User	
Location	
Job Description	
Note	

Measurement

Description		
Start	2023-06-02	09:35:04
Stop	2023-06-02	09:50:47
Duration		00:15:43.0
Run Time		00:15:40.1
Pause		00:00:02.9
Pre-Calibration	2023-06-02	09:33:29
Post-Calibration		None
Calibration Deviation		---

Overall Settings

RMS Weight	A Weighting				
Peak Weight	A Weighting				
Detector	Slow				
Preamplifier	PRMLxT1L				
Microphone Correction	Off				
Integration Method	Linear				
Overload	121.9	dB			
	A		**C**	**Z**	
Under Range Peak	**78.3**		75.3	80.3	dB
Under Range Limit	**26.3**		26.0	31.1	dB
Noise Floor	16.5		16.8	22.0	dB
	First		**Second**	**Third**	
Instrument Identification					

Results

LA_{eq}	62.4	dB			
LAE	92.1	dB			
EA	181.523	µPa²h			
EA8	5.561	mPa²h			
EA40	27.805	mPa²h			
$LA_{peak\ (max)}$	2023-06-02	09:38:51	94.0	dB	
LAS_{max}	2023-06-02	09:47:36	72.9	dB	

Summary

File Name on Meter	LxT_Data.148.s
File Name on PC	LxT_0003285-20230602 095546-LxT_Data.148.ldbin
Serial Number	0003285
Model	SoundTrack LxT®
Firmware Version	2.302
User	
Location	
Job Description	
Note	

Measurement

Description	
Start	2023-06-02 09:55:46
Stop	2023-06-02 10:11:24
Duration	00:15:38.1
Run Time	00:15:37.0
Pause	00:00:01.1
Pre-Calibration	2023-06-02 09:55:07
Post-Calibration	None
Calibration Deviation	---

Overall Settings

RMS Weight	A Weighting			
Peak Weight	A Weighting			
Detector	Slow			
Preamplifier	PRMLxT1L			
Microphone Correction	Off			
Integration Method	Linear			
Overload	121.9 dB			
	A	**C**	**Z**	
Under Range Peak	**78.2**	75.2	80.2	dB
Under Range Limit	**26.2**	25.9	31.1	dB
Noise Floor	16.5	16.8	21.9	dB

	First	**Second**	**Third**
Instrument Identification			

Results

LA_{eq}	77.8	dB	
LAE	107.5	dB	
EA	6.273	mPa^2h	
EA8	192.819	mPa^2h	
EA40	964.096	mPa^2h	
$LA_{peak\ (max)}$	2023-06-02 10:01:39	109.2	dB
LAS_{max}	2023-06-02 10:01:39	93.8	dB

LAS_{min}	2023-06-02 09:59:35	55.6 dB
SEA	-99.9 dB	

	Exceedance Counts	Duration
LAS > 85.0 dB	12	57.5 s
LAS > 115.0 dB	0	0.0 s
LA_{peak} > 135.0 dB	0	0.0 s
LA_{peak} > 137.0 dB	0	0.0 s
LA_{peak} > 140.0 dB	0	0.0 s

LC_{eq}	76.7 dB
LA_{eq}	77.8 dB
LC_{eq} - LA_{eq}	-1.1 dB
LAI_{eq}	83.2 dB
LA_{eq}	77.8 dB
LAI_{eq} - LA_{eq}	5.4 dB

	A		C		
	dB	**Time Stamp**	**dB**	**Time Stamp**	**dB**
L_{eq}	77.8		76.7		
$L_{S(max)}$	93.8	2023/06/02 10:01:39			
$L_{S(min)}$	55.6	2023/06/02 9:59:35			
$L_{Peak(max)}$	109.2	2023/06/02 10:01:39			

Overload Count	0
Overload Duration	0.0 s

Dose Settings

Dose Name	OSHA-1	OSHA-2
Exchange Rate	5	3 dB
Threshold	90	80 dB
Criterion Level	90	90 dB
Criterion Duration	8	8 h

Results

Dose	0.42	0.20 %
Projected Dose	12.85	6.03 %
TWA (Projected)	75.2	77.8 dB
TWA (t)	50.5	62.9 dB
Lep (t)	62.9	62.9 dB

Statistics

LA 3.00	86.5 dB
LA 8.00	82.4 dB
LA 16.00	78.5 dB
LA 25.00	75.9 dB
LA 50.00	70.8 dB
LA 90.00	61.4 dB

Calibration History

Preamp	Date	dB re. 1V/Pa	6.3	8.0
PRMLxT1L	2023-06-02 09:55:07	-28.21	54.76	54.16
PRMLxT1L	2023-06-02 09:33:27	-28.28	53.36	53.49
PRMLxT1L	2023-04-20 12:21:05	-28.23	65.37	65.89
PRMLxT1L	2023-04-20 12:15:43	-28.27	41.54	48.03
PRMLxT1L	2023-04-20 11:25:27	-28.22	54.11	49.56
PRMLxT1L	2023-04-20 10:48:21	-28.18	93.18	72.86
PRMLxT1L	2023-04-20 10:48:00	-28.14	57.61	54.82
PRMLxT1L	2023-04-20 10:12:02	-28.25	50.48	51.81
PRMLxT1L	2023-04-20 09:22:48	-28.21	59.18	54.35
PRMLxT1L	2023-04-20 05:53:09	-28.17	46.01	48.06
PRMLxT1L	2023-04-20 04:58:32	-28.15	65.01	58.46

Z
Time Stamp

10.0	12.5	16.0	20.0	25.0	31.5	40.0	50.0	63.0	80.0	100	125	160	200
48.18	50.42	56.81	58.37	59.83	57.01	56.29	52.26	50.96	51.36	49.09	46.61	48.10	48.76
46.14	52.60	52.95	56.44	57.95	54.90	59.03	54.84	56.64	63.28	53.82	57.57	55.20	55.53
69.75	71.98	66.39	56.36	62.75	62.95	59.47	56.02	56.17	56.32	57.34	55.24	53.53	54.24
51.27	52.51	61.11	58.99	63.61	62.00	58.53	56.62	60.83	54.62	58.36	52.99	50.46	53.21
51.32	56.01	53.39	51.36	67.26	63.00	56.78	59.34	62.82	52.48	55.59	53.67	49.71	52.87
49.55	58.51	51.92	65.81	65.50	60.96	63.52	58.10	55.36	56.27	54.47	55.20	59.05	51.18
97.16	96.27	103.89	54.39	63.59	58.27	61.52	55.75	62.67	58.02	56.85	55.59	55.03	52.65
57.85	55.24	67.59	62.22	59.85	63.05	54.95	55.33	58.78	56.20	82.52	81.18	76.66	69.95
52.45	60.69	64.37	67.06	58.62	64.49	65.05	64.78	61.55	55.89	54.84	61.91	61.68	62.44
45.97	45.66	55.38	56.64	54.71	59.17	62.81	56.41	54.52	64.39	58.12	53.75	57.16	50.37
61.83	56.14	61.83	64.52	68.85	69.38	62.35	57.22	66.34	65.72	60.34	66.34	65.05	62.81

250	315	400	500	630	800	1000	1250	1600	2000	2500	3150	4000	5000	6300
48.61	49.01	57.24	54.67	45.13	39.44	114.05	48.98	21.57	66.14	22.32	62.97	28.33	33.75	21.98
55.87	52.71	53.45	47.27	45.30	47.04	113.93	51.08	46.21	66.02	35.67	62.90	31.09	34.61	25.30
57.06	54.90	54.62	50.06	41.41	31.68	114.03	48.83	20.25	66.06	22.82	63.22	28.52	34.03	22.11
48.48	49.51	49.07	44.14	36.94	30.22	113.93	48.73	18.75	65.98	22.57	63.15	28.35	33.87	22.10
45.85	46.95	46.32	42.30	37.91	35.16	113.94	48.82	20.17	66.04	22.61	63.03	28.52	33.61	21.90
53.11	52.15	52.87	46.95	41.63	39.31	113.95	48.87	22.78	65.90	22.16	63.00	28.29	33.59	22.45
52.05	52.52	46.08	43.22	38.55	37.79	114.10	49.04	24.40	66.01	22.01	63.15	27.84	33.82	22.78
70.93	68.71	67.47	60.64	60.14	64.62	113.93	61.68	49.47	70.16	49.03	66.33	60.17	55.82	53.23
55.31	63.09	56.30	54.84	43.01	35.20	113.94	49.02	22.43	66.03	21.82	62.86	28.55	33.80	21.52
47.92	47.42	46.61	43.74	37.46	31.46	113.96	49.08	18.82	65.82	21.67	62.81	28.55	34.03	21.63
64.43	62.36	63.84	60.92	54.40	40.92	113.94	49.21	27.45	65.89	22.08	62.77	28.56	33.89	21.51

8000	10000	12500	16000	20000
22.55	24.29	26.33	28.58	31.12
24.78	26.80	27.52	28.66	31.15
23.08	24.56	26.43	28.97	31.01
22.95	24.21	26.33	28.45	30.60
22.83	24.36	26.04	28.29	30.59
23.20	41.67	25.97	28.68	31.51
23.47	24.23	26.00	28.49	31.04
51.90	50.48	48.89	47.72	46.85
23.06	24.15	25.70	28.11	30.78
22.64	24.04	25.88	27.96	30.90
22.91	24.21	26.01	28.12	31.08

LAS_{min}	2023-06-02 09:39:55	55.0 dB
SEA	-99.9 dB	

	Exceedance Counts	Duration
LAS > 85.0 dB	0	0.0 s
LAS > 115.0 dB	0	0.0 s
LA_{peak} > 135.0 dB	0	0.0 s
LA_{peak} > 137.0 dB	0	0.0 s
LA_{peak} > 140.0 dB	0	0.0 s

LC_{eq}	67.4 dB
LA_{eq}	62.4 dB
LC_{eq} - LA_{eq}	5.0 dB
LAI_{eq}	67.3 dB
LA_{eq}	62.4 dB
LAI_{eq} - LA_{eq}	4.9 dB

	A		C		
	dB	**Time Stamp**	**dB**	**Time Stamp**	**dB**
L_{eq}	62.4		67.4		
$L_{S(max)}$	72.9	2023/06/02 9:47:36			
$L_{S(min)}$	55.0	2023/06/02 9:39:55			
$L_{Peak(max)}$	94.0	2023/06/02 9:38:51			

Overload Count	0
Overload Duration	0.0 s

Dose Settings

Dose Name	OSHA-1	OSHA-2
Exchange Rate	5	3 dB
Threshold	90	80 dB
Criterion Level	90	90 dB
Criterion Duration	8	8 h

Results

Dose	0.07	0.01 %
Projected Dose	2.03	0.17 %
TWA (Projected)	61.9	62.4 dB
TWA (t)	37.2	47.5 dB
Lep (t)	47.5	47.5 dB

Statistics

LA 3.00	67.2 dB
LA 8.00	65.2 dB
LA 16.00	64.0 dB
LA 25.00	63.1 dB
LA 50.00	61.2 dB
LA 90.00	57.9 dB

Calibration History					
Preamp	**Date**		**dB re. 1V/Pa**	**6.3**	**8.0**
PRMLxT1L	2023-06-02	09:33:27	-28.28	53.36	53.49
PRMLxT1L	2023-04-20	12:21:05	-28.23	65.37	65.89
PRMLxT1L	2023-04-20	12:15:43	-28.27	41.54	48.03
PRMLxT1L	2023-04-20	11:25:27	-28.22	54.11	49.56
PRMLxT1L	2023-04-20	10:48:21	-28.18	93.18	72.86
PRMLxT1L	2023-04-20	10:48:00	-28.14	57.61	54.82
PRMLxT1L	2023-04-20	10:12:02	-28.25	50.48	51.81
PRMLxT1L	2023-04-20	09:22:48	-28.21	59.18	54.35
PRMLxT1L	2023-04-20	05:53:09	-28.17	46.01	48.06
PRMLxT1L	2023-04-20	04:58:32	-28.15	65.01	58.46
PRMLxT1L	2023-02-16	13:52:45	-28.11	59.49	56.37

Z
Time Stamp

10.0	12.5	16.0	20.0	25.0	31.5	40.0	50.0	63.0	80.0	100	125	160	200
46.14	52.60	52.95	56.44	57.95	54.90	59.03	54.84	56.64	63.28	53.82	57.57	55.20	55.53
69.75	71.98	66.39	56.36	62.75	62.95	59.47	56.02	56.17	56.32	57.34	55.24	53.53	54.24
51.27	52.51	61.11	58.99	63.61	62.00	58.53	56.62	60.83	54.62	58.36	52.99	50.46	53.21
51.32	56.01	53.39	51.36	67.26	63.00	56.78	59.34	62.82	52.48	55.59	53.67	49.71	52.87
49.55	58.51	51.92	65.81	65.50	60.96	63.52	58.10	55.36	56.27	54.47	55.20	59.05	51.18
97.16	96.27	103.89	54.39	63.59	58.27	61.52	55.75	62.67	58.02	56.85	55.59	55.03	52.65
57.85	55.24	67.59	62.22	59.85	63.05	54.95	55.33	58.78	56.20	82.52	81.18	76.66	69.95
52.45	60.69	64.37	67.06	58.62	64.49	65.05	64.78	61.55	55.89	54.84	61.91	61.68	62.44
45.97	45.66	55.38	56.64	54.71	59.17	62.81	56.41	54.52	64.39	58.12	53.75	57.16	50.37
61.83	56.14	61.83	64.52	68.85	69.38	62.35	57.22	66.34	65.72	60.34	66.34	65.05	62.81
53.26	54.06	45.60	45.34	43.69	44.27	38.96	36.84	32.73	33.38	33.58	36.19	31.56	32.60

250	315	400	500	630	800	1000	1250	1600	2000	2500	3150	4000	5000	6300
55.87	52.71	53.45	47.27	45.30	47.04	113.93	51.08	46.21	66.02	35.67	62.90	31.09	34.61	25.30
57.06	54.90	54.62	50.06	41.41	31.68	114.03	48.83	20.25	66.06	22.82	63.22	28.52	34.03	22.11
48.48	49.51	49.07	44.14	36.94	30.22	113.93	48.73	18.75	65.98	22.57	63.15	28.35	33.87	22.10
45.85	46.95	46.32	42.30	37.91	35.16	113.94	48.82	20.17	66.04	22.61	63.03	28.52	33.61	21.90
53.11	52.15	52.87	46.95	41.63	39.31	113.95	48.87	22.78	65.90	22.16	63.00	28.29	33.59	22.45
52.05	52.52	46.08	43.22	38.55	37.79	114.10	49.04	24.40	66.01	22.01	63.15	27.84	33.82	22.78
70.93	68.71	67.47	60.64	60.14	64.62	113.93	61.68	49.47	70.16	49.03	66.33	60.17	55.82	53.23
55.31	63.09	56.30	54.84	43.01	35.20	113.94	49.02	22.43	66.03	21.82	62.86	28.55	33.80	21.52
47.92	47.42	46.61	43.74	37.46	31.46	113.96	49.08	18.82	65.82	21.67	62.81	28.55	34.03	21.63
64.43	62.36	63.84	60.92	54.40	40.92	113.94	49.21	27.45	65.89	22.08	62.77	28.56	33.89	21.51
37.52	34.57	36.42	37.45	27.09	29.02	113.94	48.96	18.55	66.38	20.66	60.93	26.90	32.18	21.47

8000	10000	12500	16000	20000
24.78	26.80	27.52	28.66	31.15
23.08	24.56	26.43	28.97	31.01
22.95	24.21	26.33	28.45	30.60
22.83	24.36	26.04	28.29	30.59
23.20	41.67	25.97	28.68	31.51
23.47	24.23	26.00	28.49	31.04
51.90	50.48	48.89	47.72	46.85
23.06	24.15	25.70	28.11	30.78
22.64	24.04	25.88	27.96	30.90
22.91	24.21	26.01	28.12	31.08
22.53	24.21	25.91	28.37	31.04

Summary

File Name on Meter	LxT_Data.149.s
File Name on PC	LxT_0003285-20230602 102607-LxT_Data.149.ldbin
Serial Number	0003285
Model	SoundTrack LxT®
Firmware Version	2.302
User	
Location	
Job Description	
Note	

Measurement

Description	
Start	2023-06-02 10:26:07
Stop	2023-06-02 10:41:52
Duration	00:15:45.8
Run Time	00:15:45.8
Pause	00:00:00.0
Pre-Calibration	2023-06-02 10:25:35
Post-Calibration	None
Calibration Deviation	---

Overall Settings

RMS Weight	A Weighting			
Peak Weight	A Weighting			
Detector	Slow			
Preamplifier	PRMLxT1L			
Microphone Correction	Off			
Integration Method	Linear			
Overload	121.8 dB			
	A	**C**	**Z**	
Under Range Peak	**78.1**	75.1	80.1	dB
Under Range Limit	**26.1**	25.9	31.0	dB
Noise Floor	16.5	16.8	21.9	dB

	First	**Second**	**Third**
Instrument Identification			

Results

LA_{eq}	66.4 dB			
LAE	96.2 dB			
EA	458.730 µPa²h			
EA8	13.969 mPa²h			
EA40	69.843 mPa²h			
$LA_{peak\ (max)}$	2023-06-02 10:29:56	95.4	dB	
LAS_{max}	2023-06-02 10:29:56	78.7	dB	

LAS_{min}	2023-06-02 10:36:48	56.9 dB
SEA	-99.9 dB	

	Exceedance Counts	Duration
LAS > 85.0 dB	0	0.0 s
LAS > 115.0 dB	0	0.0 s
LA_{peak} > 135.0 dB	0	0.0 s
LA_{peak} > 137.0 dB	0	0.0 s
LA_{peak} > 140.0 dB	0	0.0 s

LC_{eq}	68.8 dB
LA_{eq}	66.4 dB
LC_{eq} - LA_{eq}	2.4 dB
LAI_{eq}	71.7 dB
LA_{eq}	66.4 dB
LAI_{eq} - LA_{eq}	5.3 dB

	A		C		
	dB	**Time Stamp**	**dB**	**Time Stamp**	**dB**
L_{eq}	66.4		68.8		
$L_{S(max)}$	78.7	2023/06/02 10:29:56			
$L_{S(min)}$	56.9	2023/06/02 10:36:48			
$L_{Peak(max)}$	95.4	2023/06/02 10:29:56			

Overload Count	0
Overload Duration	0.0 s

Dose Settings

Dose Name	OSHA-1	OSHA-2
Exchange Rate	5	3 dB
Threshold	90	80 dB
Criterion Level	90	90 dB
Criterion Duration	8	8 h

Results

Dose	0.11	0.01 %
Projected Dose	3.49	0.45 %
TWA (Projected)	65.8	66.5 dB
TWA (t)	41.2	51.7 dB
Lep (t)	51.6	51.6 dB

Statistics

LA 3.00	71.7 dB
LA 8.00	69.9 dB
LA 16.00	68.3 dB
LA 25.00	67.1 dB
LA 50.00	64.6 dB
LA 90.00	60.6 dB

Calibration History

Preamp	Date	dB re. 1V/Pa	6.3	8.0
PRMLxT1L	2023-06-02 10:25:34	-28.17	42.13	52.77
PRMLxT1L	2023-06-02 09:55:07	-28.21	54.76	54.16
PRMLxT1L	2023-06-02 09:33:27	-28.28	53.36	53.49
PRMLxT1L	2023-04-20 12:21:05	-28.23	65.37	65.89
PRMLxT1L	2023-04-20 12:15:43	-28.27	41.54	48.03
PRMLxT1L	2023-04-20 11:25:27	-28.22	54.11	49.56
PRMLxT1L	2023-04-20 10:48:21	-28.18	93.18	72.86
PRMLxT1L	2023-04-20 10:48:00	-28.14	57.61	54.82
PRMLxT1L	2023-04-20 10:12:02	-28.25	50.48	51.81
PRMLxT1L	2023-04-20 09:22:48	-28.21	59.18	54.35
PRMLxT1L	2023-04-20 05:53:09	-28.17	46.01	48.06

Z
Time Stamp

10.0	12.5	16.0	20.0	25.0	31.5	40.0	50.0	63.0	80.0	100	125	160	200
46.42	54.04	53.33	52.49	65.47	61.97	57.15	61.52	60.22	57.69	56.76	57.99	52.45	51.29
48.18	50.42	56.81	58.37	59.83	57.01	56.29	52.26	50.96	51.36	49.09	46.61	48.10	48.76
46.14	52.60	52.95	56.44	57.95	54.90	59.03	54.84	56.64	63.28	53.82	57.57	55.20	55.53
69.75	71.98	66.39	56.36	62.75	62.95	59.47	56.02	56.17	56.32	57.34	55.24	53.53	54.24
51.27	52.51	61.11	58.99	63.61	62.00	58.53	56.62	60.83	54.62	58.36	52.99	50.46	53.21
51.32	56.01	53.39	51.36	67.26	63.00	56.78	59.34	62.82	52.48	55.59	53.67	49.71	52.87
49.55	58.51	51.92	65.81	65.50	60.96	63.52	58.10	55.36	56.27	54.47	55.20	59.05	51.18
97.16	96.27	103.89	54.39	63.59	58.27	61.52	55.75	62.67	58.02	56.85	55.59	55.03	52.65
57.85	55.24	67.59	62.22	59.85	63.05	54.95	55.33	58.78	56.20	82.52	81.18	76.66	69.95
52.45	60.69	64.37	67.06	58.62	64.49	65.05	64.78	61.55	55.89	54.84	61.91	61.68	62.44
45.97	45.66	55.38	56.64	54.71	59.17	62.81	56.41	54.52	64.39	58.12	53.75	57.16	50.37

250	315	400	500	630	800	1000	1250	1600	2000	2500	3150	4000	5000	6300
52.98	51.43	58.09	59.71	50.77	41.20	114.03	48.94	26.43	66.05	21.62	62.92	28.13	33.78	21.85
48.61	49.01	57.24	54.67	45.13	39.44	114.05	48.98	21.57	66.14	22.32	62.97	28.33	33.75	21.98
55.87	52.71	53.45	47.27	45.30	47.04	113.93	51.08	46.21	66.02	35.67	62.90	31.09	34.61	25.30
57.06	54.90	54.62	50.06	41.41	31.68	114.03	48.83	20.25	66.06	22.82	63.22	28.52	34.03	22.11
48.48	49.51	49.07	44.14	36.94	30.22	113.93	48.73	18.75	65.98	22.57	63.15	28.35	33.87	22.10
45.85	46.95	46.32	42.30	37.91	35.16	113.94	48.82	20.17	66.04	22.61	63.03	28.52	33.61	21.90
53.11	52.15	52.87	46.95	41.63	39.31	113.95	48.87	22.78	65.90	22.16	63.00	28.29	33.59	22.45
52.05	52.52	46.08	43.22	38.55	37.79	114.10	49.04	24.40	66.01	22.01	63.15	27.84	33.82	22.78
70.93	68.71	67.47	60.64	60.14	64.62	113.93	61.68	49.47	70.16	49.03	66.33	60.17	55.82	53.23
55.31	63.09	56.30	54.84	43.01	35.20	113.94	49.02	22.43	66.03	21.82	62.86	28.55	33.80	21.52
47.92	47.42	46.61	43.74	37.46	31.46	113.96	49.08	18.82	65.82	21.67	62.81	28.55	34.03	21.63

8000	10000	12500	16000	20000
22.75	24.21	25.94	28.40	30.60
22.55	24.29	26.33	28.58	31.12
24.78	26.80	27.52	28.66	31.15
23.08	24.56	26.43	28.97	31.01
22.95	24.21	26.33	28.45	30.60
22.83	24.36	26.04	28.29	30.59
23.20	41.67	25.97	28.68	31.51
23.47	24.23	26.00	28.49	31.04
51.90	50.48	48.89	47.72	46.85
23.06	24.15	25.70	28.11	30.78
22.64	24.04	25.88	27.96	30.90

Summary

File Name on Meter	LxT_Data.150.s
File Name on PC	LxT_0003285-20230615 174607-LxT_Data.150.ldbin
Serial Number	0003285
Model	SoundTrack LxT®
Firmware Version	2.302
User	
Location	
Job Description	
Note	

Measurement

Description	
Start	2023-06-15 17:46:07
Stop	2023-06-15 18:08:57
Duration	00:22:49.6
Run Time	00:22:49.6
Pause	00:00:00.0
Pre-Calibration	2023-06-15 17:45:47
Post-Calibration	None
Calibration Deviation	---

Overall Settings

RMS Weight	A Weighting			
Peak Weight	Z Weighting			
Detector	Slow			
Preamplifier	PRMLxT1L			
Microphone Correction	Off			
Integration Method	Exponential			
Overload	121.8 dB			
	A	**C**	**Z**	
Under Range Peak	78.1	75.1	**80.1**	dB
Under Range Limit	**26.1**	25.9	31.0	dB
Noise Floor	16.5	16.7	21.9	dB

	First	**Second**	**Third**
Instrument Identification			

Results

LA_{Seq}	80.3 dB		
LASE	111.7 dB		
EAS	16.306 mPa^2h		
EAS8	342.887 mPa^2h		
EAS40	1.714 Pa^2h		
$LZ_{peak\ (max)}$	2023-06-15 17:58:28	107.1	dB
LAS_{max}	2023-06-15 17:46:34	91.9	dB

LAS_{min}	2023-06-15 18:07:06	55.7 dB
SEA	-99.9 dB	

	Exceedance Counts	Duration
LAS > 85.0 dB	49	181.7 s
LAS > 115.0 dB	0	0.0 s
LZ_{peak} > 135.0 dB	0	0.0 s
LZ_{peak} > 137.0 dB	0	0.0 s
LZ_{peak} > 140.0 dB	0	0.0 s

LC_{Seq}	84.2 dB
LA_{Seq}	80.3 dB
LC_{Seq} - LA_{Seq}	3.9 dB
LAI_{eq}	85.0 dB
LA_{eq}	80.3 dB
LAI_{eq} - LA_{eq}	4.7 dB

	A		C		
	dB	**Time Stamp**	**dB**	**Time Stamp**	**dB**
L_{eq}	80.3				
$L_{S(max)}$	91.9	2023/06/15 17:46:34			
$L_{S(min)}$	55.7	2023/06/15 18:07:06			
$L_{Peak(max)}$					107.1

Overload Count	0
Overload Duration	0.0 s

Dose Settings

Dose Name	OSHA-1	OSHA-2
Exchange Rate	5	5 dB
Threshold	90	80 dB
Criterion Level	90	90 dB
Criterion Duration	8	8 h

Results

Dose	0.02	0.72 %
Projected Dose	0.36	15.18 %
TWA (Projected)	49.5	76.4 dB
TWA (t)	27.5	54.4 dB
Lep (t)	67.1	67.1 dB

Statistics

LAS 5.00	86.3 dB
LAS 10.00	84.6 dB
LAS 33.30	80.3 dB
LAS 50.00	76.2 dB
LAS 66.60	65.6 dB
LAS 90.00	61.3 dB

Calibration History				
Preamp	**Date**	**dB re. 1V/Pa**	**6.3**	**8.0**
PRMLxT1L	2023-06-15 17:45:45	-28.14	65.45	52.00
PRMLxT1L	2023-06-02 10:25:34	-28.17	42.13	52.77
PRMLxT1L	2023-06-02 09:55:07	-28.21	54.76	54.16
PRMLxT1L	2023-06-02 09:33:27	-28.28	53.36	53.49
PRMLxT1L	2023-04-20 12:21:05	-28.23	65.37	65.89
PRMLxT1L	2023-04-20 12:15:43	-28.27	41.54	48.03
PRMLxT1L	2023-04-20 11:25:27	-28.22	54.11	49.56
PRMLxT1L	2023-04-20 10:48:21	-28.18	93.18	72.86
PRMLxT1L	2023-04-20 10:48:00	-28.14	57.61	54.82
PRMLxT1L	2023-04-20 10:12:02	-28.25	50.48	51.81
PRMLxT1L	2023-04-20 09:22:48	-28.21	59.18	54.35

Z
Time Stamp
2023/06/15 17:58:28

10.0	12.5	16.0	20.0	25.0	31.5	40.0	50.0	63.0	80.0	100	125	160
56.45	56.40	56.28	61.07	64.86	65.87	66.76	61.34	58.74	79.37	69.26	70.35	79.65
46.42	54.04	53.33	52.49	65.47	61.97	57.15	61.52	60.22	57.69	56.76	57.99	52.45
48.18	50.42	56.81	58.37	59.83	57.01	56.29	52.26	50.96	51.36	49.09	46.61	48.10
46.14	52.60	52.95	56.44	57.95	54.90	59.03	54.84	56.64	63.28	53.82	57.57	55.20
69.75	71.98	66.39	56.36	62.75	62.95	59.47	56.02	56.17	56.32	57.34	55.24	53.53
51.27	52.51	61.11	58.99	63.61	62.00	58.53	56.62	60.83	54.62	58.36	52.99	50.46
51.32	56.01	53.39	51.36	67.26	63.00	56.78	59.34	62.82	52.48	55.59	53.67	49.71
49.55	58.51	51.92	65.81	65.50	60.96	63.52	58.10	55.36	56.27	54.47	55.20	59.05
97.16	96.27	103.89	54.39	63.59	58.27	61.52	55.75	62.67	58.02	56.85	55.59	55.03
57.85	55.24	67.59	62.22	59.85	63.05	54.95	55.33	58.78	56.20	82.52	81.18	76.66
52.45	60.69	64.37	67.06	58.62	64.49	65.05	64.78	61.55	55.89	54.84	61.91	61.68

200	250	315	400	500	630	800	1000	1250	1600	2000	2500	3150	4000	5000
67.15	68.11	60.22	60.58	59.43	61.65	52.84	114.00	49.04	35.12	66.14	24.31	62.95	28.20	33.60
51.29	52.98	51.43	58.09	59.71	50.77	41.20	114.03	48.94	26.43	66.05	21.62	62.92	28.13	33.78
48.76	48.61	49.01	57.24	54.67	45.13	39.44	114.05	48.98	21.57	66.14	22.32	62.97	28.33	33.75
55.53	55.87	52.71	53.45	47.27	45.30	47.04	113.93	51.08	46.21	66.02	35.67	62.90	31.09	34.61
54.24	57.06	54.90	54.62	50.06	41.41	31.68	114.03	48.83	20.25	66.06	22.82	63.22	28.52	34.03
53.21	48.48	49.51	49.07	44.14	36.94	30.22	113.93	48.73	18.75	65.98	22.57	63.15	28.35	33.87
52.87	45.85	46.95	46.32	42.30	37.91	35.16	113.94	48.82	20.17	66.04	22.61	63.03	28.52	33.61
51.18	53.11	52.15	52.87	46.95	41.63	39.31	113.95	48.87	22.78	65.90	22.16	63.00	28.29	33.59
52.65	52.05	52.52	46.08	43.22	38.55	37.79	114.10	49.04	24.40	66.01	22.01	63.15	27.84	33.82
69.95	70.93	68.71	67.47	60.64	60.14	64.62	113.93	61.68	49.47	70.16	49.03	66.33	60.17	55.82
62.44	55.31	63.09	56.30	54.84	43.01	35.20	113.94	49.02	22.43	66.03	21.82	62.86	28.55	33.80

6300	8000	10000	12500	16000	20000
21.89	23.02	24.27	26.01	28.45	30.73
21.85	22.75	24.21	25.94	28.40	30.60
21.98	22.55	24.29	26.33	28.58	31.12
25.30	24.78	26.80	27.52	28.66	31.15
22.11	23.08	24.56	26.43	28.97	31.01
22.10	22.95	24.21	26.33	28.45	30.60
21.90	22.83	24.36	26.04	28.29	30.59
22.45	23.20	41.67	25.97	28.68	31.51
22.78	23.47	24.23	26.00	28.49	31.04
53.23	51.90	50.48	48.89	47.72	46.85
21.52	23.06	24.15	25.70	28.11	30.78