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## **Appendix H2**

### Construction Noise Modeling Inputs and Outputs



To User: bordered cells are inputs, unbordered cells have formulae

noise level limit for construction phase at residential land use, per FTA guidance = 80  
 allowable hours over which Leq is to be averaged = 8

temporary barrier (TB) of input height inserted between source and receptor

Construction Activity	Equipment	Total Equipment Qty	AUF % (from FHWA RCNM)	Reference Lmax @ 50 ft. from FHWA RCNM	Client Equipment Description, Data Source and/or Notes	Source to NSR Distance (ft.)	Temporary Barrier Insertion Loss (dB)	Additional Noise Reduction	Distance-Adjusted Lmax	Allowable Operation Time (hours)	Allowable Operation Time (minutes)	Predicted 8-hour Leq	Source Elevation (ft)	Receiver Elevation (ft)	Barrier Height (ft)	Source to Barr. ("A") Horiz. (ft)	Rcvr. to Barr. ("B") Horiz. (ft)	Source to Rcvr. ("C") Horiz. (ft)	"A" (ft)	"B" (ft)	"C" (ft)	Path Length Diff. "P" (ft)	Abarr (dB)	Heff (with barrier)	Heff (w/out barrier)	G (with barrier)	G (without barrier)	ILbarr (dB)
Demolition	front end loader	1	40	79		620	0.1		51.9	8	480	48	5	5	0	615	5	620	615.0	7.1	620.0	0.00	0.1	5.0	5.0	0.7	0.7	0.1
	excavator	1	40	81		620	0.1		53.9	8	480	50	5	5	0	615	5	620	615.0	7.1	620.0	0.00	0.1	5.0	5.0	0.7	0.7	0.1
	concrete saw	1	20	90		620	0.1		62.9	8	480	56	5	5	0	615	5	620	615.0	7.1	620.0	0.00	0.1	5.0	5.0	0.7	0.7	0.1
	tractor	1	40	84		620	0.1		56.9	8	480	53	5	5	0	615	5	620	615.0	7.1	620.0	0.00	0.1	5.0	5.0	0.7	0.7	0.1
Total for Demolition Phase:												58.8																
Site Preparation	dozer	1	40	82		620	0.1		54.9	8	480	51	5	5	0	615	5	620	615.0	7.1	620.0	0.00	0.1	5.0	5.0	0.7	0.7	0.1
	tractor	1	40	84		620	0.1		56.9	8	480	53	5	5	0	615	5	620	615.0	7.1	620.0	0.00	0.1	5.0	5.0	0.7	0.7	0.1
	front end loader	1	40	79		620	0.1		51.9	8	480	48	5	5	0	615	5	620	615.0	7.1	620.0	0.00	0.1	5.0	5.0	0.7	0.7	0.1
	backhoe	1	40	78		620	0.1		50.9	8	480	47	5	5	0	615	5	620	615.0	7.1	620.0	0.00	0.1	5.0	5.0	0.7	0.7	0.1
Total for Site Preparation Phase:												56.4																
Grading (including utilities)	excavator	1	40	81		620	0.1		53.9	8	480	50	5	5	0	615	5	620	615.0	7.1	620.0	0.00	0.1	5.0	5.0	0.7	0.7	0.1
	dozer	1	40	82		620	0.1		54.9	8	480	51	5	5	0	615	5	620	615.0	7.1	620.0	0.00	0.1	5.0	5.0	0.7	0.7	0.1
	front end loader	1	40	79		620	0.1		51.9	8	480	48	5	5	0	615	5	620	615.0	7.1	620.0	0.00	0.1	5.0	5.0	0.7	0.7	0.1
	tractor	1	40	84		620	0.1		56.9	8	480	53	5	5	0	615	5	620	615.0	7.1	620.0	0.00	0.1	5.0	5.0	0.7	0.7	0.1
	grader	1	40	85		620	0.1		57.9	8	480	54	5	5	0	615	5	620	615.0	7.1	620.0	0.00	0.1	5.0	5.0	0.7	0.7	0.1
Total for Grading (including utilities) Phase:												58.7																
Building/Vertical Construction	generator	1	50	72		620	0.1		44.9	8	480	42	5	5	0	615	5	620	615.0	7.1	620.0	0.00	0.1	5.0	5.0	0.7	0.7	0.1
	crane	1	16	81		620	0.1		53.9	7	420	45	5	5	0	615	5	620	615.0	7.1	620.0	0.00	0.1	5.0	5.0	0.7	0.7	0.1
	man lift	1	20	75		620	0.1		47.9	8	480	41	5	5	0	615	5	620	615.0	7.1	620.0	0.00	0.1	5.0	5.0	0.7	0.7	0.1
	backhoe	1	40	78		620	0.1		50.9	7	420	46	5	5	0	615	5	620	615.0	7.1	620.0	0.00	0.1	5.0	5.0	0.7	0.7	0.1
	welder / torch	1	40	73		620	0.1		45.9	8	480	42	5	5	0	615	5	620	615.0	7.1	620.0	0.00	0.1	5.0	5.0	0.7	0.7	0.1
Total for Building/Vertical Construction Phase:												50.9																
Paving	paver	1	50	77		625	0.1		49.9	8	480	47	5	5	0	620	5	625	620.0	7.1	625.0	0.00	0.1	5.0	5.0	0.7	0.7	0.1
	concrete mixer truck	1	40	79		625	0.1		51.9	8	480	48	5	5	0	620	5	625	620.0	7.1	625.0	0.00	0.1	5.0	5.0	0.7	0.7	0.1
	concrete pump truck	1	20	81		625	0.1		53.9	8	480	47	5	5	0	620	5	625	620.0	7.1	625.0	0.00	0.1	5.0	5.0	0.7	0.7	0.1
	roller	1	20	80		625	0.1		52.9	8	480	46	5	5	0	620	5	625	620.0	7.1	625.0	0.00	0.1	5.0	5.0	0.7	0.7	0.1
Total for Paving Phase:												53.0																
Architectural Coating	compressor (air)	1	40	78		620	0.1		50.9	6	360	46	5	5	0	615	5	620	615.0	7.1	620.0	0.00	0.1	5.0	5.0	0.7	0.7	0.1
Total for Architectural Coating Phase:												45.7																
Rail Spurs Construction		0	#N/A	#N/A		620	0.1		#N/A	6	360	0	5	5	0	615	5	620	615.0	7.1	620.0	0.00	0.1	5.0	5.0	0.7	0.7	0.1
Total for Rail Spurs Construction Phase:												0.0																

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noise level limit for construction phase at residential land use, per FTA guidance = 80  
 allowable hours over which Leq is to be averaged = 8

     = temporary barrier (TB) of input height inserted between source and receptor

Construction Activity	Equipment	Total Equipment Qty	AUF % (from FHWA RCNM)	Reference Lmax @ 50 ft. from FHWA RCNM	Client Equipment Description, Data Source and/or Notes	Source to NSR Distance (ft.)	Temporary Barrier Insertion Loss (dB)	Additional Noise Reduction	Distance-Adjusted Lmax	Allowable Operation Time (hours)	Allowable Operation Time (minutes)	Predicted 8-hour Leq	Source Elevation (ft)	Receiver Elevation (ft)	Barrier Height (ft)	Source to Barr. ("A") Horiz. (ft)	Rcvr. to Barr. ("B") Horiz. (ft)	Source to Rcvr. ("C") Horiz. (ft)	"A" (ft)	"B" (ft)	"C" (ft)	Path Length Diff. "P" (ft)	Abarr (dB)	Heff (with barrier)	Heff (w/out barrier)	G (with barrier)	G (without barrier)	ILbarr (dB)													
Demolition	front end loader	2	40	79		1560	0.1		42.8	8	480	42	5	5	0	1555	5	1560	1555.0	7.1	1560.0	0.00	0.1	5.0	5.0	0.7	0.7	0.1													
	excavator	3	40	81		1560	0.1		44.8	8	480	46	5	5	0	1555	5	1560	1555.0	7.1	1560.0	0.00	0.1	5.0	5.0	0.7	0.7	0.1													
	concrete saw	1	20	90		1560	0.1		53.8	8	480	47	5	5	0	1555	5	1560	1555.0	7.1	1560.0	0.00	0.1	5.0	5.0	0.7	0.7	0.1													
	tractor	1	40	84		1560	0.1		47.8	8	480	44	5	5	0	1555	5	1560	1555.0	7.1	1560.0	0.00	0.1	5.0	5.0	0.7	0.7	0.1													
Total for Demolition Phase:												50.9																													
Site Preparation	dozer	3	40	82		1560	0.1		45.8	8	480	47	5	5	0	1555	5	1560	1555.0	7.1	1560.0	0.00	0.1	5.0	5.0	0.7	0.7	0.1													
	tractor	2	40	84		1560	0.1		47.8	8	480	47	5	5	0	1555	5	1560	1555.0	7.1	1560.0	0.00	0.1	5.0	5.0	0.7	0.7	0.1													
	front end loader	1	40	79		1560	0.1		42.8	8	480	39	5	5	0	1555	5	1560	1555.0	7.1	1560.0	0.00	0.1	5.0	5.0	0.7	0.7	0.1													
	backhoe	1	40	78		1560	0.1		41.8	8	480	38	5	5	0	1555	5	1560	1555.0	7.1	1560.0	0.00	0.1	5.0	5.0	0.7	0.7	0.1													
Total for Site Preparation Phase:												50.3																													
Grading (including utilities)	excavator	1	40	81		1560	0.1		44.8	8	480	41	5	5	0	1555	5	1560	1555.0	7.1	1560.0	0.00	0.1	5.0	5.0	0.7	0.7	0.1													
	dozer	1	40	82		1560	0.1		45.8	8	480	42	5	5	0	1555	5	1560	1555.0	7.1	1560.0	0.00	0.1	5.0	5.0	0.7	0.7	0.1													
	front end loader	2	40	79		1560	0.1		42.8	8	480	42	5	5	0	1555	5	1560	1555.0	7.1	1560.0	0.00	0.1	5.0	5.0	0.7	0.7	0.1													
	tractor	1	40	84		1560	0.1		47.8	8	480	44	5	5	0	1555	5	1560	1555.0	7.1	1560.0	0.00	0.1	5.0	5.0	0.7	0.7	0.1													
	grader	1	40	85		1560	0.1		48.8	8	480	45	5	5	0	1555	5	1560	1555.0	7.1	1560.0	0.00	0.1	5.0	5.0	0.7	0.7	0.1													
Total for Grading (including utilities) Phase:												49.9																													
Building/Vertical Construction	generator	1	50	72		1560	0.1		35.8	8	480	33	5	5	0	1555	5	1560	1555.0	7.1	1560.0	0.00	0.1	5.0	5.0	0.7	0.7	0.1													
	crane	1	16	81		1560	0.1		44.8	7	420	36	5	5	0	1555	5	1560	1555.0	7.1	1560.0	0.00	0.1	5.0	5.0	0.7	0.7	0.1													
	man lift	3	20	75		1560	0.1		38.8	8	480	37	5	5	0	1555	5	1560	1555.0	7.1	1560.0	0.00	0.1	5.0	5.0	0.7	0.7	0.1													
	backhoe	3	40	78		1560	0.1		41.8	7	420	42	5	5	0	1555	5	1560	1555.0	7.1	1560.0	0.00	0.1	5.0	5.0	0.7	0.7	0.1													
	welder / torch	1	40	73		1560	0.1		36.8	8	480	33	5	5	0	1555	5	1560	1555.0	7.1	1560.0	0.00	0.1	5.0	5.0	0.7	0.7	0.1													
Total for Building/Vertical Construction Phase:												44.6																													
Paving	paver	2	50	77		1560	0.1		40.8	8	480	41	5	5	0	1555	5	1560	1555.0	7.1	1560.0	0.00	0.1	5.0	5.0	0.7	0.7	0.1													
	concrete mixer truck	1	40	79		1560	0.1		42.8	8	480	39	5	5	0	1555	5	1560	1555.0	7.1	1560.0	0.00	0.1	5.0	5.0	0.7	0.7	0.1													
	concrete pump truck	1	20	81		1560	0.1		44.8	8	480	38	5	5	0	1555	5	1560	1555.0	7.1	1560.0	0.00	0.1	5.0	5.0	0.7	0.7	0.1													
	roller	2	20	80		1560	0.1		43.8	8	480	40	5	5	0	1555	5	1560	1555.0	7.1	1560.0	0.00	0.1	5.0	5.0	0.7	0.7	0.1													
Total for Paving Phase:												45.5																													
Architectural Coating	compressor (air)	1	40	78		1560	0.1		41.8	6	360	37	5	5	0	1555	5	1560	1555.0	7.1	1560.0	0.00	0.1	5.0	5.0	0.7	0.7	0.1													
Total for Architectural Coating Phase:												36.6																													
Rail Spurs Construction		0	#N/A	#N/A		1560	0.1		#N/A	6	360	0	5	5	0	1555	5	1560	1555.0	7.1	1560.0	0.00	0.1	5.0	5.0	0.7	0.7	0.1													
Total for Rail Spurs Construction Phase:												0.0																													

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noise level limit for construction phase at residential land use, per FTA guidance = 80  
 allowable hours over which Leq is to be averaged = 8

temporary barrier (TB) of input height inserted between source and receptor

Construction Activity	Equipment	Total Equipment Qty	AUF % (from FHWA RCNM)	Reference Lmax @ 50 ft. from FHWA RCNM	Client Equipment Description, Data Source and/or Notes	Source to NSR Distance (ft.)	Temporary Barrier Insertion Loss (dB)	Additional Noise Reduction	Distance-Adjusted Lmax	Allowable Operation Time (hours)	Allowable Operation Time (minutes)	Predicted 8-hour Leq	Source Elevation (ft)	Receiver Elevation (ft)	Barrier Height (ft)	Source to Barr. ("A") Horiz. (ft)	Rcvr. to Barr. ("B") Horiz. (ft)	Source to Rcvr. ("C") Horiz. (ft)	"A" (ft)	"B" (ft)	"C" (ft)	Path Length Diff. "P" (ft)	Abarr (dB)	Heff (with barrier)	Heff (w/out barrier)	G (with barrier)	G (without barrier)	ILbarr (dB)
Demolition	front end loader	1	40	79		120	0.1		68.5	8	480	65	5	5	0	115	5	120	115.1	7.1	120.0	0.00	0.1	5.0	5.0	0.7	0.7	0.1
	excavator	1	40	81		120	0.1		70.5	8	480	67	5	5	0	115	5	120	115.1	7.1	120.0	0.00	0.1	5.0	5.0	0.7	0.7	0.1
	concrete saw	1	20	90		120	0.1		79.5	8	480	73	5	5	0	115	5	120	115.1	7.1	120.0	0.00	0.1	5.0	5.0	0.7	0.7	0.1
	tractor	1	40	84		120	0.1		73.5	8	480	70	5	5	0	115	5	120	115.1	7.1	120.0	0.00	0.1	5.0	5.0	0.7	0.7	0.1
Total for Demolition Phase:																												
75.3																												
Site Preparation	dozer	1	40	82		120	0.1		71.5	8	480	68	5	5	0	115	5	120	115.1	7.1	120.0	0.00	0.1	5.0	5.0	0.7	0.7	0.1
	tractor	1	40	84		120	0.1		73.5	8	480	70	5	5	0	115	5	120	115.1	7.1	120.0	0.00	0.1	5.0	5.0	0.7	0.7	0.1
	front end loader	1	40	79		120	0.1		68.5	8	480	65	5	5	0	115	5	120	115.1	7.1	120.0	0.00	0.1	5.0	5.0	0.7	0.7	0.1
	backhoe	1	40	78		120	0.1		67.5	8	480	64	5	5	0	115	5	120	115.1	7.1	120.0	0.00	0.1	5.0	5.0	0.7	0.7	0.1
Total for Site Preparation Phase:																												
73.0																												
Grading (including utilities)	excavator	1	40	81		120	0.1		70.5	8	480	67	5	5	0	115	5	120	115.1	7.1	120.0	0.00	0.1	5.0	5.0	0.7	0.7	0.1
	dozer	1	40	82		120	0.1		71.5	8	480	68	5	5	0	115	5	120	115.1	7.1	120.0	0.00	0.1	5.0	5.0	0.7	0.7	0.1
	front end loader	1	40	79		120	0.1		68.5	8	480	65	5	5	0	115	5	120	115.1	7.1	120.0	0.00	0.1	5.0	5.0	0.7	0.7	0.1
	tractor	1	40	84		120	0.1		73.5	8	480	70	5	5	0	115	5	120	115.1	7.1	120.0	0.00	0.1	5.0	5.0	0.7	0.7	0.1
	grader	1	40	85		120	0.1		74.5	8	480	71	5	5	0	115	5	120	115.1	7.1	120.0	0.00	0.1	5.0	5.0	0.7	0.7	0.1
Total for Grading (including utilities) Phase:																												
75.2																												
Building/Vertical Construction	generator	1	50	72		120	0.1		61.5	8	480	59	5	5	0	115	5	120	115.1	7.1	120.0	0.00	0.1	5.0	5.0	0.7	0.7	0.1
	crane	1	16	81		120	0.1		70.5	7	420	62	5	5	0	115	5	120	115.1	7.1	120.0	0.00	0.1	5.0	5.0	0.7	0.7	0.1
	man lift	1	20	75		120	0.1		64.5	8	480	58	5	5	0	115	5	120	115.1	7.1	120.0	0.00	0.1	5.0	5.0	0.7	0.7	0.1
	backhoe	1	40	78		120	0.1		67.5	7	420	63	5	5	0	115	5	120	115.1	7.1	120.0	0.00	0.1	5.0	5.0	0.7	0.7	0.1
	welder / torch	1	40	73		120	0.1		62.5	8	480	59	5	5	0	115	5	120	115.1	7.1	120.0	0.00	0.1	5.0	5.0	0.7	0.7	0.1
Total for Building/Vertical Construction Phase:																												
67.4																												
Paving	paver	1	50	77		120	0.1		66.5	8	480	64	5	5	0	115	5	120	115.1	7.1	120.0	0.00	0.1	5.0	5.0	0.7	0.7	0.1
	concrete mixer truck	1	40	79		120	0.1		68.5	8	480	65	5	5	0	115	5	120	115.1	7.1	120.0	0.00	0.1	5.0	5.0	0.7	0.7	0.1
	concrete pump truck	1	20	81		120	0.1		70.5	8	480	64	5	5	0	115	5	120	115.1	7.1	120.0	0.00	0.1	5.0	5.0	0.7	0.7	0.1
	roller	1	20	80		120	0.1		69.5	8	480	63	5	5	0	115	5	120	115.1	7.1	120.0	0.00	0.1	5.0	5.0	0.7	0.7	0.1
Total for Paving Phase:																												
69.6																												
Architectural Coating	compressor (air)	1	40	78		120	0.1		67.5	6	360	62	5	5	0	115	5	120	115.1	7.1	120.0	0.00	0.1	5.0	5.0	0.7	0.7	0.1
Total for Architectural Coating Phase:																												
62.3																												
Rail Spurs Construction		0	#N/A	#N/A		120	0.1		#N/A	6	360	0	5	5	0	115	5	120	115.1	7.1	120.0	0.00	0.1	5.0	5.0	0.7	0.7	0.1
Total for Rail Spurs Construction Phase:																												
0.0																												

To User: bordered cells are inputs, unbordered cells have formulae


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 = temporary barrier (TB) of input height inserted between source and receptor

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Demolition	front end loader	2	40	79		805	0.1		49.4	8	480	48	5	5	0	800	5	805	800.0	7.1	805.0	0.00	0.1	5.0	5.0	0.7	0.7	0.1
	excavator	3	40	81		805	0.1		51.4	8	480	52	5	5	0	800	5	805	800.0	7.1	805.0	0.00	0.1	5.0	5.0	0.7	0.7	0.1
	concrete saw	1	20	90		805	0.1		60.4	8	480	53	5	5	0	800	5	805	800.0	7.1	805.0	0.00	0.1	5.0	5.0	0.7	0.7	0.1
	tractor	1	40	84		805	0.1		54.4	8	480	50	5	5	0	800	5	805	800.0	7.1	805.0	0.00	0.1	5.0	5.0	0.7	0.7	0.1
Total for Demolition Phase:												57.5																
Site Preparation	dozer	3	40	82		805	0.1		52.4	8	480	53	5	5	0	800	5	805	800.0	7.1	805.0	0.00	0.1	5.0	5.0	0.7	0.7	0.1
	tractor	2	40	84		805	0.1		54.4	8	480	53	5	5	0	800	5	805	800.0	7.1	805.0	0.00	0.1	5.0	5.0	0.7	0.7	0.1
	front end loader	1	40	79		805	0.1		49.4	8	480	45	5	5	0	800	5	805	800.0	7.1	805.0	0.00	0.1	5.0	5.0	0.7	0.7	0.1
	backhoe	1	40	78		805	0.1		48.4	8	480	44	5	5	0	800	5	805	800.0	7.1	805.0	0.00	0.1	5.0	5.0	0.7	0.7	0.1
Total for Site Preparation Phase:												56.9																
Grading (including utilities)	excavator	1	40	81		805	0.1		51.4	8	480	47	5	5	0	800	5	805	800.0	7.1	805.0	0.00	0.1	5.0	5.0	0.7	0.7	0.1
	dozer	1	40	82		805	0.1		52.4	8	480	48	5	5	0	800	5	805	800.0	7.1	805.0	0.00	0.1	5.0	5.0	0.7	0.7	0.1
	front end loader	2	40	79		805	0.1		49.4	8	480	48	5	5	0	800	5	805	800.0	7.1	805.0	0.00	0.1	5.0	5.0	0.7	0.7	0.1
	tractor	1	40	84		805	0.1		54.4	8	480	50	5	5	0	800	5	805	800.0	7.1	805.0	0.00	0.1	5.0	5.0	0.7	0.7	0.1
	grader	1	40	85		805	0.1		55.4	8	480	51	5	5	0	800	5	805	800.0	7.1	805.0	0.00	0.1	5.0	5.0	0.7	0.7	0.1
Total for Grading (including utilities) Phase:												56.5																
Building/Vertical Construction	generator	1	50	72		805	0.1		42.4	8	480	39	5	5	0	800	5	805	800.0	7.1	805.0	0.00	0.1	5.0	5.0	0.7	0.7	0.1
	crane	1	16	81		805	0.1		51.4	7	420	43	5	5	0	800	5	805	800.0	7.1	805.0	0.00	0.1	5.0	5.0	0.7	0.7	0.1
	man lift	3	20	75		805	0.1		45.4	8	480	43	5	5	0	800	5	805	800.0	7.1	805.0	0.00	0.1	5.0	5.0	0.7	0.7	0.1
	backhoe	3	40	78		805	0.1		48.4	7	420	49	5	5	0	800	5	805	800.0	7.1	805.0	0.00	0.1	5.0	5.0	0.7	0.7	0.1
	welder / torch	1	40	73		805	0.1		43.4	8	480	39	5	5	0	800	5	805	800.0	7.1	805.0	0.00	0.1	5.0	5.0	0.7	0.7	0.1
Total for Building/Vertical Construction Phase:												51.2																
Paving	paver	2	50	77		805	0.1		47.4	8	480	47	5	5	0	800	5	805	800.0	7.1	805.0	0.00	0.1	5.0	5.0	0.7	0.7	0.1
	concrete mixer truck	1	40	79		805	0.1		49.4	8	480	45	5	5	0	800	5	805	800.0	7.1	805.0	0.00	0.1	5.0	5.0	0.7	0.7	0.1
	concrete pump truck	1	20	81		805	0.1		51.4	8	480	44	5	5	0	800	5	805	800.0	7.1	805.0	0.00	0.1	5.0	5.0	0.7	0.7	0.1
	roller	2	20	80		805	0.1		50.4	8	480	46	5	5	0	800	5	805	800.0	7.1	805.0	0.00	0.1	5.0	5.0	0.7	0.7	0.1
Total for Paving Phase:												52.1																
Architectural Coating	compressor (air)	1	40	78		805	0.1		48.4	6	360	43	5	5	0	800	5	805	800.0	7.1	805.0	0.00	0.1	5.0	5.0	0.7	0.7	0.1
Total for Architectural Coating Phase:												43.2																
Rail Spurs Construction		0	#N/A	#N/A		805	0.1		#N/A	6	360	0	5	5	0	800	5	805	800.0	7.1	805.0	0.00	0.1	5.0	5.0	0.7	0.7	0.1
Total for Rail Spurs Construction Phase:												0.0																

To User: bordered cells are inputs, unbordered cells have formulae

noise level limit for construction phase at residential land use, per FTA guidance = **80**  
 allowable hours over which Leq is to be averaged = **8**

 = temporary barrier (TB) of input height inserted between source and receptor

Construction Activity	Equipment	Total Equipment Qty	AUF % (from FHWA RCNM)	Reference Lmax @ 50 ft. from FHWA RCNM	Client Equipment Description, Data Source and/or Notes	Source to NSR Distance (ft.)	Temporary Barrier Insertion Loss (dB)	Additional Noise Reduction	Distance-Adjusted Lmax	Allowable Operation Time (hours)	Allowable Operation Time (minutes)	Predicted 8-hour Leq	Source Elevation (ft)	Receiver Elevation (ft)	Barrier Height (ft)	Source to Barr. ("A") Horiz. (ft)	Rcvr. to Barr. ("B") Horiz. (ft)	Source to Rcvr. ("C") Horiz. (ft)	"A" (ft)	"B" (ft)	"C" (ft)	Path Length Diff. "P" (ft)	Abarr (dB)	Heff (with barrier)	Heff (w/out barrier)	G (with barrier)	G (without barrier)	ILbarr (dB)
Demolition	front end loader	1	40	79		1240	0.1		45.2	8	480	41	5	5	0	1235	5	1240	1235.0	7.1	1240.0	0.00	0.1	5.0	5.0	0.7	0.7	0.1
	excavator	1	40	81		1240	0.1		47.2	8	480	43	5	5	0	1235	5	1240	1235.0	7.1	1240.0	0.00	0.1	5.0	5.0	0.7	0.7	0.1
	concrete saw	1	20	90		1240	0.1		56.2	8	480	49	5	5	0	1235	5	1240	1235.0	7.1	1240.0	0.00	0.1	5.0	5.0	0.7	0.7	0.1
	tractor	1	40	84		1240	0.1		50.2	8	480	46	5	5	0	1235	5	1240	1235.0	7.1	1240.0	0.00	0.1	5.0	5.0	0.7	0.7	0.1
Total for Demolition Phase:																												
52.0																												
Site Preparation	dozer	1	40	82		1240	0.1		48.2	8	480	44	5	5	0	1235	5	1240	1235.0	7.1	1240.0	0.00	0.1	5.0	5.0	0.7	0.7	0.1
	tractor	1	40	84		1240	0.1		50.2	8	480	46	5	5	0	1235	5	1240	1235.0	7.1	1240.0	0.00	0.1	5.0	5.0	0.7	0.7	0.1
	front end loader	1	40	79		1240	0.1		45.2	8	480	41	5	5	0	1235	5	1240	1235.0	7.1	1240.0	0.00	0.1	5.0	5.0	0.7	0.7	0.1
	backhoe	1	40	78		1240	0.1		44.2	8	480	40	5	5	0	1235	5	1240	1235.0	7.1	1240.0	0.00	0.1	5.0	5.0	0.7	0.7	0.1
Total for Site Preparation Phase:																												
49.6																												
Grading (including utilities)	excavator	1	40	81		1240	0.1		47.2	8	480	43	5	5	0	1235	5	1240	1235.0	7.1	1240.0	0.00	0.1	5.0	5.0	0.7	0.7	0.1
	dozer	1	40	82		1240	0.1		48.2	8	480	44	5	5	0	1235	5	1240	1235.0	7.1	1240.0	0.00	0.1	5.0	5.0	0.7	0.7	0.1
	front end loader	1	40	79		1240	0.1		45.2	8	480	41	5	5	0	1235	5	1240	1235.0	7.1	1240.0	0.00	0.1	5.0	5.0	0.7	0.7	0.1
	tractor	1	40	84		1240	0.1		50.2	8	480	46	5	5	0	1235	5	1240	1235.0	7.1	1240.0	0.00	0.1	5.0	5.0	0.7	0.7	0.1
	grader	1	40	85		1240	0.1		51.2	8	480	47	5	5	0	1235	5	1240	1235.0	7.1	1240.0	0.00	0.1	5.0	5.0	0.7	0.7	0.1
Total for Grading (including utilities) Phase:																												
51.9																												
Building/Vertical Construction	generator	1	50	72		1240	0.1		38.2	8	480	35	5	5	0	1235	5	1240	1235.0	7.1	1240.0	0.00	0.1	5.0	5.0	0.7	0.7	0.1
	crane	1	16	81		1240	0.1		47.2	7	420	39	5	5	0	1235	5	1240	1235.0	7.1	1240.0	0.00	0.1	5.0	5.0	0.7	0.7	0.1
	man lift	1	20	75		1240	0.1		41.2	8	480	34	5	5	0	1235	5	1240	1235.0	7.1	1240.0	0.00	0.1	5.0	5.0	0.7	0.7	0.1
	backhoe	1	40	78		1240	0.1		44.2	7	420	40	5	5	0	1235	5	1240	1235.0	7.1	1240.0	0.00	0.1	5.0	5.0	0.7	0.7	0.1
	welder / torch	1	40	73		1240	0.1		39.2	8	480	35	5	5	0	1235	5	1240	1235.0	7.1	1240.0	0.00	0.1	5.0	5.0	0.7	0.7	0.1
Total for Building/Vertical Construction Phase:																												
44.1																												
Paving	paver	1	50	77		1240	0.1		43.2	8	480	40	5	5	0	1235	5	1240	1235.0	7.1	1240.0	0.00	0.1	5.0	5.0	0.7	0.7	0.1
	concrete mixer truck	1	40	79		1240	0.1		45.2	8	480	41	5	5	0	1235	5	1240	1235.0	7.1	1240.0	0.00	0.1	5.0	5.0	0.7	0.7	0.1
	concrete pump truck	1	20	81		1240	0.1		47.2	8	480	40	5	5	0	1235	5	1240	1235.0	7.1	1240.0	0.00	0.1	5.0	5.0	0.7	0.7	0.1
	roller	1	20	80		1240	0.1		46.2	8	480	39	5	5	0	1235	5	1240	1235.0	7.1	1240.0	0.00	0.1	5.0	5.0	0.7	0.7	0.1
Total for Paving Phase:																												
46.2																												
Architectural Coating	compressor (air)	1	40	78		1240	0.1		44.2	6	360	39	5	5	0	1235	5	1240	1235.0	7.1	1240.0	0.00	0.1	5.0	5.0	0.7	0.7	0.1
Total for Architectural Coating Phase:																												
38.9																												
Rail Spurs Construction		0	#N/A	#N/A		1240	0.1		#N/A	6	360	0	5	5	0	1235	5	1240	1235.0	7.1	1240.0	0.00	0.1	5.0	5.0	0.7	0.7	0.1
Total for Rail Spurs Construction Phase:																												
0.0																												

To User: bordered cells are inputs, unbordered cells have formulae

noise level limit for construction phase at residential land use, per FTA guidance = **80**  
 allowable hours over which Leq is to be averaged = **8**

**Yellow** = temporary barrier (TB) of input height inserted between source and receptor

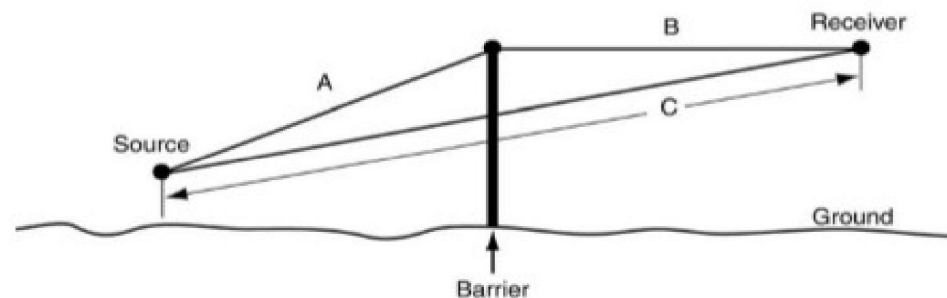
Construction Activity	Equipment	Total Equipment Qty	AUF % (from FHWA RCNM)	Reference Lmax @ 50 ft. from FHWA RCNM	Client Equipment Description, Data Source and/or Notes	Source to NSR Distance (ft.)	Temporary Barrier Insertion Loss (dB)	Additional Noise Reduction	Distance-Adjusted Lmax	Allowable Operation Time (hours)	Allowable Operation Time (minutes)	Predicted 8-hour Leq	Source Elevation (ft)	Receiver Elevation (ft)	Barrier Height (ft)	Source to Barr. ("A") Horiz. (ft)	Rcvr. to Barr. ("B") Horiz. (ft)	Source to Rcvr. ("C") Horiz. (ft)	"A" (ft)	"B" (ft)	"C" (ft)	Path Length Diff. "P" (ft)	Abarr (dB)	Heff (with barrier)	Heff (w/out barrier)	G (with barrier)	G (without barrier)	ILbarr (dB)									
Demolition	front end loader	2	40	79		2500	0.1		37.7	8	480	37	5	5	0	2495	5	2500	2495.0	7.1	2500.0	0.00	0.1	5.0	5.0	0.7	0.7	0.1									
	excavator	3	40	81		2500	0.1		39.7	8	480	41	5	5	0	2495	5	2500	2495.0	7.1	2500.0	0.00	0.1	5.0	5.0	0.7	0.7	0.1									
	concrete saw	1	20	90		2500	0.1		48.7	8	480	42	5	5	0	2495	5	2500	2495.0	7.1	2500.0	0.00	0.1	5.0	5.0	0.7	0.7	0.1									
	tractor	1	40	84		2500	0.1		42.7	8	480	39	5	5	0	2495	5	2500	2495.0	7.1	2500.0	0.00	0.1	5.0	5.0	0.7	0.7	0.1									
Total for Demolition Phase:																																					
												<b>45.8</b>																									
Site Preparation	dozer	3	40	82		2500	0.1		40.7	8	480	42	5	5	0	2495	5	2500	2495.0	7.1	2500.0	0.00	0.1	5.0	5.0	0.7	0.7	0.1									
	tractor	2	40	84		2500	0.1		42.7	8	480	42	5	5	0	2495	5	2500	2495.0	7.1	2500.0	0.00	0.1	5.0	5.0	0.7	0.7	0.1									
	front end loader	1	40	79		2500	0.1		37.7	8	480	34	5	5	0	2495	5	2500	2495.0	7.1	2500.0	0.00	0.1	5.0	5.0	0.7	0.7	0.1									
	backhoe	1	40	78		2500	0.1		36.7	8	480	33	5	5	0	2495	5	2500	2495.0	7.1	2500.0	0.00	0.1	5.0	5.0	0.7	0.7	0.1									
Total for Site Preparation Phase:																																					
												<b>45.2</b>																									
Grading (including utilities)	excavator	1	40	81		2500	0.1		39.7	8	480	36	5	5	0	2495	5	2500	2495.0	7.1	2500.0	0.00	0.1	5.0	5.0	0.7	0.7	0.1									
	dozer	1	40	82		2500	0.1		40.7	8	480	37	5	5	0	2495	5	2500	2495.0	7.1	2500.0	0.00	0.1	5.0	5.0	0.7	0.7	0.1									
	front end loader	2	40	79		2500	0.1		37.7	8	480	37	5	5	0	2495	5	2500	2495.0	7.1	2500.0	0.00	0.1	5.0	5.0	0.7	0.7	0.1									
	tractor	1	40	84		2500	0.1		42.7	8	480	39	5	5	0	2495	5	2500	2495.0	7.1	2500.0	0.00	0.1	5.0	5.0	0.7	0.7	0.1									
	grader	1	40	85		2500	0.1		43.7	8	480	40	5	5	0	2495	5	2500	2495.0	7.1	2500.0	0.00	0.1	5.0	5.0	0.7	0.7	0.1									
Total for Grading (including utilities) Phase:																																					
												<b>44.8</b>																									
Building/Vertical Construction	generator	1	50	72		2500	0.1		30.7	8	480	28	5	5	0	2495	5	2500	2495.0	7.1	2500.0	0.00	0.1	5.0	5.0	0.7	0.7	0.1									
	crane	1	16	81		2500	0.1		39.7	7	420	31	5	5	0	2495	5	2500	2495.0	7.1	2500.0	0.00	0.1	5.0	5.0	0.7	0.7	0.1									
	man lift	3	20	75		2500	0.1		33.7	8	480	32	5	5	0	2495	5	2500	2495.0	7.1	2500.0	0.00	0.1	5.0	5.0	0.7	0.7	0.1									
	backhoe	3	40	78		2500	0.1		36.7	7	420	37	5	5	0	2495	5	2500	2495.0	7.1	2500.0	0.00	0.1	5.0	5.0	0.7	0.7	0.1									
	welder / torch	1	40	73		2500	0.1		31.7	8	480	28	5	5	0	2495	5	2500	2495.0	7.1	2500.0	0.00	0.1	5.0	5.0	0.7	0.7	0.1									
Total for Building/Vertical Construction Phase:																																					
												<b>39.5</b>																									
Paving	paver	2	50	77		2500	0.1		35.7	8	480	36	5	5	0	2495	5	2500	2495.0	7.1	2500.0	0.00	0.1	5.0	5.0	0.7	0.7	0.1									
	concrete mixer truck	1	40	79		2500	0.1		37.7	8	480	34	5	5	0	2495	5	2500	2495.0	7.1	2500.0	0.00	0.1	5.0	5.0	0.7	0.7	0.1									
	concrete pump truck	1	20	81		2500	0.1		39.7	8	480	33	5	5	0	2495	5	2500	2495.0	7.1	2500.0	0.00	0.1	5.0	5.0	0.7	0.7	0.1									
	roller	2	20	80		2500	0.1		38.7	8	480	35	5	5	0	2495	5	2500	2495.0	7.1	2500.0	0.00	0.1	5.0	5.0	0.7	0.7	0.1									
Total for Paving Phase:																																					
												<b>40.4</b>																									
Architectural Coating	compressor (air)	1	40	78		2500	0.1		36.7	6	360	31	5	5	0	2495	5	2500	2495.0	7.1	2500.0	0.00	0.1	5.0	5.0	0.7	0.7	0.1									
Total for Architectural Coating Phase:																																					
												<b>31.5</b>																									
Rail Spurs Construction		0	#N/A	#N/A		2500	0.1		#N/A	6	360	0	5	5	0	2495	5	2500	2495.0	7.1	2500.0	0.00	0.1	5.0	5.0	0.7	0.7	0.1									
Total for Rail Spurs Construction Phase:																																					
												<b>0.0</b>																									



Equipment Description	Impact Device?	Acoustical Use Factor (%)	Lesser of or available Lmax	Spec. 721 Lmax	Measured L <sub>max</sub> @50ft (dBA, slow)
All Other Equipment > 5 HP	No	50	85	85	-- N/A --
Auger Drill Rig	No	20	84	85	84
Backhoe	No	40	78	80	78
Bar Bender	No	20	80	80	-- N/A --
Blasting	Yes	-- N/A --	94	94	-- N/A --
Boring Jack Power Unit	No	50	80	80	83
Chain Saw	No	20	84	85	84
Clam Shovel (dropping)	Yes	20	87	93	87
Compactor (ground)	No	20	80	80	83
Compressor (air)	No	40	78	80	78
Concrete Batch Plant	No	15	83	83	-- N/A --
Concrete Mixer Truck	No	40	79	85	79
Concrete Pump Truck	No	20	81	82	81
Concrete Saw	No	20	90	90	90
Crane	No	16	81	85	81
Dozer	No	40	82	85	82
Drill Rig Truck	No	20	79	84	79
Drum Mixer	No	50	80	80	80
Dump Truck	No	40	76	84	76
Excavator	No	40	81	85	81
Flat Bed Truck	No	40	74	84	74
Front End Loader	No	40	79	80	79
Generator	No	50	72	72	81
Generator (<25KVA, VMS signs)	No	50	70	70	73
Gradall	No	40	83	85	83
Grader	No	40	85	85	-- N/A --
Grapple (on backhoe)	No	40	85	85	87
Horizontal Boring Hydr. Jack	No	25	80	80	82
Hydra Break Ram	Yes	10	90	90	-- N/A --
Impact Pile Driver	Yes	20	95	95	101
Jackhammer	Yes	20	85	85	89
Man Lift	No	20	75	85	75
Mounted Impact Hammer (hoe ram)	Yes	20	90	90	90
Pavement Scarafier	No	20	85	85	90
Paver	No	50	77	85	77
Pickup Truck	No	40	55	55	75
Pneumatic Tools	No	50	85	85	85
Pumps	No	50	77	77	81
Refrigerator Unit	No	100	73	82	73
Rivit Buster/chipping gun	Yes	20	79	85	79
Rock Drill	No	20	81	85	81
Roller	No	20	80	85	80
Sand Blasting (Single Nozzle)	No	20	85	85	96
Scraper	No	40	84	85	84
Shears (on backhoe)	No	40	85	85	96
Slurry Plant	No	100	78	78	78
Slurry Trenching Machine	No	50	80	82	80
Soil Mix Drill Rig	No	50	80	80	-- N/A --
Tractor	No	40	84	84	-- N/A --
Vacuum Excavator (Vac-truck)	No	40	85	85	85
Vacuum Street Sweeper	No	10	80	80	82
Ventilation Fan	No	100	79	85	79
Vibrating Hopper	No	50	85	85	87
Vibratory Concrete Mixer	No	20	80	80	80
Vibratory Pile Driver	No	20	95	95	101
Warning Horn	No	5	83	85	83
Welder / Torch	No	40	73	73	74

Source <sub>elev</sub>	5.0	A <sub>horiz</sub>	24.0	A	25.0
Receiver <sub>elev</sub>	10.0	B <sub>horiz</sub>	38.0	B	38.1
C	62.2	C <sub>horiz</sub>	62.0		
P	0.85				
Barrier <sub>elev</sub>	12				
A <sub>barr</sub>	12.3				

**Barrier Parameter P**  
P = A+B-C



The above calculations, referring to inputs from the figure at right, helps a user estimate what barrier attenuation (A<sub>barr</sub>) to expect (i.e., up to 15 per formula to right) based upon source height (above grade), barrier height, and receiver height, and the horizontal distances between the source and receiver to the barrier. The FTA-based formula in the worksheets use these path length (P) and A<sub>barr</sub> values to determine the barrier's insertion loss.

11/26/21, MCS:  
the calculations herein assume the "In General" calculation of Heff per Figure 6-5, which then allows a calculation of "G" with and without barrier.

For all other barriers, and for protrusion of terrain above the line of sight:	$A_{barrier} = \min \left\{ 15 \text{ or } \left[ 20 \times \log \left( \frac{2.51\sqrt{P}}{\tanh[4.46\sqrt{P}]} \right) + 5 \right] \right\}$
Barrier Insertion Loss	$IL_{barrier} = \max \left\{ 0 \text{ or } \left[ A_{barrier} - 10(G_{NB} - G_B) \log \left( \frac{D}{50} \right) \right] \right\}$
<p>D = <u>closest</u> distance between the receiver and the source, in feet                  P = path length difference, in feet (see figure below)                  G<sub>NB</sub> = Ground factor G computed <i>without barrier</i> (see Figure 6-5)                  G<sub>B</sub> = Ground factor G computed <i>with barrier</i> (see Figure 6-5)</p> <p>† The term "tanh(variable)" stands for hyperbolic tangent, available on many scientific calculators. If "tanh" is not available, then compute E = exp(variable), and set tanh(variable) = (E - 1/E) / (E + 1/E), where exp(variable) is the "exponential" function, also written as e<sup>x</sup> on calculator keypads.</p>	

Sources: Transit Noise & Vibration Impact Assessment (FTA 2006)