Appendix F

Noise Modeling Results and Vibration Calculations

Roadway Construction Noise Model (RCNM),Version 1.1

Report date: 03/01/2022
Case Description: Piedmont Housing Element

**** Receptor #1 ****

Description	Land Use	Baselines (dBA) Daytime	Evening	Night
50 Feet from Construction	Residential	65.0	65.0	65.0

Equipment

Description	Impact Device	Usage (%)	Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Excavator	No	40		80.7	50.0	0.0
Dozer	No	40		81.7	50.0	0.0
Jackhammer	Yes	20		88.9	50.0	0.0

Results

Noise Limits (dBA)

Noise Limit Exceedance (dBA)

Equipment	Calculated (dBA) Day Lmax	Day Leq	Evening Lmax	Evening Leq	Night Lmax	Night Leq	Day Lmax	Day Leq	Evening Lmax	Evening Leq	Night Lmax	Night Leq
Excavator	80.7	76.7	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Dozer	81.7	77.7	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Jackhammer	88.9	81.9	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Total	88.9	84.2	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Groundborne Noise and Vibration Modeling

Notes
The reference distance is measured from the nearest anticipated point of construction equipment to the nearest structure. Last Updated: 09/29/2021

Variables	
V_{ref}	1E-06
Crest Factor (PPV/RMS)	4
Soil Type *(Choice: default, hard, or sands)*	default
n value	1.1

	Reference Level Inputs			
Equipment	**PPV_{ref} (in/sec)**	**Lv_{ref} (VdB)**	**RMS_{ref} (in/sec)**	**Reference Distance**
Impact Pile Driver	0.644	112	0.398	25
Sonic Pile Driver	0.17	105	0.178	25
Vibratory Roller	0.21	94	0.050	25
Hoe Ram	0.089	87	0.022	25
Large bulldozer	0.089	87	0.022	25
Caisson drilling	0.089	87	0.022	25
Loaded trucks	0.076	83	0.014	25
Jack hammer	0.035	79	0.009	25
Small bulldozer	0.003	58	0.001	25

	Vibration Level at Receiver			
Equipment	**Distance (feet)**	**PPV_x (in/sec)**	**Lv_x (VdB)**	**RMS_x (in/sec)**
Impact Pile Driver	25	0.6440	112	0.398
Sonic Pile Driver	25	0.1700	105	0.178
Vibratory Roller	25	0.2100	94	0.050
Hoe Ram	25	0.0890	87	0.022
Large bulldozer	25	0.0890	87	0.022
Caisson drilling	25	0.0890	87	0.022
Loaded trucks	25	0.0760	83	0.014
Jack hammer	25	0.0350	79	0.009
Small bulldozer	25	0.0030	58	0.001

	Vibration Contours		
	Distance to (feet)		
Equipment	**0.100 PPV**	**72.0 VdB**	**0.0080 RMS**
Impact Pile Driver	136	1645	872
Sonic Pile Driver	40	791	419
Vibratory Roller	49	250	133
Hoe Ram	22	120	64
Large bulldozer	22	120	64
Caisson drilling	22	120	64
Loaded trucks	19	79	42
Jack hammer	10	52	28
Small bulldozer	1	6	3

Sources

California Department of Transportation (Caltrans). 2020. Transportation and Construction Vibration Guidance Manual. April 2020. Available at: https://dot.ca.gov/-/media/dot-media/programs/environmental-analysis/documents/env/tcvgm-apr2020-a11y.pdf

Federal Transit Administration (FTA). 2018. Transit Noise and Vibration Imapact Assessment Manual. September 2018. Available at: https://www.transit.dot.gov/sites/fta.dot.gov/files/docs/research-innovation/118131/transit-noise-and-vibration-impact-assessment-manual-fta-report-no-0123_0.pdf

Groundborne Noise and Vibration Modeling

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Soil Type	
(Choice: default, hard, or sands)	default
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	Reference Level Inputs			
Equipment	**PPV_{ref} (in/sec)**	**Lv_{ref} (VdB)**	**RMS_{ref} (in/sec)**	**Reference Distance**
Impact Pile Driver	0.644	112	0.398	25
Sonic Pile Driver	0.17	105	0.178	25
Vibratory Roller	0.21	94	0.050	25
Hoe Ram	0.089	87	0.022	25
Large bulldozer	0.089	87	0.022	25
Caisson drilling	0.089	87	0.022	25
Loaded trucks	0.076	83	0.014	25
Jack hammer	0.035	79	0.009	25
Small bulldozer	0.003	58	0.001	25

	Vibration Level at Receiver			
Equipment	**Distance (feet)**	**PPV_x (in/sec)**	**Lv_x (VdB)**	**RMS_x (in/sec)**
Impact Pile Driver	50	0.3004	105	0.186
Sonic Pile Driver	50	0.0793	98	0.083
Vibratory Roller	50	0.0980	87	0.023
Hoe Ram	50	0.0415	80	0.010
Large bulldozer	50	0.0415	80	0.010
Caisson drilling	50	0.0415	80	0.010
Loaded trucks	50	0.0355	76	0.007
Jack hammer	50	0.0163	72	0.004
Small bulldozer	50	0.0014	51	0.000

	Vibration Contours		
	Distance to (feet)		
Equipment	**0.100 PPV**	**72.0 VdB**	**0.0080 RMS**
Impact Pile Driver	136	1645	872
Sonic Pile Driver	40	791	419
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Groundborne Noise and Vibration Modeling

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	Reference Level Inputs			
Equipment	PPV_{ref} (in/sec)	Lv_{ref} (VdB)	RMS_{ref} (in/sec)	Reference Distance
Impact Pile Driver	0.644	112	0.398	25
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Caisson drilling	0.089	87	0.022	25
Loaded trucks	0.076	83	0.014	25
Jack hammer	0.035	79	0.009	25
Small bulldozer	0.003	58	0.001	25

	Vibration Level at Receiver			
Equipment	Distance (feet)	PPV_x (in/sec)	Lv_x (VdB)	RMS_x (in/sec)
Impact Pile Driver	75	0.1923	102	0.119
Sonic Pile Driver	75	0.0508	95	0.053
Vibratory Roller	75	0.0627	84	0.015
Hoe Ram	75	0.0266	77	0.007
Large bulldozer	75	0.0266	77	0.007
Caisson drilling	75	0.0266	77	0.007
Loaded trucks	75	0.0227	73	0.004
Jack hammer	75	0.0105	69	0.003
Small bulldozer	75	0.0009	48	0.000

	Vibration Contours		
	Distance to (feet)		
Equipment	0.100 PPV	72.0 VdB	0.0080 RMS
Impact Pile Driver	136	1645	872
Sonic Pile Driver	40	791	419
Vibratory Roller	49	250	133
Hoe Ram	22	120	64
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Small bulldozer	1	6	3

Variables	
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Soil Type	
(Choice: default, hard, or sands)	default
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Hoe Ram	0.089	87	0.022	25
Large bulldozer	0.089	87	0.022	25
Caisson drilling	0.089	87	0.022	25
Loaded trucks	0.076	83	0.014	25
Jack hammer	0.035	79	0.009	25
Small bulldozer	0.003	58	0.001	25

	Vibration Level at Receiver			
Equipment	**Distance (feet)**	**PPV_x (in/sec)**	**Lv_x (VdB)**	**RMS_x (in/sec)**
Impact Pile Driver	100	0.1402	99	0.087
Sonic Pile Driver	100	0.0370	92	0.039
Vibratory Roller	100	0.0457	81	0.011
Hoe Ram	100	0.0194	74	0.005
Large bulldozer	100	0.0194	74	0.005
Caisson drilling	100	0.0194	74	0.005
Loaded trucks	100	0.0165	70	0.003
Jack hammer	100	0.0076	66	0.002
Small bulldozer	100	0.0007	45	0.000

	Vibration Contours		
	Distance to (feet)		
Equipment	**0.100 PPV**	**72.0 VdB**	**0.0080 RMS**
Impact Pile Driver	136	1645	872
Sonic Pile Driver	40	791	419
Vibratory Roller	49	250	133
Hoe Ram	22	120	64
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Variables	
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Caisson drilling	0.089	87	0.022	25
Loaded trucks	0.076	83	0.014	25
Jack hammer	0.035	79	0.009	25
Small bulldozer	0.003	58	0.001	25

	Vibration Level at Receiver			
Equipment	Distance (feet)	PPV_x (in/sec)	Lv_x (VdB)	RMS_x (in/sec)
Impact Pile Driver	125	0.1097	97	0.068
Sonic Pile Driver	125	0.0289	90	0.030
Vibratory Roller	125	0.0358	79	0.009
Hoe Ram	125	0.0152	72	0.004
Large bulldozer	125	0.0152	72	0.004
Caisson drilling	125	0.0152	72	0.004
Loaded trucks	125	0.0129	68	0.002
Jack hammer	125	0.0060	64	0.002
Small bulldozer	125	0.0005	43	0.000

	Vibration Contours		
	Distance to (feet)		
Equipment	0.100 PPV	72.0 VdB	0.0080 RMS
Impact Pile Driver	136	1645	872
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Noise Attenuation and Contours

Input Variables

Point or Line Source	Point	
Hard or Soft Site	Hard	
Attenuation Rate	6	dBA/Doubling of Distance
(Choice: 3, 4.5, 6, or 7.5)		
Reference Noise Level	70	dBA
Reference Distance	50	feet

Note: Within 0-10 feet from the source, there is virtually no attenuation.

Noise Level at Receiver

Distance to Receiver		Noise Level	
50	ft	70.0	dBA
100	ft	64.0	dBA
150	ft	60.5	dBA
200	ft	58.0	dBA
400	ft	51.9	dBA
300	ft	54.4	dBA

Noise Contours

Noise Level Contour		Distance from Source	
80	dBA	16	ft
75	dBA	28	ft
70	dBA	50	ft
65	dBA	89	ft
60	dBA	158	ft
55	dBA	281	ft
50	dBA	500	ft
45	dBA	889	ft

Groundborne Noise and Vibration Modeling

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