Appendix K

Construction Noise and Vibration Calculations

Construction Equipment Average Noise Levels

Project Name: Shelter Island Commercial Fishing Wharf Project

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).

Location	Distance to Nearest Receptor in feet	Combined Predicted Noise Level (dBA L_{eq})
Thresholds		
Daytime Standard	318	75.0
Sensitive Receptors		
Baseball Field	790	67.1
Single Family Homes	1050	64.6
Navy Dormitories	430	72.4

Equipment[1]	Reference Emission Noise Levels (dBA L_{max}) at 50 feet[2]	Usage Factor[2]
Impact Pile Driver w/ Wood Block	98	0.2
Crane	81	0.2

Ground Type	Hard
Source Height	8
Receiver Height	5
Ground Factor[3]	0.00

Predicted Noise Level [4]	dBA L_{eq} at 50 feet[4]
Impact Pile Driver w/ Wood Block	91.0
Crane	73.0

Combined Predicted Noise Level (dBA L_{eq} at 50 feet)
91.1

Sources:

[1] Where measured values are not available, noise levels based on the Construction Noise Control Specifiction 721.560 were used.

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

[3] Based on Figure 4-26 from the Federal Transit Noise and Vibration Impact Assessment, 2018 (pg 86).

[4] Based on the following from the Federal Transit Noise and Vibration Impact Assessment, 2018 (pg 177).

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 2018: pg 86); and

D = Distance from source to receiver.

Construction Equipment Average Noise Levels with Mitigation Measure-WQ-1

Project Name: Shelter Island Commercial Fishing Wharf Project

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).

Location	Distance to Nearest Receptor in feet	Combined Predicted Noise Level (dBA L_{eq})
Thresholds		
Daytime Standard	322	75.0
Sensitive Receptors		
Baseball Field	790	67.2
Single Family Homes	1050	64.7
Navy Dormitories	430	72.5

Equipment[1]	Reference Emission Noise Levels (dBA L_{max}) at 50 feet[2]	Usage Factor[2]
Impact Pile Driver w/ Wood Block	98	0.2
Crane	81	0.2
Flat Bed Truck	74	0.4
Crane	81	0.2

Noise levels generated by a crane would be similar or less than noise levels generated by dredger, as they share similar function and characteristics

Ground Type	Hard
Source Height	8
Receiver Height	5
Ground Factor[3]	0.00

Predicted Noise Level [4]	dBA L_{eq} at 50 feet[4]
Impact Pile Driver w/ Wood Block	91.0
Crane	73.0
Flat Bed Truck	70.0
Crane	73.0

Noise levels generated by a crane would be similar or less than noise levels generated by dredger, as they share similar function and characteristics

Combined Predicted Noise Level (dBA L_{eq} at 50 feet)
91.2

Sources:

[1] Where measured values are not available, noise levels based on the Construction Noise Control Specifiction 721.560 were used.

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

[3] Based on Figure 4-26 from the Federal Transit Noise and Vibration Impact Assessment, 2018 (pg 86).

[4] Based on the following from the Federal Transit Noise and Vibration Impact Assessment, 2018 (pg 177).

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 2018: pg 86); and

D = Distance from source to receiver.

Ground Vibration Distance Propagation Calculations for Stationary 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).

Project Name: Shelter Island Project

STEP 1: Determine units in which to perform calculation.

— If vibration decibels (VdB), then use Table A and proceed to Steps 2A and 3A.

— If peak particle velocity (PPV), then use Table B and proceed to Steps 2B and 3B.

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

STEP 3A: Select the distance to the receiver.

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

Noise Source/ID	Reference Noise Level			Attenuated Noise Level at Receptor		
	vibration level (VdB)	@	distance (ft)	vibration level (VdB)	@	distance (ft)
Vibratory Roller	94	@	25	63	@	280
Hoe Ram	87	@	25	57	@	250

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

Land Use Category	Human Annoyance Criteria GBV Impact Levels (VdB re 1 micro-inch/sec)		
	Frequent Events	Occacional Events	Infrequent Events
Category 1: Buildings where vibration would interfere with interior operations.	65 VdB	65 VdB	65 VdB
Category 2: Residences and buildings where people normally sleep.	72 VdB	75 VdB	80 VdB
Category 3: Institutional land uses with primarily daytime use.	75 VdB	78 VdB	83 VdB

Source: Federal Transit Administration, pg 126

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

STEP 3B: Select the distance to the receiver.

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

Noise Source/ID	Reference Noise Level			Attenuated Noise Level at Receptor		
	vibration level (PPV)	@	distance (ft)	vibration level (PPV)	@	distance (ft)
Pile Driver (impact - upper range)	1.518	@	25	0.040	@	282
Pile Driver (Sonic - upper range)	0.734	@	25	0.040	@	175
Pile Driver (impact - upper range)	1.518	@	25	0.500	@	52
Pile Driver (Sonic - upper range)	0.734	@	25	0.500	@	32

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

Construction Vibration Damage Criteria		
Building/Structural Category	PPV, in/sec	Approximate Lv
I. Reinforced-concrete, steel or timber (no plaster)	0.5	102
II. Engineered concrete and masonry (no plaster)	0.3	98
III. Non-engineered timber and masonry buildng	0.2	94
IV. Buildings extremely susceptible to vibration damage	0.12	90

Source: Federal Transit Administration, pg 186

Notes:

- Computation of propagated vibration levels is based on the equations presented on pg. 185 of FTA 2018.
- Estimates of attenuated vibration levels do not account for reductions from intervening underground barriers or other underground structures of any type, or changes in soil type.
- Frequenct Events are defined as more than 70 events per day; occasional events as 30--70 events per day; and infrequent events as fewer than 30 events per day

Reference:

Federal Transit Association (FTA). 2018 (September). Transit Noise and Vibration Impact Assessment Manual. FTA Report No. 0123. Washington, D.C. Accessed: December 20, 2020. Page Available:
https://www.transit.dot.gov/sites/fta.dot.gov/files/docs/research-innovation/118131/transit-noise-and-vibration-impact-assessment-manual-fta-report-no-