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MEMORANDUM

To:	Jack Straw (Pacifica Companies)
From:	Mark Storm, INCE Bd. Cert. (Dudek)
Subject:	Amara Bay Project **Construction Noise Study**
Date:	March 20, 2023
cc:	Carey Fernandes (Dudek); Shana Carey (Dudek)
Attachment(s):	A. Glossary of Common Acoustical Terms B. Outdoor Ambient Noise Monitoring Sample Photographs C. Construction Noise Model Worksheets

The purpose of this technical memorandum is to provide a predictive construction noise analysis associated with planned site-wide rough grading, storm drain installation, and subsequent street improvements for the subject project. Dudek also conducted an investigator-attended outdoor sound pressure level (SPL) survey to sample the pre-construction (a.k.a., baseline) ambient environment and confirm or upgrade the noise level threshold used to determine potential impact to sensitive avian species inhabiting the J Street Marsh area south of the Marina View Park that lies south of the southern edge of the project.

Using a prediction model that emulates and uses reference equipment sound level data from the Federal Highway Administration (FHWA) Roadway Construction Noise Model (RCNM), Dudek evaluated a variety of project construction scenarios to help establish when implementation of administrative noise controls (e.g., operation time and proximity limits on active construction equipment) and/or temporary sound abatement (erected plywood barriers or suspended outdoor-use acoustical blankets) would be needed to help ensure aggregate project construction noise levels would be compliant with 60 dBA hourly energy-equivalent level (L_{eq1h}) during sensitive avian species breeding seasons in habitats within the J Street Marsh.

Attachments to this memo include: A) a glossary of relevant noise descriptors to help provide the reader context with respect to the analyses and findings presented herein; B) photographs of the SPL survey location; and C) predictive modeling inputs and source definition worksheets.

Project Description and Context

As illustrated in Exhibit 1, the approximately 37-acre project site is located along Marina Parkway in the City of Chula Vista, California. The majority of the project site lies north and east of Marina Parkway; however, several small additional areas lay southwest of Marina Parkway along West J Street. Most of the site is currently an undeveloped, vacant lot located adjacent to San Diego Bay. The approximate centroid of the site is 32°37'24.2"N 117°05'52.7"W. The project site is bordered on the north by a graded lot in the process of being developed, to

the south Marina Parkway and the Chula Vista Marina View Park, to the east the Bayshore Bikeway, a commercial area, and the Interstate 5 freeway, and to the west Marina Parkway and the Chula Vista Marina. The site falls within Township 18 South, Range 2 West of the Imperial Beach, California 7.5-minute Quadrangle. The site is generally flat as the elevation on site ranges from 0-5 feet above mean sea level.

Sources: Google Earth Pro (2023), Dudek (2023)

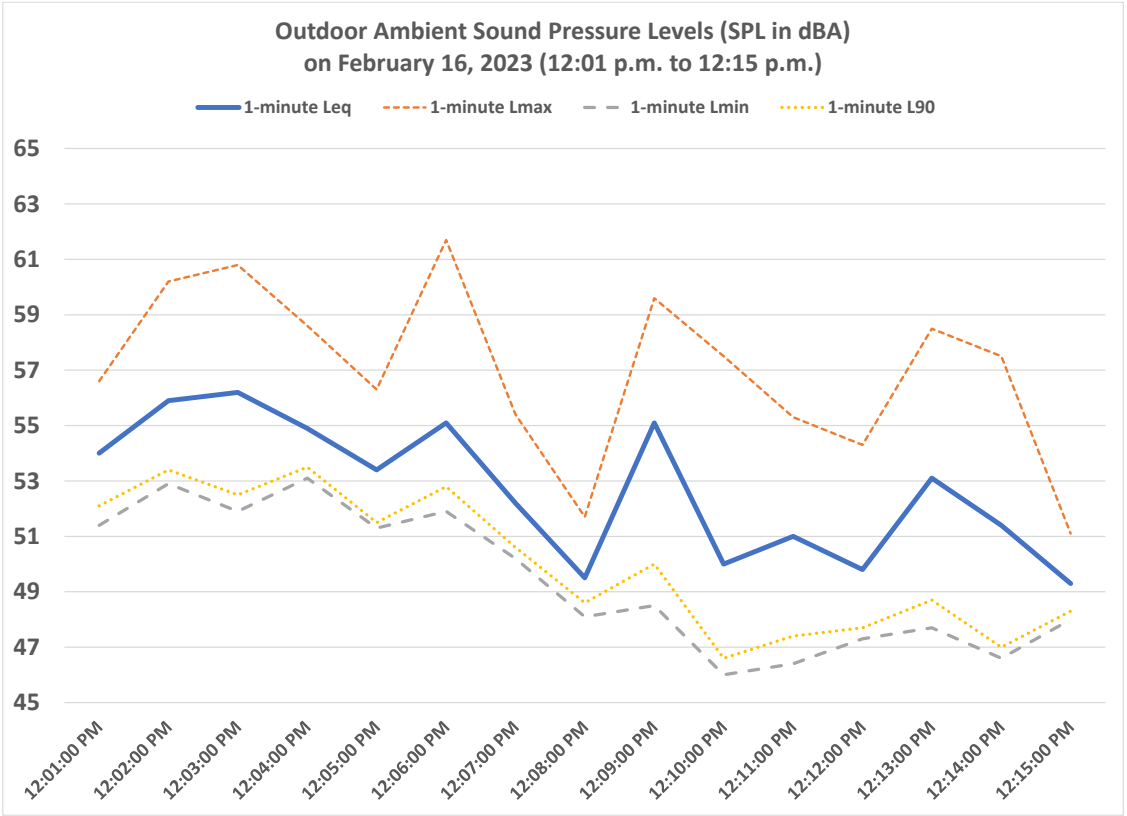
Exhibit 1. Amara Bay Project location (with project site parcels bounded in black and tagged in yellow text [e.g., "H-13"]; and outdoor ambient measurement position "ST1")

Outdoor Ambient Noise Survey

Measurements

Outdoor SPL monitoring was conducted over a continuous 15-minute period on February 16, 2023 near the southwestern corner of West J Street and Marina Parkway—see the position called out as "ST1" shown in Exhibit 1. Successive A-weighted measurements were collected at one-minute duration intervals under "slow" response setting with a SoftdB "Piccolo II" Model sound level meter (SLM) equipped with a 0.5-inch, pre-polarized condenser microphone with pre-amplifier. The Piccolo II SLM (last four digits of serial number [SN] = 2101) meets the current American National Standards Institute (ANSI) standard for a Type 2 sound level meter. The accuracy of the SLM was checked before the SPL measurement survey with a Rion Model NC-74 calibrator, and the measurements were conducted with a standard factory-provided foam-type wind-screen applied over the SLM microphone.

Exhibit 2 displays the one-minute interval L_{eq}, L_{max}, L_{min}, and L_{90} values that began at 12:01 p.m. and concluded at 12:16 p.m. The L_{eq} value for the entire 15-minute period is 53.3 dBA, the L_{max} value is 61.7 dBA, the L_{min} value is 46.0, and the average L_{90} value is 50.0 dBA.



Source: Dudek (2022)

Exhibit 2. Plots of measured and statistical values from the outdoor ambient sound level survey at ST1

The variance in values from minute-to-minute appearing in Exhibit 2 reflects the observed acoustical contributions to the measured outdoor ambient sound level from a variety of sources that included distant highway and arterial roadway traffic, local vehicle pass-bys on Marina Parkway, jet and rotor-wing aircraft overflights, rustling palm fronds, and occasional duck calls from the outlet stream dividing the Marina View Park from the J Street Marsh.

Compliance Level Confirmation

As the 15-minute observed and measured sample seemed representative of typical conditions for the project vicinity, the 53.3 dBA L_{eq} value measured could thus be considered representative of a largely steady hourly L_{eq} value, and would therefore be less than 60 dBA by several decibels. For this reason, the applicable construction noise level limit at the northern boundary of sensitive avian species habitat, understood to be the southern edge of the outlet stream on the north side of the J Street Marsh wetland area, would remain 60 dBA L_{eq1h} for purposes of potential impact assessment and mitigation need during applicable breeding seasons.

Construction Noise Assessment

Compliance Criterion

Construction noise is considered a short-term impact and would be considered significant (in the context of effects on sensitive avian species in the J Street Marsh area) if aggregate noise from project construction activities exceed 60 dBA L_{eq1h} over any hour occurring within an applicable breeding season—a quantitative threshold confirmed by the preceding paragraph and empirical data.

Methodology

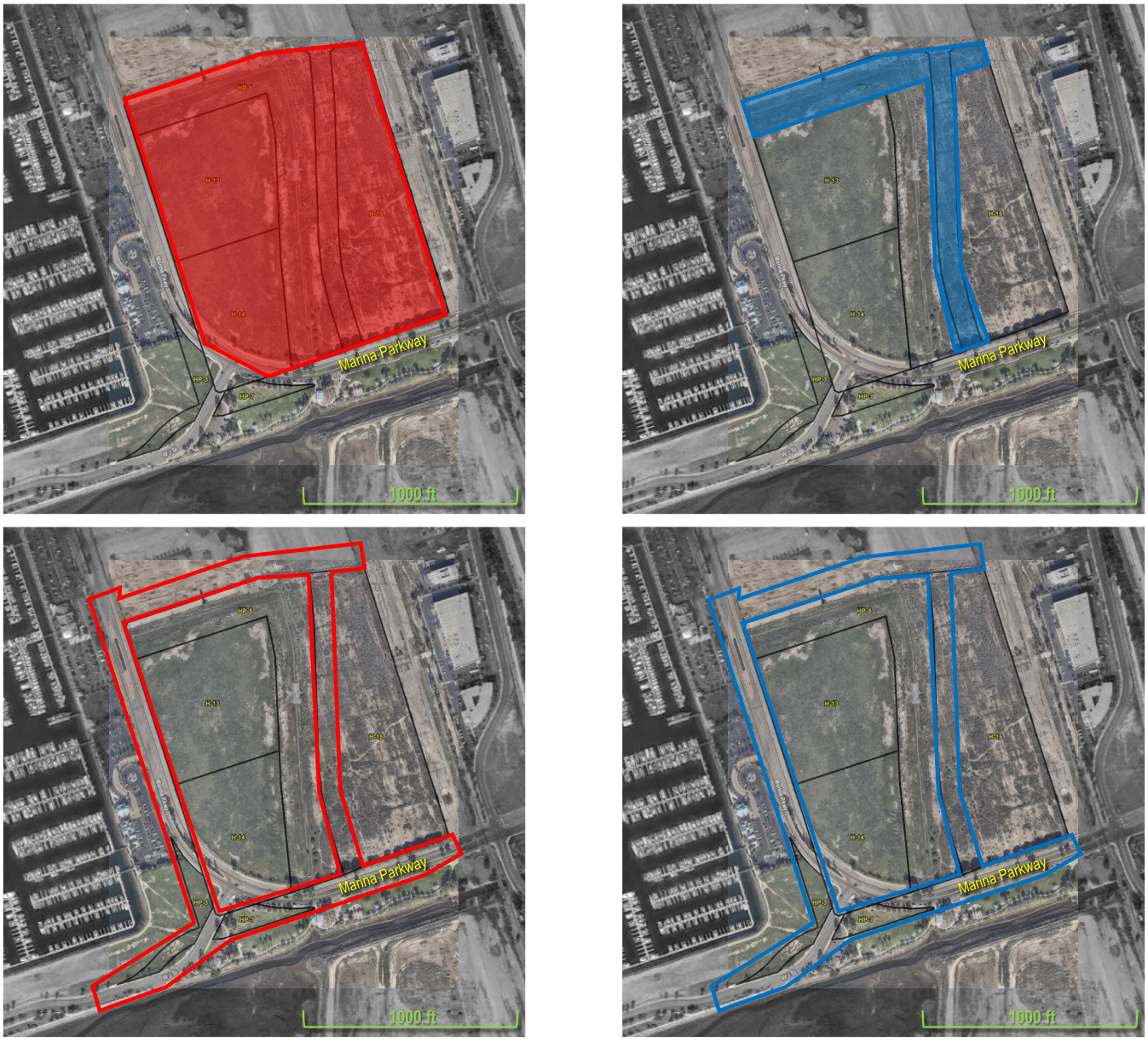
Project-generated construction noise will vary depending on the active construction processes and their locations onsite, the type of equipment involved, and the duration and potential concurrency of work being performed. Using information provided to Dudek, project construction noise exposure level (expressed as L_{eq1h}) was predicted at a presumed nearest J Street Marsh receptor position with an RCNM emulator for each of four distinct phases as follows, with approximate geographic boundaries shown in Exhibit 3.

- Rough Grading – a set of eight scrapers, two dozers, two graders, and two water trucks working across the portion of the project area shown in Exhibit 1 as the combination of parcels H13, H14, H15, HP5, and the "C Street" planned roadway between HP5 and H15.

- Storm Drain Installation – two excavators, a front-end loader, and a water truck working across the portion of the project area shown in Exhibit 1 as the combination of parcels H13, H14, H15, HP5, and the "C Street" planned roadway between HP5 and H15.

- Phase 2 Grading – two scrapers, one dozer, and one water truck working on J Street and Marina Parkway improvement areas (i.e., not on parcels H13, H14, H15, and HP5).

- Phase 2 Storm Drain Installation – two excavators, a front-end loader, and a water truck working on J Street and Marina Parkway improvement areas (i.e., not on parcels H13, H14, H15, and HP5).



Sources: Hazard Construction (2023); Dudek (2023)

Exhibit 3. Approximate geographic boundaries of studied project construction activity phases: *upper left* – Rough Grading (across red-shaded zone); *upper right* – Storm Drain Installation (across blue-shaded zone); *lower left* – Phase 2 Grading (within red outline); *lower right* – Phase 2 Storm Drain Installation (within blue outline)

Due to the potential uncertainty and variability of operating construction equipment locations within the phase boundaries shown in Exhibit 3, prediction of aggregate construction noise adopts two approaches:

- An "acoustic centroid" approach, akin to the Federal Transit Administration (FTA) general assessment technique for estimating construction noise, whereby all listed equipment for a construction phase is represented by a common location at the geographic center of the studied construction zone or area.

- A modified "acoustic centroid" approach similar to the above, but allowing for one or multiple loudest operating pieces of equipment associated with the studied construction phase to be as close to the receptor position—or a noise-occluding physical barrier on the edge of the construction site—as possible for a limited portion of or the entirety of a full hour.

The first of these two approaches utilizing the acoustic centroid technique allows definition of a fixed distance between a time-averaged location for all construction equipment involved in the studied phase and a receptor position, thereby yielding an aggregate energy-averaged distance-dependent noise exposure level for the entire phase. This prediction technique presumes that operating equipment activity during any hour would be comparable during the course of a daily 8 or 10-hour work shift.

The second approach conservatively considers a "worst-case" scenario, where one or more loudest equipment piece(s) for the phase are temporarily nearer to the receptor position. An example of such a scenario would be when a scraper or grader might make several slow passes with respect to the receptor location, momentarily being as close as the perpendicular horizontal distance between the source and receptor, but is otherwise very distant and working elsewhere on the project site.

Using these two prediction approaches, Attachment C displays the construction noise model worksheets for each of the following analysis scenarios studied for each of the four aforementioned construction phases.

Rough Grading

A. All equipment except one scraper at geographic center of project site; outlying scraper works as close as 25' of the site boundary for partial hour (24 minutes) duration, and *without* temporary barrier.

B. All equipment except two scrapers at geographic center of project site; outlying scrapers work as close as 25' of the site boundary for partial hour (12 minutes) duration.

    1) *Without* a temporary barrier (i.e., zero-height) on the site boundary southern edge

    2) *With* a temporary 8-foot tall barrier on the site boundary southern edge

C. All equipment at geographic center of project site (i.e., "acoustic centroid" per first described approach) and *without* a temporary barrier.

Storm Drain Installation

A. All equipment except one excavator at geographic center of project site; outlying excavator works as close as 25' of the site boundary for partial hour (15 minutes) duration, and *without* a temporary barrier.

B. All equipment except two excavators at geographic center of project site; outlying excavators work as close as 25' of the site boundary for partial hour (15 minutes) duration, and *without* a temporary barrier.

D. All equipment except two excavators at geographic center of project site; outlying excavators work as close as 25' of the site boundary for a full hour (60 minutes) duration, and *without* a temporary barrier.

Phase 2 Grading

B. All equipment except two scrapers and one dozer at geographic center of project site; outlying scrapers and dozer work as close as 25' of the site boundary for partial hour (15 minutes) duration.

1) *Without* a temporary barrier (i.e., zero-height) on the site boundary southern edge

2) *With* a temporary 8-foot tall barrier on the site boundary southern edge

3) *With* a temporary 8-foot tall barrier on the site boundary southern edge, and operation time halved near the barrier (i.e., 7.5 minutes instead of 15 minutes)

Phase 2 Storm Drain Installation

A. All equipment except one excavator at geographic center of project site; outlying excavator works as close as 25' of the site boundary for partial hour (15 minutes) duration;

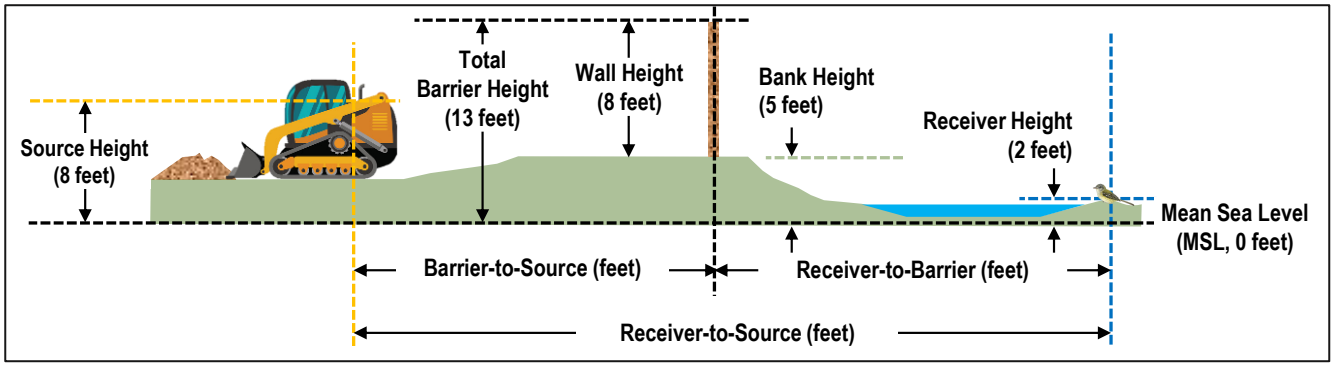
1) *Without* a temporary barrier (i.e., zero-height) on the site boundary southern edge

2) *With* a temporary 8-foot tall barrier on the site boundary southern edge

B. All equipment except two excavators at geographic center of project site; outlying excavators work as close as 25' of the site boundary for partial hour (15 minutes) duration, and *with* an 8'-tall temporary barrier.

D. All equipment except two excavators at geographic center of project site; outlying excavators work as close as 25' of the site boundary for a full hour (60 minutes) duration, and *without* a temporary barrier.

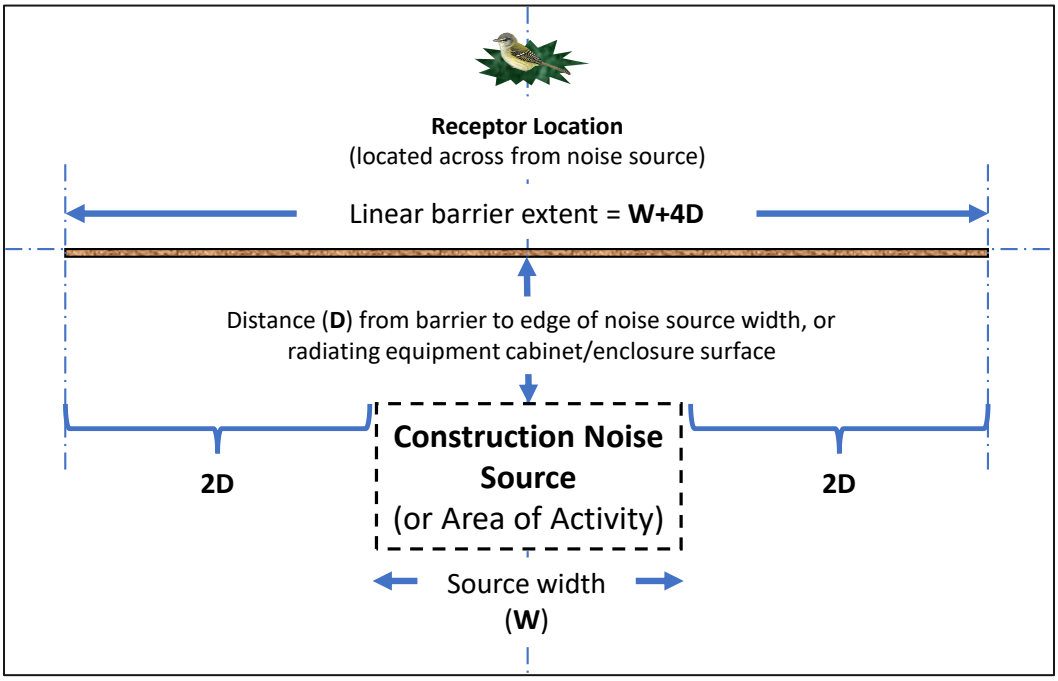
As shown in Exhibit 4, the temporary barrier or "wall" considered in these scenarios is consistently 8 feet tall from top edge to the bottom edge in contact with the local grade. Because the local grade of the project boundary is expected to be the ground surface of the Marina View Park, it is approximately 5 feet higher than the J Street Marsh surface, which means the total height of the sound-blocking barrier is 13 feet above mean sea level (MSL). For purposes of this analysis, and as shown in the Exhibit 4 elevation diagram, project construction equipment noise sources are 8 feet above MSL, and the receptor (i.e., a sensitive avian species nest) would be 2 feet above MSL.



Source: Dudek (2023)

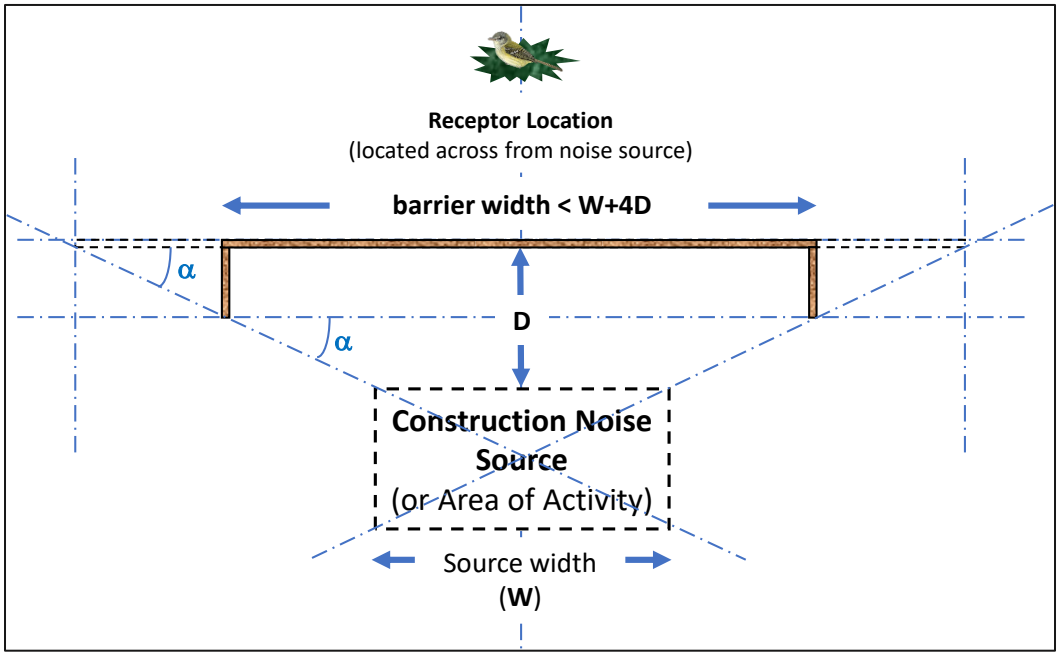
Exhibit 4. Elevation diagram for evaluating temporary noise barrier effect on propagated construction noise

The horizontal extent of a temporary noise barrier does not need to span an entire project boundary, unless the construction activity is expected to occur anywhere near its length. Exhibit 5 illustrates the minimum recommended extent for a linear temporary barrier based on the width of a noise source or the construction activity area or zone on which noise-producing operating equipment may occur. Exhibit 6 shows that a "C"-shaped barrier extent can shorten the total amount of material, so long as the vertical edges on each end of the barrier remain on the same diagonal axes through the source/area geographic center and thus preserve the angle "alpha" and correspondingly the same reduction of flanking noise paths around the barrier.



Source: Dudek (2023)

Exhibit 5. Recommened dimensions for linear temporary barrier



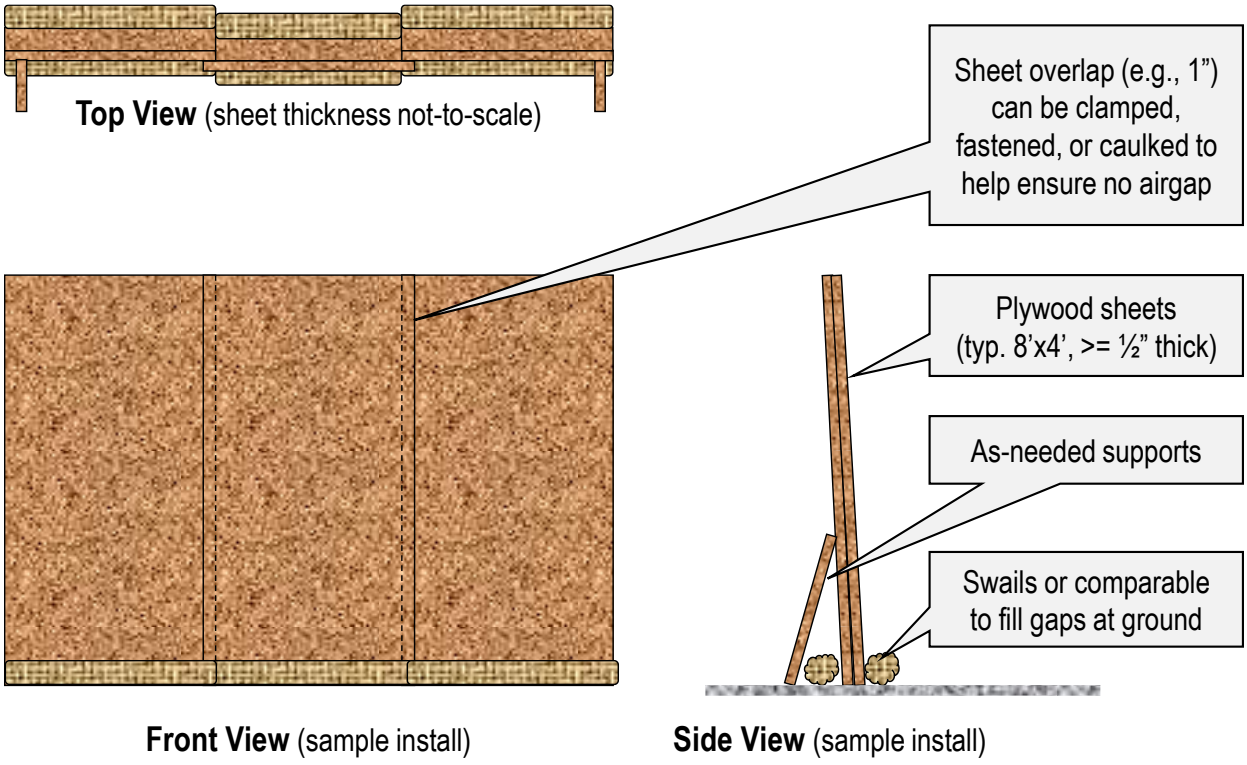
Source: Dudek (2023)

Exhibit 6. Recommened dimensions for "C"-shaped temporary barrier

Temporary construction barriers at a jobsite can be suspended acoustical blankets, or simply assemblies of plywood sheets such as the diagram appearing in Exhibit 7. Key features to ensure such temporary barrier performance include elimination of airgaps between adjoining or overlapping plywood sheets, as well as under the bottom edge of the sheets. Such a temporary barrier can be extended by simply adding sheets to each end, or "moved" by extending one end by adding sheets while removing them from the other end.

Results and Findings

Table 1 summarizes the predicted noise levels that are detailed in the Attachment C worksheets, and illustrates that during the Rough Grading (RG) phase, the need for installation of a temporary barrier is not expected for the studied scenarios. During the Storm Drain Installation (SDI) phase, due to fewer expected pieces of operating equipment, installation of a temporary noise barrier is not expected for compliance with the 60 dBA L_{eq1h} threshold at the J Street Marsh boundary. For the Phase 2 Grading (P2G) and Storm Drain Installation (P2SDI) phases that involve operating construction equipment on the J Street and Marina Parkway alignments and thus considerably closer to the J Street Marsh, compliance is expected only if a temporary barrier is installed along the southern edge of localize activity and the indicated scenario conditions are satisfied with respect to quantities of equipment and their locations. In all studied scenarios, the source, barrier, and receiver elevations appearing in Exhibit 4 are assumed to be true, and the horizontal extents of installed barriers reasonably respect the dimensions appearing in Exhibits 5 or 6.



Source: Dudek (2023)

Exhibit 7. Suggested temporary construction noise barrier implementation using plywood sheets

Table 1. Project Construction Noise Prediction Scenario Results

Scenario Tag	Scenario Description	Predicted L_{eq1h} (dBA) at Receptor	Compliant with 60 dBA L_{eq1h}?
Rough Grading Phase			
RG A.	All equipment except one scraper at geographic center of project site; outlying scraper works as close as 25' of the site boundary for partial hour (24 minutes) duration, and *without* temporary barrier.	60	Yes
RG B.1)	All equipment except two scrapers at geographic center of project site; outlying scrapers work as close as 25' of the site boundary for partial hour (12 minutes) duration—*without* temporary barrier.	60	Yes
RG B.2)	As above, but *with* temporary barrier.	56	Yes
RG C.	All equipment at geographic center of project site (i.e., "acoustic centroid" per first described approach) and *without* a temporary barrier.	59	Yes
Storm Drain Installation Phase			
SDI A.	All equipment except one excavator at geographic center of project site; outlying excavator works as close as 25' of the site boundary for partial hour (15 minutes) duration, and *without* a temporary barrier.	53	Yes

Table 1. Project Construction Noise Prediction Scenario Results

Scenario Tag	Scenario Description	Predicted L_{eq1h} (dBA) at Receptor	Compliant with 60 dBA L_{eq1h}?
SDI B.	All equipment except two excavators at geographic center of project site; outlying excavators work as close as 25' of the site boundary for partial hour (15 minutes) duration, and *without* a temporary barrier.	56	Yes
SDI D.	All equipment except two excavators at geographic center of project site; outlying excavators work as close as 25' of the site boundary for a full hour (60 minutes) duration, and *without* a temporary barrier.	59	Yes
Phase 2 Grading Phase			
P2G A.1)	All equipment except two scrapers and one dozer at geographic center of project site; outlying scrapers and dozer work as close as 25' of the site boundary for partial hour (15 minutes) duration, *without* a temporary barrier.	78	No
P2G A.2)	As above, but *with* a temporary barrier.	63	No
P2G A.3)	As above, plus operation time halved near the barrier (i.e., 7.5 minutes instead of 15 minutes).	60	Yes
Phase 2 Storm Drain Installation Phase			
P2SDI A.1)	All equipment except one excavator at geographic center of project site; outlying excavator works as close as 25' of the site boundary for partial hour (15 minutes) duration; *without* a temporary barrier.	71	No
P2SDI A.2)	As above, but *with* a temporary barrier.	56	Yes
P2SDI B.	All equipment except two excavators at geographic center of project site; outlying excavators work as close as 25' of the site boundary for partial hour (15 minutes) duration, and *with* an 8'-tall temporary barrier.	59	Yes
P2SDI D.	All equipment except two excavators at geographic center of project site; outlying excavators work as close as 25' of the site boundary for a full hour (60 minutes) duration, and *without* a temporary barrier.	65	No

For any questions or comments, please contact mstorm@dudek.com.

Mark Storm, INCE Bd. Cert.
Acoustic Services Manager

Attachment A – Glossary of Common Acoustical Terms

Ambient Noise Level	The composite of noise from all sources near and far. The normal or existing level of environmental noise at a given location.
A-Weighted Sound Level (dBA)	The sound pressure level (SPL) in decibels as measured on a sound level meter (SLM) using the A-weighted filter network, which de-emphasizes the very low and very high frequency components of the measured sound in a manner similar to the frequency response of the average healthy human ear.
Background Sound Level	The amalgam of sounds from indistinct and/or distant sources (e.g., roadway traffic, residential HVAC systems, etc.) that are not nearby or are otherwise the focus of study.
Decibel (dB)	The unit for expressing SPL and is equal to 10 times the logarithm (to the base 10) of the ratio of the measured sound pressure squared to a reference pressure, which is 20 micropascals.
Equivalent Sound Level ($L_{eq[xh]}$)	The value corresponding to a steady-state sound level containing the same total energy as a time-varying signal over a given sample period. The L_{eq} may feature notation in its subscript indicating the time period (e.g., eight hours as "8h" to populate "[Xh]") of energy averaging.
Octave Band Center Frequency (OBCF)	Commonly discussed octave frequency bands are: 31.5 Hz, 63 Hz, 125 Hz, 250 Hz, 500 Hz, 1 kHz, 2 kHz, 4 kHz, 8 kHz and 16 kHz. Each of these "center frequencies" represents an octave band defined by a lower band limit equal to 0.707 times the center frequency, and an upper band limit equal to 1.414 times the center frequency.
Sound Transmission Loss (TL)	The amount of sound, in decibels (dB), that is isolated by a material or partition in a particular OBCF or 1/3-OBCF. Example: 1/2″ drywall has a TL at 125 Hz of 15 dB.
Sound Transmission Class (STC)	A single-number rating that can be used to conveniently compare, acoustical isolation properties of different materials or assemblies. Generally, higher numbers indicate a material will provide more sound insulation when used as a barrier. Plotted against standardized STC curves, with established curve-fit tolerances, the TL of a material (in dB) at 500 Hz serves as the STC rating.
Statistical Sound Level (L_{XX})	A sound level exceed for a cumulative XX percentage of time within a defined measurement period. The L50 ("L-fifty") value is thus often called the "median" sound level; and the L90 ("L-ninety") value is a dB level exceed 90% of the measurement period and hence typically used to evaluate specific continuous or steady-state sound sources, or describe the background sound level (see above definition).

Attachment B – Outdoor Ambient Noise Monitoring Sample Photographs

02/16/23 – View of Sound Level Meter (SLM) at Position **ST1**
(looking southwest; sound level meter [SLM] encircled in yellow dashes)

02/16/23 – View of Sound Level Meter (SLM) at Position **ST1**
(looking east; sound level meter [SLM] encircled in yellow dashes)

Attachment C – Construction Noise Model Worksheets

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

noise level limit for construction phase at receiving nest (or habitat edge, as applicable) = 60
allowable hours over which Leq is to be averaged = 1

= height of grade with respect to marsh (approx. mean sea level [MSL])
= sum of temporary barrier (TB) height plus project site grade height above MSL

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 1-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 (wout barrier)	G (with barrier)	G (without barrier)	ILbarr (dB)
A. Rough Grading - no sound walls	scraper	7	40	84		1000	0.0		52.4	1	60	57	8	2	5	675	325	1000	675.0	325.0	1000.0	0.00	0.1	10.0	5.0	0.6	0.7	0.0
	flat bed truck	2	40	74	water truck	1000	0.0		42.4	1	60	41	8	2	5	675	325	1000	675.0	325.0	1000.0	0.00	0.1	10.0	5.0	0.6	0.7	0.0
	dozer	2	40	82		1000	0.0		50.4	1	60	49	8	2	5	675	325	1000	675.0	325.0	1000.0	0.00	0.1	10.0	5.0	0.6	0.7	0.0
all equipment except one scraper at geographic center of project site; outlying scraper works as close as 25' of barrier for partial hour duration	grader	2	40	85		1000	0.0		53.4	1	60	52	8	2	5	675	325	1000	675.0	325.0	1000.0	0.00	0.1	10.0	5.0	0.6	0.7	0.0
	scraper	1	40	84		1000	0.0		52.4	0.6	36	46	8	2	5	675	325	1000	675.0	325.0	1000.0	0.00	0.1	10.0	5.0	0.6	0.7	0.0
	scraper	0	40	84		800	0.0		54.5	0	0	0	8	2	5	475	325	800	475.0	325.0	800.0	0.00	0.1	10.0	5.0	0.6	0.7	0.0
	scraper	0	40	84		600	0.0		57.3	0	0	0	8	2	5	275	325	600	275.0	325.0	600.0	0.00	0.1	10.0	5.0	0.6	0.7	0.0
	scraper	1	40	84		350	0.0		62.5	0.4	24	55	8	2	5	25	325	350	25.2	325.0	350.1	0.00	0.1	10.0	5.0	0.6	0.7	0.0
								Total for A. Rough Grading - no sound walls Phase:				**60.3**															
B. Rough Grading - no sound walls	scraper	6	40	84		1000	0.0		52.4	1	60	56	8	2	5	675	325	1000	675.0	325.0	1000.0	0.00	0.1	10.0	5.0	0.6	0.7	0.0
	flat bed truck	2	40	74	water truck	1000	0.0		42.4	1	60	41	8	2	5	675	325	1000	675.0	325.0	1000.0	0.00	0.1	10.0	5.0	0.6	0.7	0.0
	dozer	2	40	82		1000	0.0		50.4	1	60	49	8	2	5	675	325	1000	675.0	325.0	1000.0	0.00	0.1	10.0	5.0	0.6	0.7	0.0
all equipment except two scrapers at geographic center of project site; outlying scrapers work as close as 25' of barrier for partial hour duration	grader	2	40	85		1000	0.0		53.4	1	60	52	8	2	5	675	325	1000	675.0	325.0	1000.0	0.00	0.1	10.0	5.0	0.6	0.7	0.0
	scraper	2	40	84		1000	0.0		52.4	0.8	48	50	8	2	5	675	325	1000	675.0	325.0	1000.0	0.00	0.1	10.0	5.0	0.6	0.7	0.0
	scraper	0	40	84		800	0.0		54.5	0	0	0	8	2	5	475	325	800	475.0	325.0	800.0	0.00	0.1	10.0	5.0	0.6	0.7	0.0
	scraper	0	40	84		600	0.0		57.3	0	0	0	8	2	5	275	325	600	275.0	325.0	600.0	0.00	0.1	10.0	5.0	0.6	0.7	0.0
	scraper	2	40	84		350	0.0		62.5	0.2	12	55	8	2	5	25	325	350	25.2	325.0	350.1	0.00	0.1	10.0	5.0	0.6	0.7	0.0
								Total for B. Rough Grading - no sound walls Phase:				**60.3**															
B. Rough Grading - with 8'-tall sound wall	scraper	6	40	84		1000	3.1		49.3	1	60	53	8	2	13	675	325	1000	675.0	325.2	1000.0	0.19	6.1	18.0	5.0	0.4	0.7	3.1
	flat bed truck	2	40	74	water truck	1000	3.1		39.3	1	60	38	8	2	13	675	325	1000	675.0	325.2	1000.0	0.19	6.1	18.0	5.0	0.4	0.7	3.1
	dozer	2	40	82		1000	3.1		47.3	1	60	46	8	2	13	675	325	1000	675.0	325.2	1000.0	0.19	6.1	18.0	5.0	0.4	0.7	3.1
all equipment except two scrapers at geographic center of project site; outlying scrapers work as close as 25' of barrier for partial hour duration	grader	2	40	85		1000	3.1		50.3	1	60	49	8	2	13	675	325	1000	675.0	325.2	1000.0	0.19	6.1	18.0	5.0	0.4	0.7	3.1
	scraper	2	40	84		1000	3.1		49.3	0.8	48	47	8	2	13	675	325	1000	675.0	325.2	1000.0	0.19	6.1	18.0	5.0	0.4	0.7	3.1
	scraper	0	40	84		800	3.3		51.2	0	0	0	8	2	13	475	325	800	475.0	325.2	800.0	0.19	6.1	18.0	5.0	0.4	0.7	3.3
	scraper	0	40	84		600	3.9		53.5	0	0	0	8	2	13	275	325	600	275.0	325.2	600.0	0.20	6.4	18.0	5.0	0.4	0.7	3.9
	scraper	2	40	84		350	9.0		53.5	0.2	12	46	8	2	13	25	325	350	25.5	325.2	350.1	0.63	11.0	18.0	5.0	0.4	0.7	9.0
								Total for B. Rough Grading - with 8'-tall sound wall Phase:				**56.3**															
C. Rough Grading - no sound walls	scraper	8	40	84		1000	0.0		52.4	1	60	57	8	2	5	675	325	1000	675.0	325.0	1000.0	0.00	0.1	10.0	5.0	0.6	0.7	0.0
	flat bed truck	2	40	74	water truck	1000	0.0		42.4	1	60	41	8	2	5	675	325	1000	675.0	325.0	1000.0	0.00	0.1	10.0	5.0	0.6	0.7	0.0
	dozer	2	40	82		1000	0.0		50.4	1	60	49	8	2	5	675	325	1000	675.0	325.0	1000.0	0.00	0.1	10.0	5.0	0.6	0.7	0.0
	grader	2	40	85		1000	0.0		53.4	1	60	52	8	2	5	675	325	1000	675.0	325.0	1000.0	0.00	0.1	10.0	5.0	0.6	0.7	0.0
all equipment at geographic center of project site	scraper	0	40	84		1000	0.0		52.4	0	0	0	8	2	5	675	325	1000	675.0	325.0	1000.0	0.00	0.1	10.0	5.0	0.6	0.7	0.0
	scraper	0	40	84		800	0.0		54.5	0	0	0	8	2	5	475	325	800	475.0	325.0	800.0	0.00	0.1	10.0	5.0	0.6	0.7	0.0
	scraper	0	40	84		600	0.0		57.3	0	0	0	8	2	5	275	325	600	275.0	325.0	600.0	0.00	0.1	10.0	5.0	0.6	0.7	0.0
	scraper	0	40	84		350	0.0		62.5	0	0	0	8	2	5	25	325	350	25.2	325.0	350.1	0.00	0.1	10.0	5.0	0.6	0.7	0.0
								Total for C. Rough Grading - no sound walls Phase:				**59.2**															

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

noise level limit for construction phase at receiving nest (or habitat edge, as applicable) = 60
allowable hours over which Leq is to be averaged = 1

= height of grade with respect to marsh (approx. mean sea level [MSL])
= sum of temporary barrier (TB) height plus project site grade height above MSL

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 1-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 (wout barrier)	G (with barrier)	G (without barrier)	ILbarr (dB)
A. Storm Drain Installation - no sound walls	excavator	1	40	81		1000	0.0		49.4	1	60	45	8	2	5	675	325	1000	675.0	325.0	1000.0	0.00	0.1	10.0	5.0	0.6	0.7	0.0
	front end loader	1	40	79		1000	0.0		47.4	1	60	43	8	2	5	675	325	1000	675.0	325.0	1000.0	0.00	0.1	10.0	5.0	0.6	0.7	0.0
	flat bed truck	1	40	74	water truck	1000	0.0		42.4	1	60	38	8	2	5	675	325	1000	675.0	325.0	1000.0	0.00	0.1	10.0	5.0	0.6	0.7	0.0
all equipment except one excavator at geographic center of project site; outlying excavator works as close as 25' of barrier for partial hour duration	excavator	1	40	81		1000	0.0		49.4	0.4	24	41	8	2	5	675	325	1000	675.0	325.0	1000.0	0.00	0.1	10.0	5.0	0.6	0.7	0.0
	excavator	1	40	81		800	0.0		51.5	0.3	18	42	8	2	5	475	325	800	475.0	325.0	800.0	0.00	0.1	10.0	5.0	0.6	0.7	0.0
	excavator	1	40	81		600	0.0		54.3	0.2	12	43	8	2	5	275	325	600	275.0	325.0	600.0	0.00	0.1	10.0	5.0	0.6	0.7	0.0
	excavator	1	40	81		350	0.0		59.5	0.1	6	46	8	2	5	25	325	350	25.2	325.0	350.1	0.00	0.1	10.0	5.0	0.6	0.7	0.0
							Total for A. Storm Drain Installation - no sound walls Phase:					**51.8**																
B. Storm Drain Installation - no sound walls	excavator	0	40	81		1000	0.0		49.4	1	60	0	8	2	5	675	325	1000	675.0	325.0	1000.0	0.00	0.1	10.0	5.0	0.6	0.7	0.0
	front end loader	1	40	79		1000	0.0		47.4	1	60	43	8	2	5	675	325	1000	675.0	325.0	1000.0	0.00	0.1	10.0	5.0	0.6	0.7	0.0
	flat bed truck	1	40	74	water truck	1000	0.0		42.4	1	60	38	8	2	5	675	325	1000	675.0	325.0	1000.0	0.00	0.1	10.0	5.0	0.6	0.7	0.0
all equipment except two excavators at geographic center of project site; outlying excavators work as close as 25' of barrier for partial hour duration	excavator	2	40	81		1000	0.0		49.4	1	60	48	8	2	5	675	325	1000	675.0	325.0	1000.0	0.00	0.1	10.0	5.0	0.6	0.7	0.0
	excavator	2	40	81		800	0.0		51.5	0.25	15	45	8	2	5	475	325	800	475.0	325.0	800.0	0.00	0.1	10.0	5.0	0.6	0.7	0.0
	excavator	2	40	81		600	0.0		54.3	0.25	15	47	8	2	5	275	325	600	275.0	325.0	600.0	0.00	0.1	10.0	5.0	0.6	0.7	0.0
	excavator	2	40	81		350	0.0		59.5	0.25	15	53	8	2	5	25	325	350	25.2	325.0	350.1	0.00	0.1	10.0	5.0	0.6	0.7	0.0
							Total for B. Storm Drain Installation - no sound walls Phase:					**55.6**																
D. Storm Drain Installation - no sound walls	excavator	0	40	81		1000	0.0		49.4	1	60	0	8	2	5	675	325	1000	675.0	325.0	1000.0	0.00	0.1	10.0	5.0	0.6	0.7	0.0
	front end loader	1	40	79		1000	0.0		47.4	1	60	43	8	2	5	675	325	1000	675.0	325.0	1000.0	0.00	0.1	10.0	5.0	0.6	0.7	0.0
	flat bed truck	1	40	74	water truck	1000	0.0		42.4	1	60	38	8	2	5	675	325	1000	675.0	325.0	1000.0	0.00	0.1	10.0	5.0	0.6	0.7	0.0
all equipment except two excavators at geographic center of project site; outlying excavators work as close as 25' of barrier for full hour duration	excavator	0	40	81		1000	0.0		49.4	0	0	0	8	2	5	675	325	1000	675.0	325.0	1000.0	0.00	0.1	10.0	5.0	0.6	0.7	0.0
	excavator	0	40	81		800	0.0		51.5	0	0	0	8	2	5	475	325	800	475.0	325.0	800.0	0.00	0.1	10.0	5.0	0.6	0.7	0.0
	excavator	0	40	81		600	0.0		54.3	0	0	0	8	2	5	275	325	600	275.0	325.0	600.0	0.00	0.1	10.0	5.0	0.6	0.7	0.0
	excavator	2	40	81		350	0.0		59.5	1	60	59	8	2	5	25	325	350	25.2	325.0	350.1	0.00	0.1	10.0	5.0	0.6	0.7	0.0
							Total for D. Storm Drain Installation - no sound walls Phase:					**58.7**																

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

noise level limit for construction phase at receiving nest (or habitat edge, as applicable) = 60
allowable hours over which Leq is to be averaged = 1

= height of grade with respect to marsh (approx. mean sea level [MSL])
= sum of temporary barrier (TB) height plus project site grade height above MSL

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 1-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 (wout barrier)	G (with barrier)	G (without barrier)	ILbarr (dB)
B. Phase 2 Grading - no sound walls	scraper	0	40	84		1000	4.5		47.9	1	60	0	8	2	5	975	25	1000	975.0	25.2	1000.0	0.17	5.7	10.0	5.0	0.6	0.7	4.5
	flat bed truck	1	40	74	water truck	1000	4.5		37.9	1	60	34	8	2	5	975	25	1000	975.0	25.2	1000.0	0.17	5.7	10.0	5.0	0.6	0.7	4.5
	dozer	0	40	82		1000	4.5		45.9	1	60	0	8	2	5	975	25	1000	975.0	25.2	1000.0	0.17	5.7	10.0	5.0	0.6	0.7	4.5
	dozer	1	40	82		700	4.5		49.3	0.25	15	39	8	2	5	675	25	700	675.0	25.2	700.0	0.16	5.5	10.0	5.0	0.6	0.7	4.5
	dozer	1	40	82		700	4.5		49.3	0.25	15	39	8	2	5	675	25	700	675.0	25.2	700.0	0.16	5.5	10.0	5.0	0.6	0.7	4.5
all equipment except two scrapers and one dozer at geographic center of project site; outlying scraper pair and dozer works as close as 25' of barrier for partial hour duration	dozer	1	40	82		400	4.4		54.8	0.25	15	45	8	2	5	375	25	400	375.0	25.2	400.0	0.15	5.2	10.0	5.0	0.6	0.7	4.4
	dozer	1	40	82		50	0.1		81.9	0.25	15	72	8	2	5	25	25	50	25.2	25.2	50.4	0.00	0.1	10.0	5.0	0.6	0.7	0.1
	scraper	2	40	84		1000	4.5		47.9	0.25	15	41	8	2	5	975	25	1000	975.0	25.2	1000.0	0.17	5.7	10.0	5.0	0.6	0.7	4.5
	scraper	2	40	84		700	4.5		51.3	0.25	15	44	8	2	5	675	25	700	675.0	25.2	700.0	0.16	5.5	10.0	5.0	0.6	0.7	4.5
	scraper	2	40	84		400	4.4		56.8	0.25	15	50	8	2	5	375	25	400	375.0	25.2	400.0	0.15	5.2	10.0	5.0	0.6	0.7	4.4
	scraper	2	40	84		50	0.1		83.9	0.25	15	77	8	2	5	25	25	50	25.2	25.2	50.4	0.00	0.1	10.0	5.0	0.6	0.7	0.1
								Total for B. Phase 2 Grading - no sound walls Phase:				78.1																
B. Phase 2 Grading - with 8' tall sound walls	scraper	0	40	84		1000	12.0		40.4	1	60	0	8	2	13	975	25	1000	975.0	27.3	1000.0	2.31	15.0	18.0	5.0	0.4	0.7	12.0
	flat bed truck	1	40	74	water truck	1000	12.0		30.4	1	60	26	8	2	13	975	25	1000	975.0	27.3	1000.0	2.31	15.0	18.0	5.0	0.4	0.7	12.0
	dozer	0	40	82		1000	12.0		38.4	1	60	0	8	2	13	975	25	1000	975.0	27.3	1000.0	2.31	15.0	18.0	5.0	0.4	0.7	12.0
	dozer	1	40	82		700	12.3		41.5	0.25	15	31	8	2	13	675	25	700	675.0	27.3	700.0	2.31	15.0	18.0	5.0	0.4	0.7	12.3
	dozer	1	40	82		700	12.3		41.5	0.25	15	31	8	2	13	675	25	700	675.0	27.3	700.0	2.31	15.0	18.0	5.0	0.4	0.7	12.3
all equipment except two scrapers and one dozer at geographic center of project site; outlying scraper pair and dozer works as close as 25' of barrier for partial hour duration	dozer	1	40	82		400	12.9		46.3	0.25	15	36	8	2	13	375	25	400	375.0	27.3	400.0	2.30	15.0	18.0	5.0	0.4	0.7	12.9
	dozer	1	40	82		50	15.0		67.0	0.25	15	57	8	2	13	25	25	50	25.5	27.3	50.4	2.45	15.0	18.0	5.0	0.4	0.7	15.0
	scraper	2	40	84		1000	12.0		40.4	0.25	15	33	8	2	13	975	25	1000	975.0	27.3	1000.0	2.31	15.0	18.0	5.0	0.4	0.7	12.0
	scraper	2	40	84		700	12.3		43.5	0.25	15	37	8	2	13	675	25	700	675.0	27.3	700.0	2.31	15.0	18.0	5.0	0.4	0.7	12.3
	scraper	2	40	84		400	12.9		48.3	0.25	15	41	8	2	13	375	25	400	375.0	27.3	400.0	2.30	15.0	18.0	5.0	0.4	0.7	12.9
	scraper	2	40	84		50	15.0		69.0	0.25	15	62	8	2	13	25	25	50	25.5	27.3	50.4	2.45	15.0	18.0	5.0	0.4	0.7	15.0
								Total for B. Phase 2 Grading - with 8' tall sound walls Phase:				63.2																
B. Phase 2 Grading - with 8' tall sound walls	scraper	1	40	84		1000	12.0		40.4	0.5	30	33	8	2	13	975	25	1000	975.0	27.3	1000.0	2.31	15.0	18.0	5.0	0.4	0.7	12.0
	flat bed truck	1	40	74	water truck	1000	12.0		30.4	1	60	26	8	2	13	975	25	1000	975.0	27.3	1000.0	2.31	15.0	18.0	5.0	0.4	0.7	12.0
	dozer	1	40	82		1000	12.0		38.4	0.5	30	31	8	2	13	975	25	1000	975.0	27.3	1000.0	2.31	15.0	18.0	5.0	0.4	0.7	12.0
	dozer	1	40	82		700	12.3		41.5	0.125	7.5	28	8	2	13	675	25	700	675.0	27.3	700.0	2.31	15.0	18.0	5.0	0.4	0.7	12.3
	dozer	1	40	82		700	12.3		41.5	0.125	7.5	28	8	2	13	675	25	700	675.0	27.3	700.0	2.31	15.0	18.0	5.0	0.4	0.7	12.3
all equipment except two scrapers and one dozer at geographic center of project site; outlying scraper pair and dozer works as close as 25' of barrier for partial hour duration	dozer	1	40	82		400	12.9		46.3	0.125	7.5	33	8	2	13	375	25	400	375.0	27.3	400.0	2.30	15.0	18.0	5.0	0.4	0.7	12.9
	dozer	1	40	82		50	15.0		67.0	0.125	7.5	54	8	2	13	25	25	50	25.5	27.3	50.4	2.45	15.0	18.0	5.0	0.4	0.7	15.0
	scraper	2	40	84		1000	12.0		40.4	0.125	7.5	30	8	2	13	975	25	1000	975.0	27.3	1000.0	2.31	15.0	18.0	5.0	0.4	0.7	12.0
	scraper	2	40	84		700	12.3		43.5	0.125	7.5	33	8	2	13	675	25	700	675.0	27.3	700.0	2.31	15.0	18.0	5.0	0.4	0.7	12.3
	scraper	2	40	84		400	12.9		48.3	0.125	7.5	38	8	2	13	375	25	400	375.0	27.3	400.0	2.30	15.0	18.0	5.0	0.4	0.7	12.9
	scraper	2	40	84		50	15.0		69.0	0.125	7.5	59	8	2	13	25	25	50	25.5	27.3	50.4	2.45	15.0	18.0	5.0	0.4	0.7	15.0
								Total for B. Phase 2 Grading - with 8' tall sound walls Phase:				**60.2**																

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

noise level limit for construction phase at receiving nest (or habitat edge, as applicable) = 60
allowable hours over which Leq is to be averaged = 1

= height of grade with respect to marsh (approx. mean sea level [MSL])
= sum of temporary barrier (TB) height plus project site grade height above MSL

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 1-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 (wout barrier)	G (with barrier)	G (without barrier)	ILbarr (dB)
A. Phase 2 Storm Drain - no sound walls	excavator	1	40	81		1000	4.5		44.9	1	60	41	8	2	5	975	25	1000	975.0	25.2	1000.0	0.17	5.7	10.0	5.0	0.6	0.7	4.5
	front end loader	1	40	79	water truck	1000	4.5		42.9	1	60	39	8	2	5	975	25	1000	975.0	25.2	1000.0	0.17	5.7	10.0	5.0	0.6	0.7	4.5
	flat bed truck	1	40	74		1000	4.5		37.9	1	60	34	8	2	5	975	25	1000	975.0	25.2	1000.0	0.17	5.7	10.0	5.0	0.6	0.7	4.5
all equipment except one excavator at geographic center of project site; outlying excavator works as close as 25' of barrier for partial hour duration	excavator	1	40	81		1000	4.5		44.9	0.25	15	35	8	2	5	975	25	1000	975.0	25.2	1000.0	0.17	5.7	10.0	5.0	0.6	0.7	4.5
	excavator	1	40	81		700	4.5		48.3	0.25	15	38	8	2	5	675	25	700	675.0	25.2	700.0	0.16	5.5	10.0	5.0	0.6	0.7	4.5
	excavator	1	40	81		400	4.4		53.8	0.25	15	44	8	2	5	375	25	400	375.0	25.2	400.0	0.15	5.2	10.0	5.0	0.6	0.7	4.4
	excavator	1	40	81		50	0.1		80.9	0.25	15	71	8	2	5	25	25	50	25.2	25.2	50.4	0.00	0.1	10.0	5.0	0.6	0.7	0.1
								Total for A. Phase 2 Storm Drain - no sound walls Phase:				70.9															
A. Phase 2 Storm Drain - with 8' sound walls	excavator	1	40	81		1000	12.0		37.4	1	60	33	8	2	13	975	25	1000	975.0	27.3	1000.0	2.31	15.0	18.0	5.0	0.4	0.7	12.0
	front end loader	1	40	79	water truck	1000	12.0		35.4	1	60	31	8	2	13	975	25	1000	975.0	27.3	1000.0	2.31	15.0	18.0	5.0	0.4	0.7	12.0
	flat bed truck	1	40	74		1000	12.0		30.4	1	60	26	8	2	13	975	25	1000	975.0	27.3	1000.0	2.31	15.0	18.0	5.0	0.4	0.7	12.0
all equipment except one excavator at geographic center of project site; outlying excavator works as close as 25' of barrier for partial hour duration	excavator	1	40	81		1000	12.0		37.4	0.25	15	27	8	2	13	975	25	1000	975.0	27.3	1000.0	2.31	15.0	18.0	5.0	0.4	0.7	12.0
	excavator	1	40	81		700	12.3		40.5	0.25	15	30	8	2	13	675	25	700	675.0	27.3	700.0	2.31	15.0	18.0	5.0	0.4	0.7	12.3
	excavator	1	40	81		400	12.9		45.3	0.25	15	35	8	2	13	375	25	400	375.0	27.3	400.0	2.30	15.0	18.0	5.0	0.4	0.7	12.9
	excavator	1	40	81		50	15.0		66.0	0.25	15	56	8	2	13	25	25	50	25.5	27.3	50.4	2.45	15.0	18.0	5.0	0.4	0.7	15.0
								Total for A. Phase 2 Storm Drain - with 8' sound walls Phase:				56.0															
B. Phase 2 Storm Drain - with 8' sound walls	excavator	0	40	81		1000	12.0		37.4	1	60	0	8	2	13	975	25	1000	975.0	27.3	1000.0	2.31	15.0	18.0	5.0	0.4	0.7	12.0
	front end loader	1	40	79	water truck	1000	12.0		35.4	1	60	31	8	2	13	975	25	1000	975.0	27.3	1000.0	2.31	15.0	18.0	5.0	0.4	0.7	12.0
	flat bed truck	1	40	74		1000	12.0		30.4	1	60	26	8	2	13	975	25	1000	975.0	27.3	1000.0	2.31	15.0	18.0	5.0	0.4	0.7	12.0
all equipment except two excavators at geographic center of project site; outlying excavators work as close as 25' of barrier for partial hour duration	excavator	2	40	81		1000	12.0		37.4	0.25	15	30	8	2	13	975	25	1000	975.0	27.3	1000.0	2.31	15.0	18.0	5.0	0.4	0.7	12.0
	excavator	2	40	81		700	12.3		40.5	0.25	15	34	8	2	13	675	25	700	675.0	27.3	700.0	2.31	15.0	18.0	5.0	0.4	0.7	12.3
	excavator	2	40	81		400	12.9		45.3	0.25	15	38	8	2	13	375	25	400	375.0	27.3	400.0	2.30	15.0	18.0	5.0	0.4	0.7	12.9
	excavator	2	40	81		50	15.0		66.0	0.25	15	59	8	2	13	25	25	50	25.5	27.3	50.4	2.45	15.0	18.0	5.0	0.4	0.7	15.0
								Total for B. Phase 2 Storm Drain - with 8' sound walls Phase:				59.0															
D. Phase 2 Storm Drain - no sound walls	excavator	0	40	81		1000	12.0		37.4	1	60	0	8	2	13	975	25	1000	975.0	27.3	1000.0	2.31	15.0	18.0	5.0	0.4	0.7	12.0
	front end loader	1	40	79	water truck	1000	12.0		35.4	1	60	31	8	2	13	975	25	1000	975.0	27.3	1000.0	2.31	15.0	18.0	5.0	0.4	0.7	12.0
	flat bed truck	1	40	74		1000	12.0		30.4	1	60	26	8	2	13	975	25	1000	975.0	27.3	1000.0	2.31	15.0	18.0	5.0	0.4	0.7	12.0
all equipment except two excavators at geographic center of project site; outlying excavators work as close as 25' of barrier for full hour duration	excavator	0	40	81		1000	12.0		37.4	1	60	0	8	2	13	975	25	1000	975.0	27.3	1000.0	2.31	15.0	18.0	5.0	0.4	0.7	12.0
	excavator	0	40	81		700	12.3		40.5	1	60	0	8	2	13	675	25	700	675.0	27.3	700.0	2.31	15.0	18.0	5.0	0.4	0.7	12.3
	excavator	0	40	81		400	12.9		45.3	1	60	0	8	2	13	375	25	400	375.0	27.3	400.0	2.30	15.0	18.0	5.0	0.4	0.7	12.9
	excavator	2	40	81		50	15.0		66.0	1	60	65	8	2	13	25	25	50	25.5	27.3	50.4	2.45	15.0	18.0	5.0	0.4	0.7	15.0
								Total for D. Phase 2 Storm Drain - no sound walls Phase:				65.0															