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Memorandum

Subject	**Acoustical Model of Proposed GD Electric Boat South Yard Assembly Building Project**
Date	April 8, 2019
To:	Mr. Paul Harren
	Facilities Master Plan Program Manager

This technical memorandum summarizes the predicted sound levels for the proposed new assembly building at the General Dynamics Electric Boat South Yard Assembly Building Project (Project) in Groton, Connecticut. Figure 1 present the Project's proposed building general arrangement and the predicted sound levels based on the analysis described herein as well as the ambient sound monitoring location. The Project is located along a historically working waterfront and Electric Boat has over a 100 year operational history in the area. While the City of Groton, Connecticut has not established numeric sound limits, predicted Project sound levels are within the range of those measured at the Projects property line. It is also understood that General Dynamics Electric Boat has offered to work with nearby residences potentially concerned about various aspects of the Project, including potential future sound levels, and has offered to purchase numerous homes.

Fundamentals of Acoustics

Acoustics is the study of sound, and noise is defined as unwanted sound. Airborne sound is a rapid fluctuation or oscillation of air pressure above and below atmospheric pressure creating a sound wave. Acoustical terms used in this memorandum are summarized in Table 1.

TABLE 1
Definitions of Acoustical Terms

Term	Definition
Ambient Noise Level	The composite of noise from all sources near and far. The normal or existing level of environmental noise or sound at a given location. The ambient level is typically defined by the L_{eq} level.
Background Noise Level	The underlying ever-present lower level noise that remains in the absence of intrusive or intermittent sounds. Distant sources, such as traffic, typically make up the background. The background level is generally defined by the L_{90} percentile noise level.
Intrusive	Noise that intrudes over and above the existing ambient noise at a given location. The relative intrusiveness of a sound depends upon its amplitude, duration, frequency, time of occurrence, tonal content, the prevailing ambient noise level as well as the sensitivity of the receiver. The intrusive level is generally defined by the L_{10} percentile noise level.
Sound Pressure (Noise) Level or Decibel (dB)	A unit describing the amplitude of sound, equal to 20 times the logarithm to the base 10 of the ratio of the pressure of the sound measured to the reference pressure, which is 20 micropascals (20 micronewtons per square meter).
A-Weighted Sound Pressure (Noise) Level (dBA)	The sound level in decibels as measured on a sound level meter using the A-weighted filter network. The A-weighted filter de-emphasizes the very low and very high frequency components of the sound in a manner similar to the frequency response of the human ear. All sound (noise) levels in this report are A-weighted.
Equivalent Noise Level (L_{eq})	The average A-weighted noise level, on an equal energy basis, during the measurement period.
Percentile Noise Level (L_n)	The noise level exceeded during n percent of the measurement period, where n is a number between 0 and 100 (for example, L_{90})

The most common metric is the overall A-weighted sound level measurement that has been adopted by regulatory bodies worldwide. The A-weighting network measures sound in a similar fashion to the way in which a person perceives or hears sound. There is consensus that A-weighting is appropriate for estimation of the hazard of noise induced hearing loss. With respect to other effects, such as annoyance, A-weighting is acceptable if there is largely middle and high frequency noise present, but if the noise is unusually high at low frequencies, or contains prominent low frequency tones, the A-weighting may not give a valid measure. No unusually high sources of low frequency noise, such as simple-cycle gas turbine with direct exhaust or large induced draft fans are anticipated for this Project.

A-weighted sound levels are typically measured or presented as equivalent noise level (L_{eq}), which is defined as the average noise level, on an equal energy basis for a stated period of time, and is commonly used to measure steady-state sound or noise that is usually dominant. Statistical methods are used to capture the dynamics of a changing acoustical environment. Statistical measurements are typically denoted by L_{xx}, where xx represents the percentile of time the sound level is exceeded. The L_{90} is a measurement that represents the noise level that is exceeded during 90 percent of the measurement period. Similarly, the L_{10} represents the noise level exceeded for 10 percent of the measurement period.

The effects of noise on people can be listed in three general categories:

- Subjective effects of annoyance, nuisance, and dissatisfaction
- Interference with activities such as speech, sleep, and learning
- Physiological effects such as startling and hearing loss

In most cases, environmental noise produces effects in the first two categories only. However, workers in industrial plants may experience noise effects in the third category. No completely satisfactory way exists to measure the subjective effects of noise, or to measure the corresponding reactions of annoyance and dissatisfaction. This lack of a common standard is primarily due to the wide variation in individual thresholds of annoyance and habituation to noise. Thus, an important way of determining a person's subjective reaction to a new noise is by comparing it to the existing or "ambient" environment to which that person has adapted. In general, the more the level or the tonal (frequency) variations of a noise exceed the previously existing ambient noise level or tonal quality, the less acceptable the new noise will be, as judged by the exposed individual.

Table 2 shows the relative A-weighted noise levels of common sounds measured in the environment and in industry for various sound levels.

TABLE 2
Typical Sound Levels Measured in the Environment and Industry

Noise Source At a Given Distance	A-Weighted Sound Level in Decibels	Qualitative Description
Carrier Deck Jet Operation	140	
	130	Pain threshold
Jet takeoff (200 feet)	120	
Auto Horn (3 feet)	110	Maximum Vocal Effort
Jet takeoff (2,000 feet) Shout (0.5 foot)	100	
N.Y. Subway Station Heavy Truck (50 feet)	90	Very Annoying Hearing Damage (8-hour, continuous exposure)
Pneumatic drill (50 feet)	80	Annoying
Freight Train (50 feet) Freeway Traffic (50 feet)	70 to 80	
	70	Intrusive Telephone Use Difficult
Air Conditioning Unit (20 feet)	60	
Light auto traffic (50 feet)	50	Quiet
Living Room Bedroom	40	

TABLE 2
Typical Sound Levels Measured in the Environment and Industry

Noise Source At a Given Distance	A-Weighted Sound Level in Decibels	Qualitative Description
Library Soft whisper (5 feet)	30	Very Quiet
Broadcasting Studio	20	Recording studio
	10	Just Audible

Adapted from Table E, New York Department of Environmental Conservation (2001).

Modeling Methods

An acoustical model of the proposed Project has been developed using the Cadna/A noise model by DataKustik GmbH of Munich, Germany. The Cadna/A noise model is a three-dimensional ray tracing model that is capable of modeling complex industrial plants and terrain. The sound propagation factors used in the model have been adopted from International Organization for Standardization (ISO) 9613-2, *Acoustics – Sound Attenuation during Propagation Outdoors* (ISO, 1996). The model divides the proposed facility into a list of individual sound sources representing each piece of equipment that produces a significant amount of noise. Using these noise levels as a basis, the model calculates the noise level that would occur at each receptor from each source after losses from distance, air absorption, blockages, etc., are considered. The sum of all these individual levels is the total Project level at the modeling point.

The ISO 9613-2 method is based on an omnidirectional downwind condition. That is, the sound prediction algorithms assume every point at which sound level is calculated is downwind of all noise-emitting equipment simultaneously. In essence, the prediction assumes each receiver or prediction point is a “black hole” and the wind is blowing from each sound source and into this black hole. While this is physically impossible, the ISO 9613-2 model has been widely and successfully used to develop acoustical models for industrial facilities. The ISO 9613-2 parameters used in this assessment are hard ground (G = 0, where G may vary between 0 for hard (e.g., water, pavement or concrete) and 1 for acoustically absorptive ground (e.g., plowed earth)) for the Project parcel and adjacent water body and mixed ground (G=0.2). The model used a receptor height of 6.5 feet and screening from topography was considered in the model. Atmospheric absorption for conditions of 50 degrees Fahrenheit and 70 percent relative humidity (conditions that favor propagation) was computed in accordance with ISO 9613-1, Acoustics—Sound Attenuation During Propagation Outdoors, Part 1: Calculation of the Absorption of Sound by the Atmosphere (ISO, 1993).

Potentially substantial sources of sound were identified by the Project engineering team. Outdoor sound sources consisted primarily of heating, ventilation and air conditioning (HVAC) equipment (e.g., roof fans, chillers), motors and exhaust. Sources of intermittent or short duration sound, such as steam venting are understood to have silencer to minimize their sound levels and have not been included in these modeling results. Sound generating activities inside the building will vary throughout the manufacturing and assembly process. To assess the potential for interior activities to influence exterior sound levels, the sound level along the full height of the interior face of the main building walls and roof were assumed to be 80 dBA. This is 5 dBA less than the typical OSHA standard for hearing protection. An interior sound of 75 dBA was used for the utility building. While sound levels may exceed the OSHA standard for hearing protection at some areas within the building, sound levels dissipate with distance. Experience at other large buildings (e.g., power plants) has indicated that while sound levels near various pieces equipment may exceed 100 dBA, the average sound level at the interior of the building walls dissipates to less than 75 dBA. Building ventilation louvers were modeled as open windows and the large doors on the north and south side of the building were modeled to provide a 5 dBA reduction (or, equivalently, that when the doors are open the average sound level of the opening is 75 dBA). The building walls and roof were modeled with a sound reduction index of 25, similar to that afforded by a single layer of 1 mm thick steel.

Modeling Results

The predicted Project-only sound levels are presented as sound contours in Figure 1. The model results incorporate topography but do not include the additional shielding afforded by buildings located on or off the Project site. The predicted results are subject to both negative and positive variance, the level of which depends on a number of factors, including timescale, metric, and methods of evaluation. As shown in Figure 1, the long-term average project sound level is not predicted to exceed 54 dBA along Eastern Point Road. As the overall sound level one would hear or measure is the sum of both Project and non-Project sounds, the assessment of Project-only sounds during periods of substantial non-Project sounds may require statistical or engineering methods to minimize the undue influence of non-Project sounds.

Existing Sound Levels

Existing sound levels were measured just within the fence line of the Electric Boat Groton Facility, where Chapman Street meets Eastern Point Road, State Route 349 (refer to Figure 1). A Type 1, precision, statistical sound level meter was used to conduct the sound level measurements. The sound level meter was was located field calibrated before and after the survey with a precision calibrator. Weather during the first day of the survey (the morning of April 3 to early afternoon April 4) was conducive to accurate measurements. Winds increased later in the afternoon of April 4 and there were periods of precipitation which may have resulted in increased sound level measurements. Sound sources in the vicinity were observed to be primarily related to local automobile, medium and heavy truck traffic. In addition to traffic associated with Electric Boat, other destinations include Pfizer, University of Connecticut's Avery Point Campus and the Buckeye Terminal. Squawks from seagulls were occasional observed, as well as occasional blasts from a ship's whistle getting underway on the Thames River and back-up warning signals. The monitoring results are presented in Table 3 and graphically in Figure 3 and 4. These results depict typical diurnal sound and traffic patterns where sound levels increase during the day and decrease at night, with the lowest sound levels occurring between 1 and 4 a.m. Outside of these hours, the measured sound levels typically exceed the predicted Project-only sound levels.

Conclusions

An acoustical model of the proposed Project was developed, and sound levels were monitored within the facility fence line. Measured existing ambient sound levels varied between approximately 40 and 70 dBA and were primarily influenced by traffic along State Route 349. The long-term average Project sound level is not predicted to exceed 54 dBA at the fence line adjacent to State Route 349. While Project sound levels may vary, it is not anticipated that they will fall outside of the range of measured existing levels.

References

International Organization for Standardization (ISO) 1993. ISO 9613-1, Acoustics—Sound Attenuation During Propagation Outdoors. Part 1: Calculation of the Absorption of Sound by the Atmosphere. Geneva, Switzerland.

International Organization for Standardization (ISO). 1996. ISO 9613-2, Acoustics—Sound Attenuation During Propagation Outdoors. Part 2: General Method of Calculation. Geneva, Switzerland.

New York Department of Environmental Conservation. 2001. Assessing and Mitigating Noise Impacts. February 2, 2001.

Figures

LEGEND

Predicted Sound Pressure Level (dBA)

- 40
- 41; 42; 43; 44
- 45
- 46; 47; 48; 49
- 50
- 51; 52; 53; 54
- 55
- 56; 57; 58; 59
- 60
- 61; 62; 63; 64
- 65
- 66; 67; 68; 69
- 70

- Proposed Building
- Deck
- Noise Monitoring Station
- Approximate Property Boundary

N

0 250 500 1,000
Feet

Figure 1. Predicted Sound Pressure Level (dBA)
General Dynmics Electric Boat Project
Groton, Connecticut

C:\USERS\GGEE\DOCUMENTS\GIS\BASTACH_PROJECT\GDEB\MAPFILES\SOUND_040519.MXD GGEE 4/9/2019 11:57:39 AM

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FIGURE 2

Site Sound Monitoring Equipment Location

FIGURE 3
Plotted Sound Monitoring Data

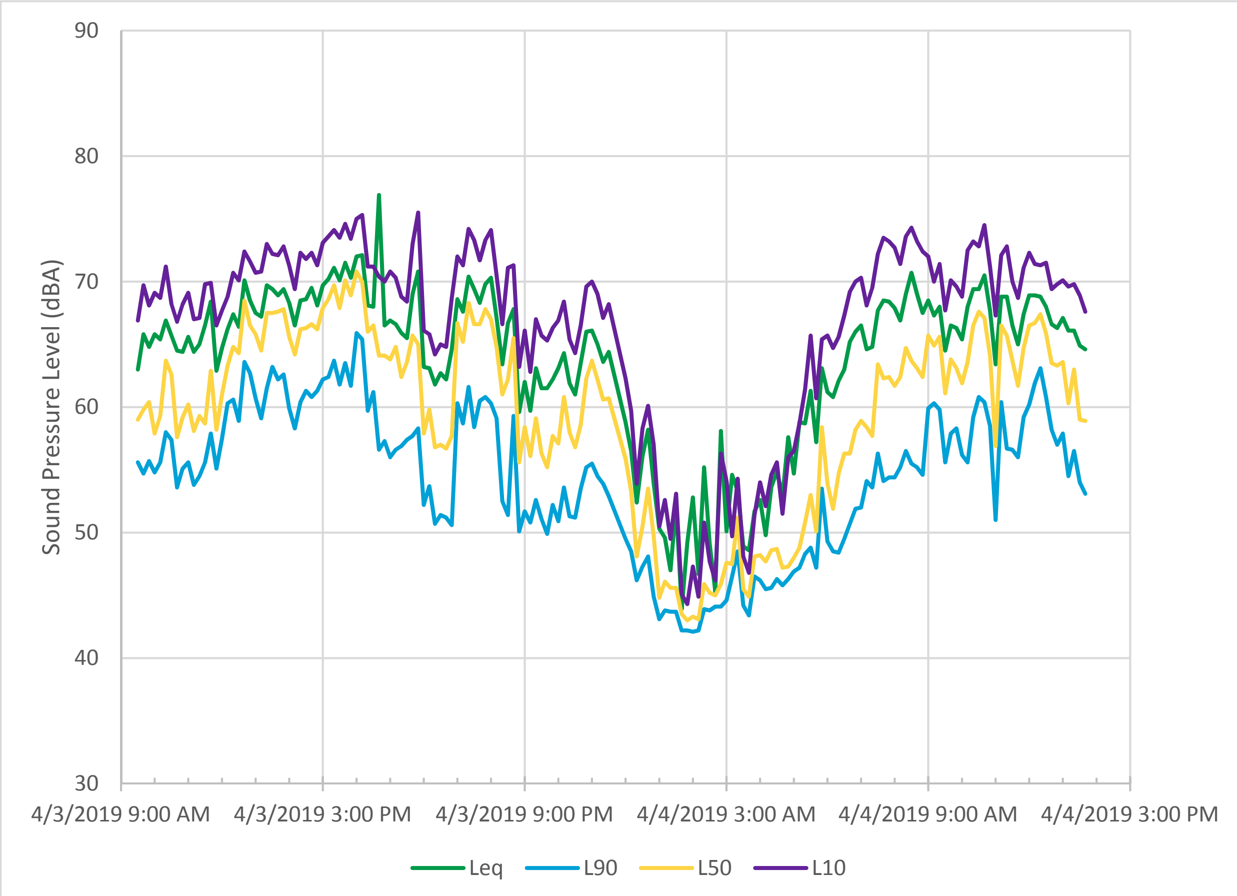
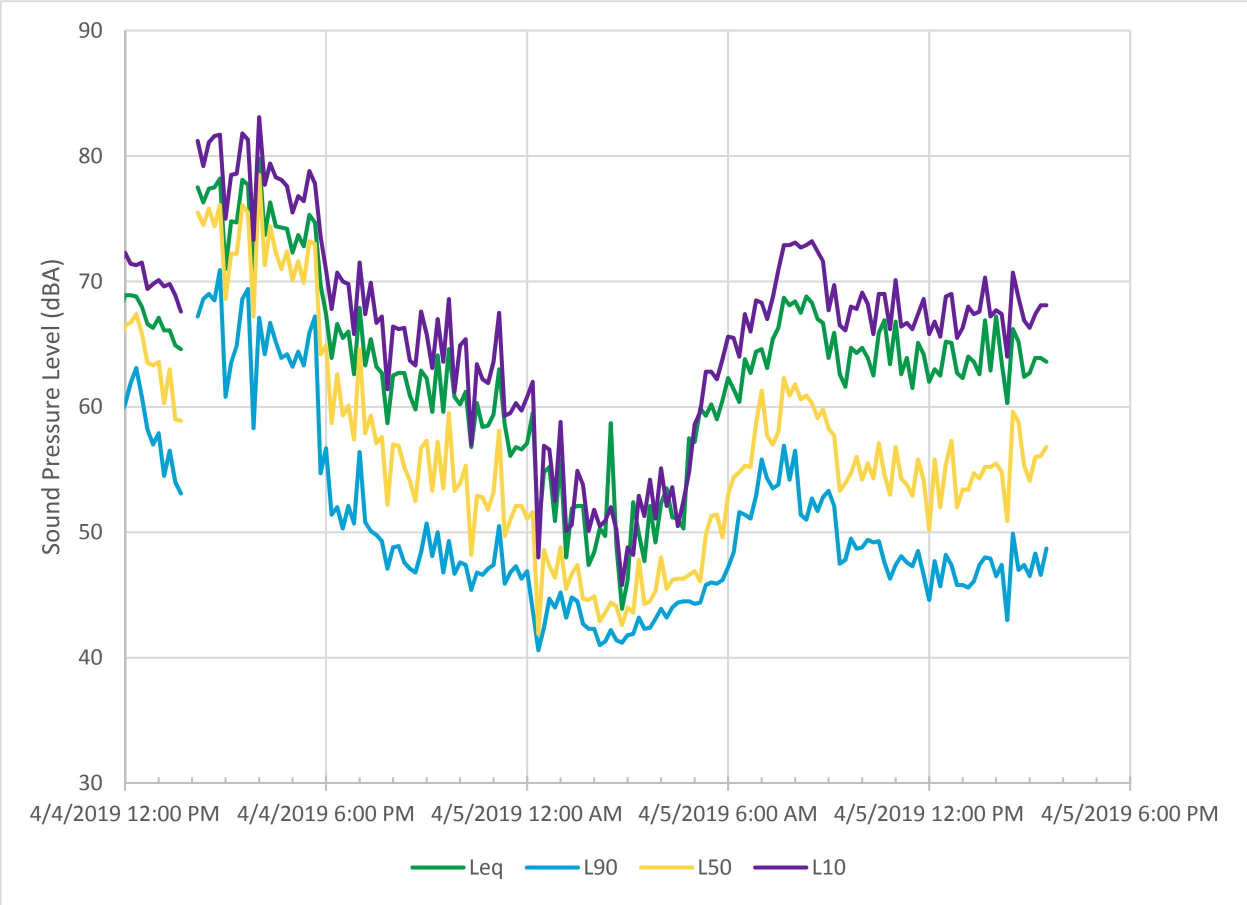


FIGURE 4
Plotted Sound Monitoring Data



Tables

Table 3. Tabular Sound Monitoring Results (dBA)

Period start	L_{eq}	L_{min}	L_{max}	L_{90}	L_{50}	L_{10}
4/3/2019 9:30	63	54	75	56	59	67
4/3/2019 9:40	66	52	81	55	60	70
4/3/2019 9:50	65	54	79	56	60	68
4/3/2019 10:00	66	52	81	55	58	69
4/3/2019 10:10	65	53	79	56	59	69
4/3/2019 10:20	67	56	79	58	64	71
4/3/2019 10:30	66	52	79	57	63	68
4/3/2019 10:40	65	51	82	54	58	67
4/3/2019 10:50	64	53	76	55	59	68
4/3/2019 11:00	66	52	81	56	60	69
4/3/2019 11:10	64	51	80	54	58	67
4/3/2019 11:20	65	52	83	55	59	67
4/3/2019 11:30	67	53	85	56	59	70
4/3/2019 11:40	68	56	87	58	63	70
4/3/2019 11:50	63	54	75	55	58	67
4/3/2019 12:00	65	56	78	58	61	68
4/3/2019 12:10	66	57	81	60	63	69
4/3/2019 12:20	67	56	81	61	65	71
4/3/2019 12:30	66	55	75	59	64	70
4/3/2019 12:40	70	60	84	64	69	72
4/3/2019 12:50	69	59	81	63	67	72
4/3/2019 13:00	68	57	77	61	66	71
4/3/2019 13:10	67	56	78	59	65	71
4/3/2019 13:20	70	56	79	62	68	73
4/3/2019 13:30	69	59	80	63	68	72
4/3/2019 13:40	69	57	78	62	68	72
4/3/2019 13:50	69	55	78	63	68	73
4/3/2019 14:00	68	54	81	60	66	71
4/3/2019 14:10	67	53	77	58	64	69
4/3/2019 14:20	69	54	78	60	66	72
4/3/2019 14:30	69	56	80	61	66	72
4/3/2019 14:40	70	54	86	61	67	72
4/3/2019 14:50	68	55	78	61	66	71
4/3/2019 15:00	70	55	80	62	68	73
4/3/2019 15:10	70	57	77	62	69	74
4/3/2019 15:20	71	58	79	64	70	74
4/3/2019 15:30	70	56	79	62	68	74
4/3/2019 15:40	72	57	80	64	70	75
4/3/2019 15:50	70	55	79	62	69	73
4/3/2019 16:00	72	62	80	66	71	75
4/3/2019 16:10	72	59	82	65	70	75
4/3/2019 16:20	68	56	81	60	66	71

Table 3. Tabular Sound Monitoring Results (dBA)

Period start	L_{eq}	L_{min}	L_{max}	L_{90}	L_{50}	L_{10}
4/3/2019 16:30	68	54	76	61	67	71
4/3/2019 16:40	77	52	102	57	64	70
4/3/2019 16:50	67	51	76	57	64	70
4/3/2019 17:00	67	52	80	56	64	71
4/3/2019 17:10	67	51	74	57	65	70
4/3/2019 17:20	66	51	82	57	62	69
4/3/2019 17:30	66	53	77	57	64	68
4/3/2019 17:40	69	51	81	58	66	73
4/3/2019 17:50	71	52	83	58	65	76
4/3/2019 18:00	63	49	81	52	58	66
4/3/2019 18:10	63	49	77	54	60	66
4/3/2019 18:20	62	47	77	51	57	64
4/3/2019 18:30	63	48	80	51	57	65
4/3/2019 18:40	62	48	76	51	57	65
4/3/2019 18:50	65	48	79	51	58	69
4/3/2019 19:00	69	56	77	60	67	72
4/3/2019 19:10	68	52	79	59	65	71
4/3/2019 19:20	70	56	79	62	68	74
4/3/2019 19:30	69	51	78	58	67	73
4/3/2019 19:40	68	55	78	61	67	72
4/3/2019 19:50	70	53	79	61	68	73
4/3/2019 20:00	70	57	81	60	67	74
4/3/2019 20:10	67	53	76	59	65	71
4/3/2019 20:20	63	46	77	53	61	67
4/3/2019 20:30	67	48	79	51	62	71
4/3/2019 20:40	68	51	78	59	66	71
4/3/2019 20:50	60	47	73	50	56	63
4/3/2019 21:00	62	48	74	52	58	66
4/3/2019 21:10	60	48	73	51	56	63
4/3/2019 21:20	63	49	73	53	59	67
4/3/2019 21:30	62	48	73	51	56	66
4/3/2019 21:40	62	47	76	50	55	65
4/3/2019 21:50	62	49	73	52	58	66
4/3/2019 22:00	63	48	77	51	57	67
4/3/2019 22:10	64	48	76	54	61	68
4/3/2019 22:20	62	49	74	51	58	65
4/3/2019 22:30	61	49	75	51	57	64
4/3/2019 22:40	64	50	79	54	59	67
4/3/2019 22:50	66	51	79	55	62	70
4/3/2019 23:00	66	52	77	56	64	70
4/3/2019 23:10	65	49	74	55	62	69
4/3/2019 23:20	64	50	74	54	61	67

Table 3. Tabular Sound Monitoring Results (dBA)

Period start	L_{eq}	L_{min}	L_{max}	L_{90}	L_{50}	L_{10}
4/3/2019 23:30	64	48	79	53	61	68
4/4/2019 0:00	59	47	72	50	56	62
4/4/2019 0:10	57	46	69	49	53	60
4/4/2019 0:20	52	44	70	46	48	54
4/4/2019 0:30	56	46	71	47	51	58
4/4/2019 0:40	58	46	75	48	54	60
4/4/2019 0:50	54	43	67	45	50	57
4/4/2019 1:00	50	42	70	43	45	51
4/4/2019 1:10	50	42	62	44	46	53
4/4/2019 1:20	47	42	58	44	46	50
4/4/2019 1:30	52	42	69	44	46	53
4/4/2019 1:40	44	42	50	42	44	45
4/4/2019 1:50	49	42	71	42	43	44
4/4/2019 2:00	53	41	73	42	43	47
4/4/2019 2:10	47	41	65	42	43	45
4/4/2019 2:20	55	43	76	44	46	51
4/4/2019 2:30	49	43	69	44	45	48
4/4/2019 2:40	45	43	50	44	45	46
4/4/2019 2:50	58	43	80	44	46	56
4/4/2019 3:00	50	44	61	45	48	54
4/4/2019 3:10	55	46	74	47	48	50
4/4/2019 3:20	53	48	68	49	51	54
4/4/2019 3:30	49	43	66	44	46	48
4/4/2019 3:40	49	43	69	43	45	47
4/4/2019 3:50	52	45	70	47	48	51
4/4/2019 4:00	53	45	69	46	48	54
4/4/2019 4:10	50	44	63	46	48	52
4/4/2019 4:20	54	44	74	46	49	55
4/4/2019 4:30	55	45	72	46	49	56
4/4/2019 4:40	53	45	71	46	47	52
4/4/2019 4:50	58	45	75	46	47	56
4/4/2019 5:00	55	46	69	47	48	57
4/4/2019 5:10	59	46	78	47	49	59
4/4/2019 5:20	59	46	73	48	51	61
4/4/2019 5:30	61	46	77	49	53	66
4/4/2019 5:40	57	46	71	47	50	61
4/4/2019 5:50	63	49	81	54	58	65
4/4/2019 6:00	61	47	73	49	54	66
4/4/2019 6:10	61	48	74	49	52	65
4/4/2019 6:20	62	47	79	48	55	66
4/4/2019 6:30	63	48	76	50	56	67
4/4/2019 6:40	65	48	79	51	56	69

Table 3. Tabular Sound Monitoring Results (dBA)

Period start	L_{eq}	L_{min}	L_{max}	L_{90}	L_{50}	L_{10}
4/4/2019 6:50	66	49	81	52	58	70
4/4/2019 7:00	67	50	85	52	59	70
4/4/2019 7:10	65	51	79	54	58	68
4/4/2019 7:20	65	51	78	54	58	70
4/4/2019 7:30	68	53	77	56	63	72
4/4/2019 7:40	69	50	79	54	62	74
4/4/2019 7:50	68	50	80	54	62	73
4/4/2019 8:00	68	51	79	54	62	73
4/4/2019 8:10	67	52	79	55	62	71
4/4/2019 8:20	69	50	79	57	65	74
4/4/2019 8:30	71	48	91	56	64	74
4/4/2019 8:40	69	50	86	55	63	73
4/4/2019 8:50	68	51	81	55	62	72
4/4/2019 9:00	69	53	79	60	66	72
4/4/2019 9:10	67	57	79	60	65	70
4/4/2019 9:20	68	56	78	60	66	71
4/4/2019 9:30	65	53	80	56	61	68
4/4/2019 9:40	67	51	77	58	64	70
4/4/2019 9:50	66	52	78	58	63	70
4/4/2019 10:00	65	53	78	56	62	69
4/4/2019 10:10	68	51	77	56	64	73
4/4/2019 10:20	69	54	79	59	67	73
4/4/2019 10:30	69	55	79	61	68	73
4/4/2019 10:40	71	54	81	60	67	75
4/4/2019 10:50	68	52	80	59	64	71
4/4/2019 11:00	63	47	78	51	57	67
4/4/2019 11:10	69	52	82	60	67	72
4/4/2019 11:20	69	50	79	57	66	73
4/4/2019 11:30	67	51	78	57	64	70
4/4/2019 11:40	65	50	76	56	62	69
4/4/2019 11:50	67	56	78	59	65	71
4/4/2019 12:00	69	53	80	60	67	72
4/4/2019 12:10	69	56	85	62	67	71
4/4/2019 12:20	69	59	79	63	67	71
4/4/2019 12:30	68	54	78	61	66	72
4/4/2019 12:40	67	54	84	58	64	69
4/4/2019 12:50	66	52	77	57	63	70
4/4/2019 13:00	67	51	82	58	64	70
4/4/2019 13:10	66	49	80	55	60	70
4/4/2019 13:20	66	52	79	57	63	70
4/4/2019 13:30	65	50	78	54	59	69
4/4/2019 13:40	65	50	79	53	59	68

Table 3. Tabular Sound Monitoring Results (dBA)

Period start	L_{eq}	L_{min}	L_{max}	L_{90}	L_{50}	L_{10}
4/4/2019 13:50	67	51	78	57	64	70
Measurements Paused						
4/4/2019 14:10	78	52	86	67	76	81
4/4/2019 14:20	76	58	87	69	75	79
4/4/2019 14:30	77	60	86	69	76	81
4/4/2019 14:40	78	58	89	69	74	82
4/4/2019 14:50	78	62	88	71	76	82
4/4/2019 15:00	71	53	82	61	69	75
4/4/2019 15:10	75	52	86	64	72	79
4/4/2019 15:20	75	53	84	65	72	79
4/4/2019 15:30	78	57	88	69	76	82
4/4/2019 15:40	78	62	85	69	76	81
4/4/2019 15:50	70	52	81	58	67	73
4/4/2019 16:00	80	52	87	67	79	83
4/4/2019 16:10	74	56	84	64	71	78
4/4/2019 16:20	76	58	88	67	74	79
4/4/2019 16:30	74	57	83	65	72	78
4/4/2019 16:40	74	53	85	64	71	78
4/4/2019 16:50	74	52	82	64	72	78
4/4/2019 17:00	72	51	83	63	70	76
4/4/2019 17:10	74	55	84	64	72	77
4/4/2019 17:20	73	55	84	63	70	76
4/4/2019 17:30	75	55	85	66	73	79
4/4/2019 17:40	75	61	84	67	73	78
4/4/2019 17:50	70	49	83	55	64	74
4/4/2019 18:00	67	49	78	57	65	71
4/4/2019 18:10	64	47	80	51	59	68
4/4/2019 18:20	67	48	78	52	63	71
4/4/2019 18:30	66	46	77	50	59	70
4/4/2019 18:40	66	49	80	52	60	70
4/4/2019 18:50	63	47	80	51	57	66
4/4/2019 19:00	68	48	81	56	65	72
4/4/2019 19:10	63	48	79	51	58	67
4/4/2019 19:20	65	47	77	50	59	70
4/4/2019 19:30	63	47	77	50	57	67
4/4/2019 19:40	63	47	76	49	58	67
4/4/2019 19:50	59	45	76	47	52	61
4/4/2019 20:00	63	46	75	49	57	66
4/4/2019 20:10	63	46	78	49	57	66
4/4/2019 20:20	63	44	78	48	55	66
4/4/2019 20:30	61	45	77	47	54	64
4/4/2019 20:40	60	45	74	47	53	63

Table 3. Tabular Sound Monitoring Results (dBA)

Period start	L_{eq}	L_{min}	L_{max}	L_{90}	L_{50}	L_{10}
4/4/2019 20:50	63	45	76	48	57	68
4/4/2019 21:00	62	46	75	51	57	66
4/4/2019 21:10	60	46	76	48	53	63
4/4/2019 21:20	64	45	80	50	57	67
4/4/2019 21:30	60	45	73	47	54	64
4/4/2019 21:40	65	45	79	49	60	69
4/4/2019 21:50	61	44	78	47	53	61
4/4/2019 22:00	60	45	73	48	54	65
4/4/2019 22:10	61	44	74	47	55	65
4/4/2019 22:20	57	43	76	45	48	57
4/4/2019 22:30	60	44	75	47	53	63
4/4/2019 22:40	58	43	74	47	53	62
4/4/2019 22:50	59	45	75	47	52	62
4/4/2019 23:00	59	46	72	47	53	64
4/4/2019 23:10	63	47	74	51	58	68
4/4/2019 23:20	59	44	78	46	50	59
4/4/2019 23:30	56	45	72	47	51	60
4/4/2019 23:40	57	45	70	47	52	60
4/4/2019 23:50	57	44	73	46	52	60
4/5/2019 0:00	57	44	71	47	51	61
4/5/2019 0:10	60	42	79	44	52	62
4/5/2019 0:20	50	39	70	41	42	48
4/5/2019 0:30	55	40	72	42	49	57
4/5/2019 0:40	55	43	75	45	47	57
4/5/2019 0:50	51	42	68	44	46	53
4/5/2019 1:00	56	43	71	45	49	59
4/5/2019 1:10	48	42	63	43	46	50
4/5/2019 1:20	52	43	74	45	47	51
4/5/2019 1:30	52	43	67	45	47	55
4/5/2019 1:40	52	41	72	43	45	54
4/5/2019 1:50	47	41	60	42	45	50
4/5/2019 2:00	48	41	61	42	45	52
4/5/2019 2:10	50	40	68	41	43	51
4/5/2019 2:20	50	40	69	41	44	51
4/5/2019 2:30	59	41	81	42	44	52
4/5/2019 2:40	49	41	68	41	44	50
4/5/2019 2:50	44	40	60	41	43	46
4/5/2019 3:00	46	40	59	42	44	49
4/5/2019 3:10	52	41	76	42	44	48
4/5/2019 3:20	50	41	63	43	48	53
4/5/2019 3:30	48	41	59	42	44	51
4/5/2019 3:40	52	41	71	42	45	54

Table 3. Tabular Sound Monitoring Results (dBA)

Period start	L_{eq}	L_{min}	L_{max}	L_{90}	L_{50}	L_{10}
4/5/2019 3:50	49	42	66	43	45	51
4/5/2019 4:00	52	41	66	44	48	55
4/5/2019 4:10	54	42	73	43	46	52
4/5/2019 4:20	51	43	70	44	46	54
4/5/2019 4:30	51	43	70	44	46	51
4/5/2019 4:40	50	44	66	45	46	53
4/5/2019 4:50	58	43	80	45	47	55
4/5/2019 5:00	57	43	73	44	47	59
4/5/2019 5:10	60	43	78	44	46	60
4/5/2019 5:20	59	44	74	46	50	63
4/5/2019 5:30	60	44	78	46	51	63
4/5/2019 5:40	59	45	72	46	51	62
4/5/2019 5:50	61	45	75	46	50	64
4/5/2019 6:00	62	46	80	47	53	66
4/5/2019 6:10	61	47	78	48	54	66
4/5/2019 6:20	60	49	74	52	55	64
4/5/2019 6:30	64	50	79	51	55	67
4/5/2019 6:40	63	50	78	51	55	66
4/5/2019 6:50	64	50	80	53	59	69
4/5/2019 7:00	65	53	77	56	61	68
4/5/2019 7:10	63	53	76	54	58	67
4/5/2019 7:20	65	53	84	54	57	69
4/5/2019 7:30	66	53	80	54	58	71
4/5/2019 7:40	69	53	82	57	62	73
4/5/2019 7:50	68	53	80	54	61	73
4/5/2019 8:00	68	54	81	57	62	73
4/5/2019 8:10	68	48	79	51	61	73
4/5/2019 8:20	69	47	86	51	61	73
4/5/2019 8:30	68	49	85	53	60	73
4/5/2019 8:40	67	49	78	52	59	72
4/5/2019 8:50	67	50	78	53	60	72
4/5/2019 9:00	64	50	78	53	58	68
4/5/2019 9:10	66	48	84	52	58	70
4/5/2019 9:20	63	46	76	48	53	67
4/5/2019 9:30	62	45	75	48	54	66
4/5/2019 9:40	65	48	79	50	55	68
4/5/2019 9:50	64	46	80	49	56	68
4/5/2019 10:00	65	46	80	49	54	69
4/5/2019 10:10	64	45	80	49	56	68
4/5/2019 10:20	63	44	77	49	54	66
4/5/2019 10:30	66	47	82	49	57	69
4/5/2019 10:40	67	45	84	48	55	69

Table 3. Tabular Sound Monitoring Results (dBA)

Period start	L_{eq}	L_{min}	L_{max}	L_{90}	L_{50}	L_{10}
4/5/2019 10:50	63	43	81	46	53	66
4/5/2019 11:00	67	44	85	47	57	70
4/5/2019 11:10	63	45	81	48	54	66
4/5/2019 11:20	64	43	80	48	54	67
4/5/2019 11:30	62	45	77	47	53	66
4/5/2019 11:40	65	45	81	49	56	67
4/5/2019 11:50	64	44	79	47	54	69
4/5/2019 12:00	62	42	80	45	50	66
4/5/2019 12:10	63	45	79	48	56	67
4/5/2019 12:20	63	42	80	46	52	66
4/5/2019 12:30	65	43	82	48	55	69
4/5/2019 12:40	65	43	81	47	57	69
4/5/2019 12:50	63	43	82	46	52	66
4/5/2019 13:00	62	43	77	46	53	66
4/5/2019 13:10	64	43	78	46	53	68
4/5/2019 13:20	64	43	79	46	55	67
4/5/2019 13:30	63	44	75	47	54	68
4/5/2019 13:40	67	45	82	48	55	70
4/5/2019 13:50	63	45	80	48	55	67
4/5/2019 14:00	67	44	88	47	56	68
4/5/2019 14:10	64	43	78	47	55	67
4/5/2019 14:20	60	41	75	43	51	64
4/5/2019 14:30	66	45	79	50	60	71
4/5/2019 14:40	65	43	80	47	59	69
4/5/2019 14:50	62	44	76	47	55	67
4/5/2019 15:00	63	43	78	47	54	66
4/5/2019 15:10	64	46	79	48	56	67
4/5/2019 15:20	64	43	80	47	56	68
4/5/2019 15:30	64	45	75	49	57	68