
***BASELINE SOUND MONITORING REPORT
FOR THE DEVELOPMENT OF
WIND ENERGY FACILITIES AT
NAVSTA NEWPORT, RHODE ISLAND***

January 2011



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1.0 EXECUTIVE SUMMARY

The U.S. Naval Station (NAVSTA) Newport and Navy Undersea Warfare Center (NUWC) propose to build a wind energy project with a potential to support up to 12 wind turbines (up to 9 megawatts [MW] capacity) in Newport, Rhode Island. Wind turbines of 0.6 to 3.0 MW capacity are being considered for the 12 sites with hub heights in the range of 60 to 80 meters (m) (196.9 to 262.5 ft). Possible turbine makes include Vestas, GE, and PowerWind. The typical cut-in wind speed for these turbines (the lowest speed for turbine operation) is 4 meters per second (m/s) (9 miles per hour [mph]) at hub height, and the design wind speed (the lowest speed at which maximum sound power is produced) is typically 8 m/s (18 mph) at hub height.

The objectives of this study are to characterize the existing ambient (L_{90}) and equivalent (L_{eq}) broadband sound pressure levels at the closest sensitive receptors to the potential 12 wind turbine sites during times when winds are high enough to sustain turbine operation. These sound level data provide a benchmark for any future sound measurements made after the turbines are in operation and they also serve as a point of comparison for the acoustic model predictions. The ambient L_{90} sound level is the sound pressure level exceeded 90% of the time during a measurement interval; in terms of perception, it represents the quietest 10% of the measurement interval. The equivalent L_{eq} sound level is the energy-average level over the duration of the measurement; it is referred to as the average sound level.

Existing sound levels were measured at eight monitoring stations covering the project area (see **Figure 2**), over daytime and nighttime periods on Monday December 6, 2010 through Thursday December 9, 2010. Hub height (60 m [196.9 ft]) wind speeds ranged from 5 to 15 m/s (11 to 34 mph), with average speeds sufficient for turbine operation 100% of the time. Ground conditions were dry and the wind direction was generally from northwest to north during the four-day period. Sound measurements were then categorized by the hub height wind speed, using data from on-site meteorological towers.

This study's conclusions are as follows:

- Existing sound levels in the project area are primarily determined by motor vehicle traffic on roads within NAVSTA Newport and NUWC and on nearby off-base roads, the wind in trees, waves, buoy bells, and aircraft overhead. Sound levels are lowest for locations setback from the water's edge where wind and wave sounds were less. Details are provided in Section 4.0.
- Existing ambient (L_{90}) sound levels during times when winds were sufficient to sustain turbine operation range from 36.4 dBA to 57.5 dBA. L_{90} sound levels in the project area generally increase 2 dBA for every 1 m/s (2 mph) increase in the 10-m (32.8 ft) wind speed. At a given wind speed, there is a slight difference in daytime and nighttime L_{90} sound levels; daytime levels are approximately 2 dBA higher.
- Existing average (L_{eq}) sound levels during times when winds were sufficient to sustain turbine operation range from 37.8 dBA to 65.5 dBA. These are typical values for a suburban area, which is the type of land use abutting NAVSTA Newport and NUWC.
- Average (L_{eq}) sound levels are in the range of 37.8 to 54.4 dBA for low-to-moderate turbine operation (wind speeds above the cut-in speed) and in the range of 38.4 to 65.5 dBA for high turbine operation (wind speeds at or above the design wind speed).

2.0 COMMON MEASURES OF COMMUNITY SOUND

All sounds originate with a source – a human voice, vehicles on a roadway, or an airplane overhead. The sound energy moves from the source to a person’s ears as sound waves, which are minute variations in air pressure. The loudness of a sound depends on the sound pressure level¹, which has units of decibel (dB). The decibel scale is logarithmic to accommodate the wide range of sound intensities to which the human ear is subjected. On this scale, the quietest sound we can hear is 0 dB, while the loudest is 120 dB. Every 10 dB increase is perceived as a doubling of loudness. Most sounds we hear in our daily lives have sound pressure levels in the range of 30 dB to 90 dB.

A property of the decibel scale is that the numerical values of two separate sounds do not directly add. For example, if a sound of 70 dB is added to another sound of 70 dB, the total is only a 3 dB increase (or 73 dB) on the decibel scale, not a doubling to 140 dB. In terms of sound perception, 3 dB is the minimum change most people can detect. **Table 1** describes the subjective effect of different changes in sound levels.

TABLE 1
SUBJECTIVE EFFECT OF CHANGES IN SOUND PRESSURE LEVELS

Change in Sound Level	Apparent Change in Loudness
3 dB	Just perceptible
5 dB	Noticeable
10 dB	Twice (or half) as loud

¹ The sound pressure level is defined as $20 \cdot \log_{10}(P/P_0)$ where P is the sound pressure and P_0 is the reference pressure of 20 micro-Pascals (20 μ Pa), which by definition corresponds to 0 dB.

Sound exposure in a community is commonly expressed in terms of the A-weighted sound level (dBA); A-weighting approximates the frequency response of the human ear. Typical sound levels associated with various activities in a rural area are presented in **Figure 1**. The distance to a major road often determines the acoustic environment in a non-urban area, such as the lands abutting NAVSTA Newport and NUWC.

Sound levels change from moment to moment. Some are sharp impulses lasting one second or less, while others rise and fall over much longer periods of time. There are various measures of sound pressure designed for different purposes. To establish the background ambient sound level in an area, the L_{90} metric, which is the sound level exceeded 90 % of the time, is sometimes used. The L_{90} can be thought of as the level representing the quietest 10 % interval of any time period. The L_{eq} , or equivalent sound level, is the steady-state sound level over a period of time that has the same acoustic energy as the fluctuating sounds that actually occurred during that same period. It is commonly referred to as the energy-average sound level.

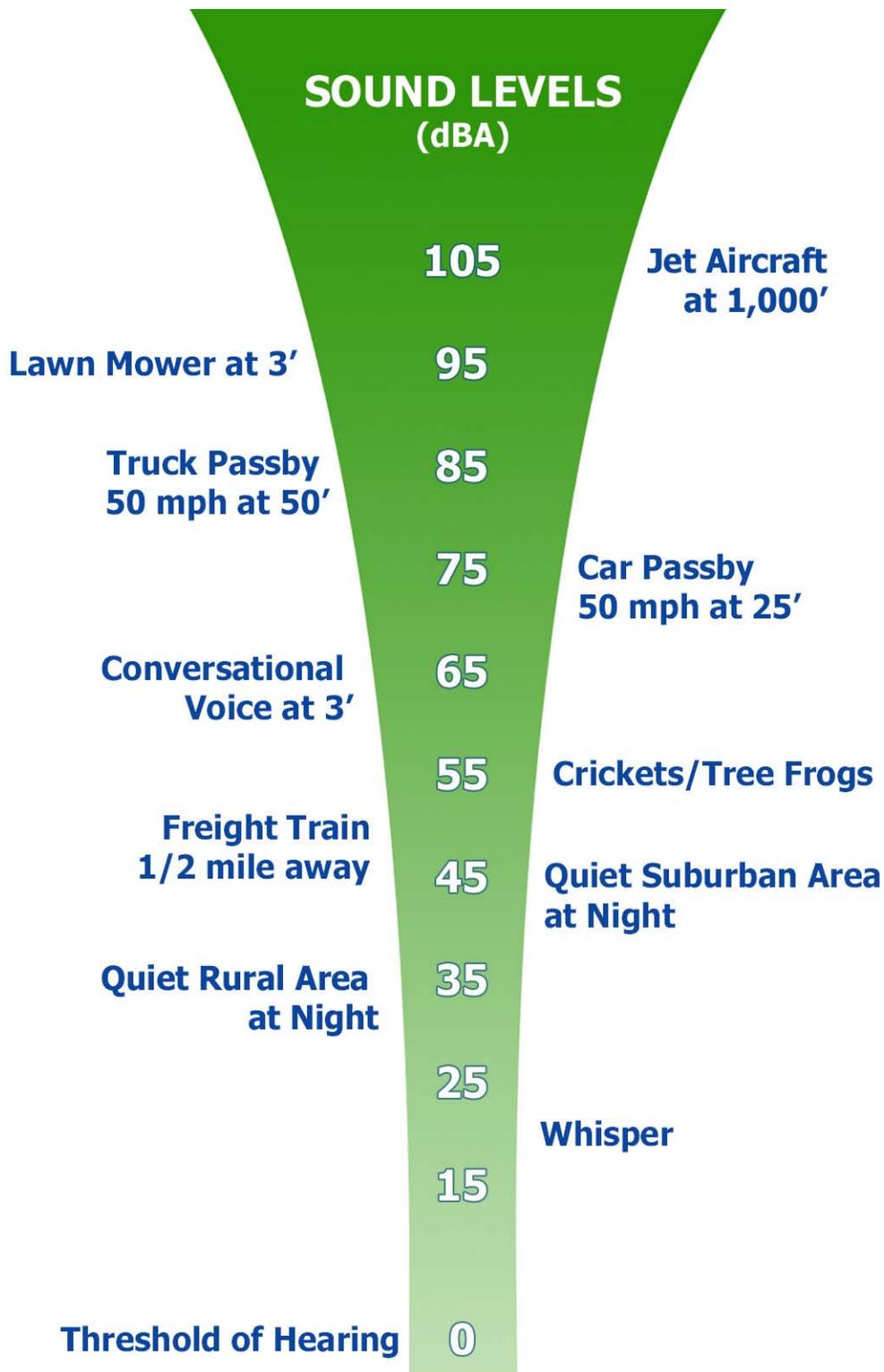


FIGURE 1.
Common Outdoor Sound Levels

3.0 NOISE REGULATIONS AND CRITERIA

There is no applicable Rhode Island State noise regulation, and thus the acoustic analysis of the NAVSTA wind project will consider a number of well-accepted sound level guidelines for preventing annoyance and sleep disturbance in populated areas. The U.S. Environmental Protection Agency (EPA) Residential Noise Guideline is 55 dBA daytime and 45 dBA at night to prevent annoyance and sleep disturbance.² The World Health Organization (WHO) recommends: “At nighttime, outside sound levels about 1 m (3.28 ft) from facades of living spaces should not exceed 45 dBA L_{eq} so that people may sleep with bedroom windows open.”³

² U.S. Environmental Protection Agency, “Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety,” Publication EPA-550/9-74-004, 1974, pp. 3 and 21.

³ World Health Organization, “Guidelines for Community Noise,” Geneva, 1995, page xiii. WHO has reaffirmed the 45-dBA residential limit in its 2009 “Night Noise Guidelines for Europe.”

4.0 AMBIENT SOUND LEVEL AND WIND MEASUREMENTS

4.1 Methodology

For the turbines being considered for use in the NAVSTA Newport wind project, the typical cut-in wind speed (the lowest speed for turbine operation) is 4 m/s (9 mph) at hub height, and the design wind speed (the lowest speed at which maximum sound power is produced) is typically 8 m/s (18 mph) at hub height. Hub height will be somewhere in the range of 60 to 80 m (196.9 to 262.5 ft). Wind speeds for this study were obtained from on-site meteorological towers. The wind speed data were used to categorize the sound level measurements into three groups:

1. Ambient sounds when the turbines are not operating. The hub height wind speed is below 4 m/s (9 mph). These sound levels are expected to be the lowest measured, but are not appropriate for comparison to project sound levels, since the turbines would not be operating. Since all wind speeds during the monitoring program were above 4 m/s (9 mph), there are no data in the “not operating” category.
2. Low-power operation. Ambient sounds when the turbines are operating with winds in the range of 4 to 7 m/s (9 to 16 mph).
3. High-power operation. Ambient sounds when the turbines are at operating at or above the design wind speed of 8 m/s (18 mph).

To efficiently collect ambient sound levels across the project area, three long-term and five short-term sound monitoring stations were used, and measurements were planned for a week when winds were strong enough to support both cut-in and design wind conditions. The eight sound monitoring stations were distributed throughout the defined project area in locations near sensitive receptors, such as residences and classrooms (see **Figure 2**). The long-term monitors are labeled LT1 through LT3, and the short-term monitors are ST1 through ST5. All locations were on NAVSTA Newport or NUWC property.

The three long-term monitoring stations (LT1 through LT3) are:

1. LT1 – Wind Turbine Site 2 at Tank Farm-4b. This location is setback from Burma Road near the meteorological tower in Tank Farm-4b. It represents receptors near the grouping of Turbine Sites 1, 2 and 3: residential areas (off-base) on Rolling Hill Road, Lawton Brook Lane, Harbor View Road, and Redwood Lane.

2. LT2 – Wind Turbine Site 5 near Gate for NUWC. This location is inside the NUWC fence-line just beyond the Gate off Burma Road, and is just off the left side of the road. It represents receptors near Wind Turbine Site 5: NUWC Campus Buildings 1170 and 1171, the Wanumetonomy Golf Club, and residences (off-base) on Brown Lane.
3. LT3 – OTC Quarters next to Nimitz Field. This location is next to the meteorological tower in the open field west of OTC Quarters and Nimitz Field. It represents receptors near Wind Turbine Sites 7, 9, and 10: OTC Quarters, Drill Hall Building 1801, Building 1112 for the Supply Corps School, Nimitz Field, and Prichard Baseball Field.

The five short-term monitoring stations (ST1 through ST5) are:

1. ST1 – Carr Point Recreation Area. This location is in the parking lot just before the white gate. It represents the Carr Point Recreation Area at the shore of Narragansett Bay near Wind Turbine Sites 1, 2, and 3.
2. ST2 – At the Entrance to Navy Greene Land Housing. This location is on the grass lawn to the right of the entrance to the Greene Lane Navy Housing, along Greene Lane. It represents the receptors near Wind Turbine Site 4: Greene Lane Housing, residences (off-base) on J.H. Dwyer Drive, and St. Columba's Cemetery.
3. ST3 – Building 11, Near Wind Turbine Site 6. This location is on the lawn next to Building 11. It represents receptors near Wind Turbine Site 6: Coddington Cove Housing (Semmes Street) and residences (off-base) on Chases Lane.
4. ST4 – Near Wind Turbine Site 8 next to the Navy Lodge. This location is in the parking lot across from the gas station next to the Navy Lodge. It represents receptors near Wind Turbine Site 8: Navy Lodge, Hart Field Housing, and the Community College of Rhode Island (off-base).
5. ST5 – Near Wind Turbine Site 11 on Coasters Island. This location is in the parking lot next to Building A138 and it represents receptors near Wind Turbine Site 11: SWOS campus buildings A138, 1164, and 1373, the Perry Road Housing, and the proposed Fitness Facility.

Sound level monitoring was performed continuously from 1 p.m. Monday December 6, 2010 through 3 p.m. Thursday December 9, 2010 at the three long-term monitoring locations, covering four daytime and three nighttime periods. Ten-minute measurements were made twice at the five short-term monitoring locations, once in the daytime and once at night. Weather conditions were generally favorable for accurate sound level monitoring during this period. The skies were generally overcast with temperatures in the range of 20^o to 36^o F, no precipitation, and clear to partly cloudy skies. Winds

were brisk with average and hub height (60 m [196.9 ft]) winds in the range of 5 to 15 m/s (11 to 34 mph).

All sound level measurements were made with Larson Davis Models 820 and 824, and with CEL Models 593, real-time sound level analyzers, which are equipped with precision condenser microphones having an operating range of 5 dB to 140 dB, and an overall frequency range of 3.5 to 20,000 hertz (Hz). These sound analyzers meet or exceed all requirements set forth in the American National Standards Institute (ANSI) Standard S1.4 for Type I (high-precision) instruments. All equipment had been laboratory calibrated to NIST standards within the previous 12 months and was field calibrated with an ANSI Type I calibrator. Microphones were tripod-mounted and equipped with ACO Pacific WS7-80T 7-inch wind screens that are specially designed to screen out wind noise. All sound monitoring was done in accordance with the requirements of ANSI Standards S12.18-1994 (Procedures for Outdoor Measurement of Sound Pressure Level) and S12.9-1993/Part 3 (Procedures for Short-Term Measurements with an Observer Present). The sound analyzers recorded L_{eq} , L_{90} , L_{10} , and L_{max} A-weighted (dBA) sound levels. The sound measurement data are summarized in **Tables A-1** and **A-2** (Appendix A). Field log sheets for the five short-term monitoring stations, which were attended by a field engineer, are provided in Appendix B. The three long-term monitoring stations were operated unattended.

**FIGURE 2.
Sound Monitoring Locations**

NUWC Wind Turbine Sites

-  Proposed
-  Alternate



Narragansett Bay



4.2 Results and Discussion

The sound levels presented in **Tables A-1** and **A-2** are shaded with two background colors: blue means the wind turbines are at a low-to-moderate level of operation (winds above the cut-in speed but below the design speed), and green means the turbines are at a high level of operation (winds at or above the design wind speed). Wind speeds were high enough that there were no “turbine not operating” hours during the monitoring program. **Table A-1** presents the L_{90} sound level data, while the L_{eq} sound data are summarized in **Table A-2**. The monitoring locations are labeled consistent with the list presented in the previous section. At the end of each table, the minimum and maximum values for L_{90} and L_{eq} are given by monitoring location.

Existing sound levels in the project area are primarily determined by motor vehicle traffic on roads within NAVSTA Newport and NUWC and on nearby off-base roads, the wind in trees, waves, buoy bells, and aircraft overhead. Sound levels are lowest for locations setback from the water’s edge where wind and wave sounds were less. The data in **Table A-1** reveal that existing ambient (L_{90}) sound levels during times when winds were sufficient to sustain turbine operation range from 36.4 to 57.5 dBA.

Scatter plots L_{90} sound level vs. the hub height wind speed for the three long-term monitoring stations (LT1 through LT3) are presented in **Figures 3** through **5**, respectively. Nighttime sound levels (10 p.m. to 6 a.m.) are denoted by triangle symbols in the plot, while daytime sound levels are circles. L_{90} sound levels generally increase 2 dBA for every 1 m/s (2 mph) increase in the hub-height wind speed.

At a given wind speed, there is a slight difference in daytime and nighttime L_{90} sound levels; daytime levels are approximately 2 dBA higher.

Table A-2 reveals that existing average (L_{eq}) sound levels during times when winds were sufficient to sustain turbine operation range from 37.8 to 65.5 dBA. Average (L_{eq}) sound levels are in the range of 37.8 to 54.4 dBA for low-to-moderate turbine operation (wind speeds above the cut-in speed) and in the range of 38.4 to 65.5 dBA for high turbine operation (wind speeds at or above the design wind speed).

FIGURE 4
SCATTER PLOT OF L₉₀ SOUND LEVEL AND HUB HEIGHT WIND SPEED FOR
MONITORING STATION LT2

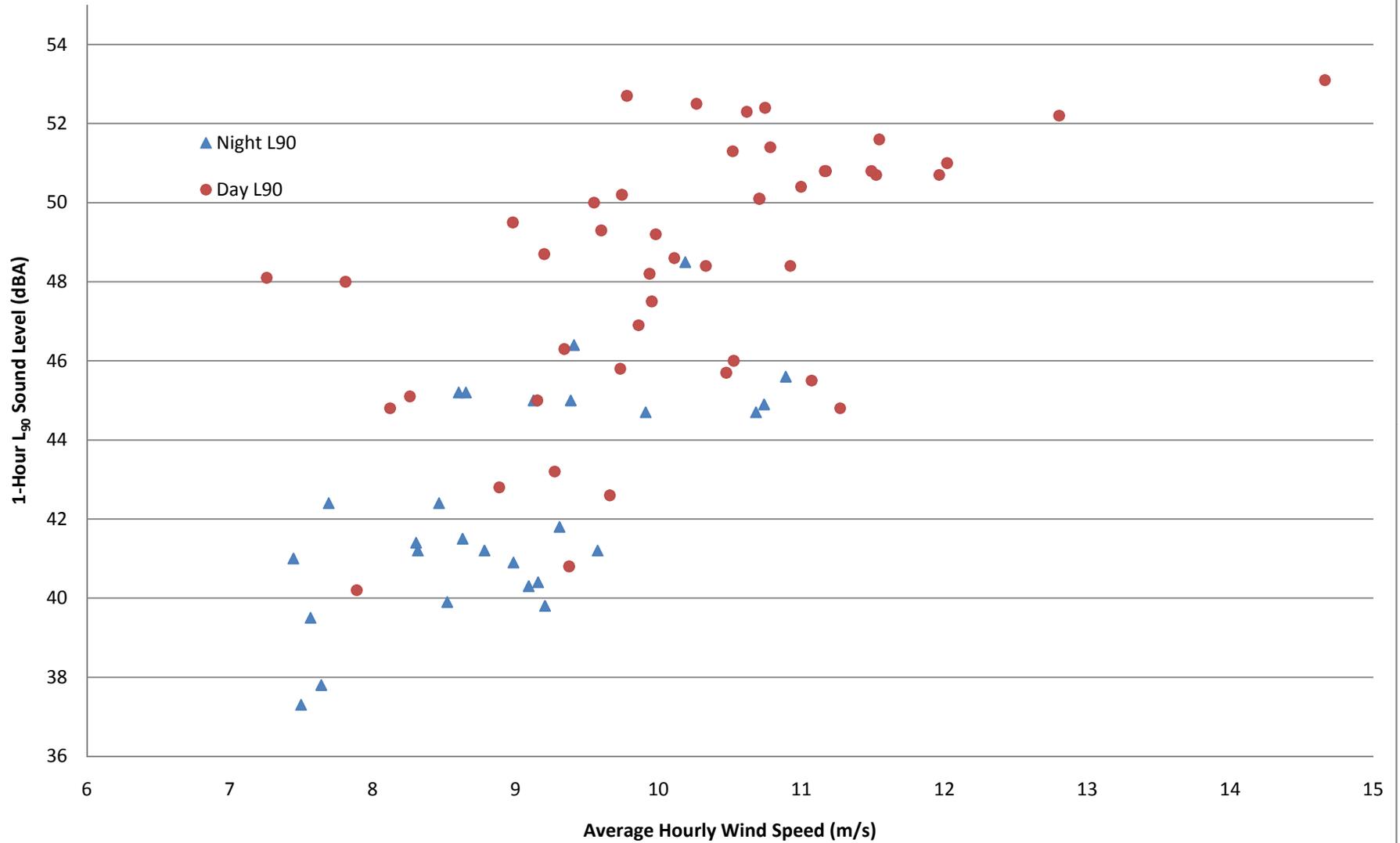
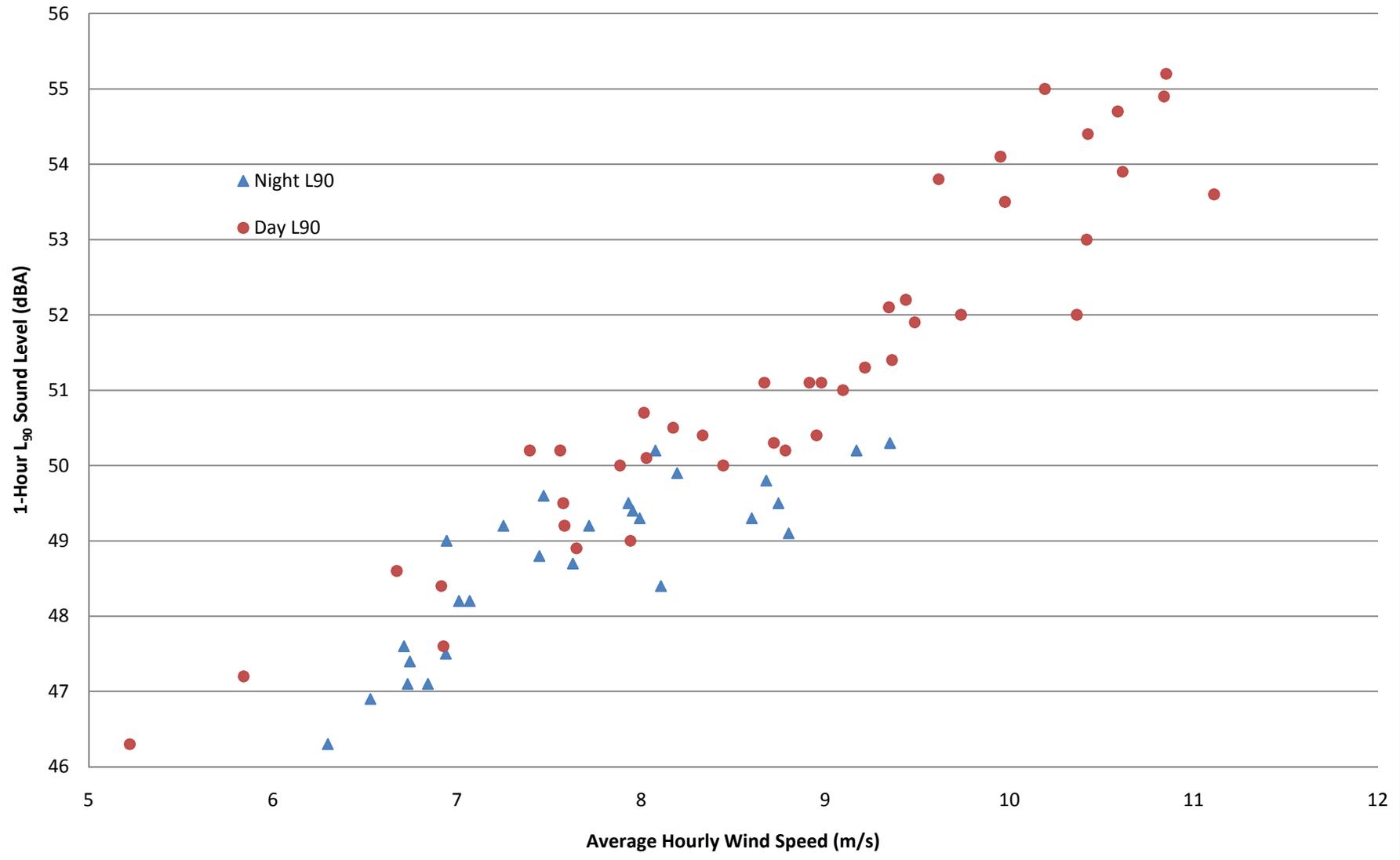


FIGURE 5
SCATTER PLOT OF L₉₀ SOUND LEVEL AND HUB HEIGHT WIND SPEED FOR
MONITORING STATION LT3



APPENDIX A

AMBIENT SOUND MONITORING DATA

**TABLE A-1.
EXISTING L90 SOUND LEVELS IN THE NUWC WIND PROJECT AREA (dBA)**

Time and Date	60m Average Wind Speed @ Tank Farm (m/s)	LT #1	LT #2	ST #1	ST #2	60m Average Wind Speed @ Pritchard Field (m/s)	LT #3	ST #3	ST #4	ST #5
12/6/10 1:00 PM	13					12	56.2			
12/6/10 2:00 PM	15	47.9	53.1			12	55.6			
12/6/10 3:00 PM	13	46.4	52.2			11	53.6			
12/6/10 4:00 PM	11	45	51.4			9	52.2			
12/6/10 5:00 PM	8	40.3	45.1			8	49.2			
12/6/10 6:00 PM	11	40.3	45.5			9	51.3			
12/6/10 7:00 PM	11	41.6	44.8			9	51.1			
12/6/10 8:00 PM	9	40.2	43.2			9	51.4			
12/6/10 9:00 PM	10	40.3	42.6			9	50.3			
12/6/10 10:00 PM	9	39.4	41.5			9	49.8			
12/6/10 11:00 PM	9	39.4	41.8			9	50.3			
12/7/10 12:00 AM	9	38.6	41.2			9	50.2			
12/7/10 1:00 AM	9	38	39.9			9	49.1			
12/7/10 2:00 AM	9	38.3	39.8			8	48.4			
12/7/10 3:00 AM	9	38.6	40.4			9	49.5			
12/7/10 4:00 AM	9	38.3	40.9			8	49.3			
12/7/10 5:00 AM	8	38.1	39.5			7	48.2			
12/7/10 6:00 AM	8	39.7	42.4			7	48.2			
12/7/10 7:00 AM	7	41.8	48.1			7	48.6			
12/7/10 8:00 AM	8	42	48			8	50			
12/7/10 9:00 AM	8	40.9	44.8			8	50			
12/7/10 10:00 AM	9	41	46.3			9	51			
12/7/10 11:00 AM	10	41.4	47.5			10	52			
12/7/10 12:00 PM	10	41.9	49.3			9	51.9			
12/7/10 1:00 PM	10	41.2	49.2			9	51.1	50.5	47.5	
12/7/10 2:00 PM	10	42.1	48.6	53.5	47	8	50.1	44		
12/7/10 3:00 PM	10	43.3	48.4	53	46.5	8	49	47	47.5	
12/7/10 4:00 PM	10	43	52.7			9	50.4			48.5
12/7/10 5:00 PM	10	41.2	48.2			7	48.4			
12/7/10 6:00 PM	10	40.8	45.7			8	48.9			
12/7/10 7:00 PM	11	42	46			9	50.2			
12/7/10 8:00 PM	10	40.8	46.9			8	50.5			
12/7/10 9:00 PM	9	39.5	45			8	50.2	48	45	
12/7/10 10:00 PM	9	39.5	45			7	49	41	47	42.5
12/7/10 11:00 PM	9	39.3	45			7	49.2	39.5	47.5	44
12/8/10 12:00 AM	9	38.3	45.2	48	39.5	7	49.6			
12/8/10 1:00 AM	9	38	45.2	47.5		8	49.4			
12/8/10 2:00 AM	8	38.1	42.4			7	47.5			
12/8/10 3:00 AM	7	37.2	41			7	47.1			
12/8/10 4:00 AM	8	37.5	41.2			7	47.4			
12/8/10 5:00 AM	10	40.1	44.7			8	48.7			
12/8/10 6:00 AM	10	42.4	48.5			8	49.2			
12/8/10 7:00 AM	11	44.8	51.3			8	49.5			
12/8/10 8:00 AM	12	45.1	50.7			9	52.1			
12/8/10 9:00 AM	12	45	51			11	54.9			
12/8/10 10:00 AM	11	42.9	48.4			10	52			
12/8/10 11:00 AM	11	43.1	50.4			11	54.7			
12/8/10 12:00 PM	11	43.9	50.8			11	53.9			
12/8/10 1:00 PM	11	43.6	50.8			12	57.5			
12/8/10 2:00 PM	12	43.6	51.6			11	55.2			
12/8/10 3:00 PM	10	43.3	52.5			10	54.4			
12/8/10 4:00 PM	11	43.5	52.3			10	53.5			
12/8/10 5:00 PM	11	44	50.8			9	51.1			
12/8/10 6:00 PM	10	41	45.8			8	50.4			
12/8/10 7:00 PM	9	38.7	42.8			6	47.2			
12/8/10 8:00 PM	8	37.5	40.2			5	46.3			
12/8/10 9:00 PM	9	37.8	40.8			7	47.6			
12/8/10 10:00 PM	11	41	44.9			7	48.8			
12/8/10 11:00 PM	8	38.2	41.4			7	47.6			
12/9/10 12:00 AM	11	39.6	44.7			8	49.9			
12/9/10 1:00 AM	11	41.3	45.6			8	49.5			
12/9/10 2:00 AM	10	38.6	41.2			7	46.9			
12/9/10 3:00 AM	7	36.4	37.3			6	46.3			
12/9/10 4:00 AM	8	36.6	37.8			7	47.1			
12/9/10 5:00 AM	9	38.4	40.3			9	49.3			
12/9/10 6:00 AM	9	41.2	46.4			8	50.2			
12/9/10 7:00 AM	11	45.1	52.4			8	50.7			
12/9/10 8:00 AM	11	44.3	50.1			7	50.2			
12/9/10 9:00 AM	12	45.1	50.7			10	53			
12/9/10 10:00 AM	11	43.4	50.1			11	56.4			
12/9/10 11:00 AM	10	42.3	50.2			10	55			
12/9/10 12:00 PM	10	43.1	50			10	54.1	52	50	
12/9/10 1:00 PM	9	41.5	49.5			10	53.8	45		
12/9/10 2:00 PM	9		48.7	50.5	43.5	9				

**TABLE A-2.
EXISTING LEQ SOUND LEVELS IN THE NUWC WIND PROJECT AREA (dBA)**

Time and Date	60m Average Wind Speed @ Tank Farm (m/s)					60m Average Wind Speed @ Pritchard Field (m/s)				
	LT #1	LT #2	ST #1	ST #2		LT #3	ST #3	ST #4	ST #5	
12/6/10 1:00 PM	13					12	62.5			
12/6/10 2:00 PM	15	53.5				12	63.2			
12/6/10 3:00 PM	13	50.9	56.9			11	59.8			
12/6/10 4:00 PM	11	47.5	55.4			9	57.5			
12/6/10 5:00 PM	8	43.7	50.5			8	51.7			
12/6/10 6:00 PM	11	46.6	50.8			9	55.5			
12/6/10 7:00 PM	11	46.7	50.3			9	54.5			
12/6/10 8:00 PM	9	42.1	46.9			9	55.1			
12/6/10 9:00 PM	10	42.5	46.4			9	54.3			
12/6/10 10:00 PM	9	41	44.3			9	52.5			
12/6/10 11:00 PM	9	41.3	45.1			9	54.7			
12/7/10 12:00 AM	9	40.5	44.5			9	54.1			
12/7/10 1:00 AM	9	39.4	44.5			9	53.1			
12/7/10 2:00 AM	9	40.3	44.3			8	51.3			
12/7/10 3:00 AM	9	40.4	44.5			9	52.8			
12/7/10 4:00 AM	9	40.4	44.3			8	52.6			
12/7/10 5:00 AM	8	39.8	44			7	50.3			
12/7/10 6:00 AM	8	43.9	49.9			7	50.2			
12/7/10 7:00 AM	7	45.5	54.1			7	50.5			
12/7/10 8:00 AM	8	45.1	54			8	53.5			
12/7/10 9:00 AM	8	44.5	50.8			8	53.3			
12/7/10 10:00 AM	9	44.3	51.9			9	54.9			
12/7/10 11:00 AM	10	46.9	52.6			10	56.6			
12/7/10 12:00 PM	10	45.7	53.1			9	56.1			
12/7/10 1:00 PM	10	45.3	53.5			9	55.2	58.5	54	
12/7/10 2:00 PM	10	45.6	53.3	56.8	55.7	8	54.9	51.7		
12/7/10 3:00 PM	10	47.4	53.6	57	54.5	8	53.8	51.8	53.3	
12/7/10 4:00 PM	10	47.5	56.3			9	55.3			57.3
12/7/10 5:00 PM	10	46.1	52.9			7	50.4			
12/7/10 6:00 PM	10	45.7	50.6			8	52.2			
12/7/10 7:00 PM	11	48.2	51.3			9	55.4			
12/7/10 8:00 PM	10	48.3	51.9			8	55			
12/7/10 9:00 PM	9	42.7	49.7			8	53	51.5	55.9	
12/7/10 10:00 PM	9	43.7	50.6			7	52	47.1	49.2	44.7
12/7/10 11:00 PM	9	42.8	49.2		41.8	7	51.7	46.4	51.3	49.2
12/8/10 12:00 AM	9	41.8	49	51.2	45.2	7	52.3			
12/8/10 1:00 AM	9	40.6	49	53.4		8	53.2			
12/8/10 2:00 AM	8	39.8	46.2			7	49.4			
12/8/10 3:00 AM	7	38.3	43.6			7	48.7			
12/8/10 4:00 AM	8	39.5	45			7	49.3			
12/8/10 5:00 AM	10	43.5	49.9			8	51.3			
12/8/10 6:00 AM	10	48.7	53.6			8	53.5			
12/8/10 7:00 AM	11	47.8	56.8			8	52.5			
12/8/10 8:00 AM	12	48.5	55.7			9	56.4			
12/8/10 9:00 AM	12	49	55.3			11	59.1			
12/8/10 10:00 AM	11	47.1	53			10	59.2			
12/8/10 11:00 AM	11	48.6	55			11	59.5			
12/8/10 12:00 PM	11	49.8	55			11	59.2			
12/8/10 1:00 PM	11	52.2	57			12	62.7			
12/8/10 2:00 PM	12	50.2	55.9			11	59.1			
12/8/10 3:00 PM	10	47.6	57.2			10	58.8			
12/8/10 4:00 PM	11	47.1	55.3			10	57.1			
12/8/10 5:00 PM	11	48.8	54.9			9	55.8			
12/8/10 6:00 PM	10	45.2	51.9			8	54.7			
12/8/10 7:00 PM	9	43	49.6			6	49.2			
12/8/10 8:00 PM	8	40.6	46.4			5	49.2			
12/8/10 9:00 PM	9	41.6	46.9			7	50.3			
12/8/10 10:00 PM	11	46.1	50.7			7	51.4			
12/8/10 11:00 PM	8	40.5	45.9			7	49.4			
12/9/10 12:00 AM	11	43.9	49.6			8	53			
12/9/10 1:00 AM	11	44.2	50			8	52.1			
12/9/10 2:00 AM	10	42.5	47.9			7	49.1			
12/9/10 3:00 AM	7	37.8	40			6	48.1			
12/9/10 4:00 AM	8	38.4	43.4			7	49.2			
12/9/10 5:00 AM	9	40.8	46.2			9	52.6			
12/9/10 6:00 AM	9	45	52.8			8	52.8			
12/9/10 7:00 AM	11	48	59.1			8	53.7			
12/9/10 8:00 AM	11	47.7	54.4			7	53			
12/9/10 9:00 AM	12	49.3	55.3			10	58.6			
12/9/10 10:00 AM	11	47.4	55			11	60.4			
12/9/10 11:00 AM	10	46.2	54.7			10	58.8			
12/9/10 12:00 PM	10	47.9	54.3			10	57.9	57	63	
12/9/10 1:00 PM	9	48.1	57.4			10	58.1	65.5		
12/9/10 2:00 PM	9		54.9	56.5	56.5	9				

APPENDIX B

FIELD LOG SHEETS

Location ST1 – Carr Point Recreational Area

1. December 7, 2010

Start Time: 2:49pm

End Time: 3:10pm

Weather: Partly Cloudy, 35 F Wind 8-20 mph

Sound Sources Observed

- Wind
- Waves
- Occasional traffic on nearby roadways

2. December 8, 2010

Start Time: 12:11am

End Time: 12:21pm

Weather: Partly Cloudy, 28 F Wind 8-15 mph with gusts up to 20 mph

Sound Sources Observed

- Wind
- Waves

3. December 8, 2010

Start Time: 12:50am

End Time: 1:10am

Weather: Partly Cloudy, 28 F Wind 8-15 mph with gusts up to 20 mph

Sound Sources Observed

- Wind
- Waves

4. December 9, 2010

Start Time: 2:03pm

End Time: 2:13am

Weather: Clear, 24 F Wind 8-20 mph with gusts up to 30 mph

Sound Sources Observed

- Wind
- Waves
- Occasional traffic on nearby roadways

Location ST2 – Entrance to Navy Greene Land Housing

1. December 7, 2010

Start Time: 2:28pm

End Time: 2:38pm

Weather: Partly Cloudy, 35 F Wind 8-20 mph

Sound Sources Observed

- Wind
- Occasional traffic on nearby roadways

2. December 7, 2010

Start Time: 3:15pm

End Time: 3:25pm

Weather: Partly Cloudy, 35 F Wind 8-20 mph

Sound Sources Observed

- Wind
- Distant and nearby traffic

3. December 7-8, 2010

Start Time: 11:56pm

End Time: 12:06am

Weather: Partly Cloudy, 28 F Wind 8-15 mph with gusts 20+ mph

Sound Sources Observed

- Wind
- Distant traffic

4. December 8, 2010

Start Time: 12:26am

End Time: 12:46am

Weather: Partly Cloudy, 28 F Wind 8-15 mph with gusts 20+ mph

Sound Sources Observed

- Wind
- Distant traffic
- Jet overhead

Location ST2 – Entrance to Navy Greene Land Housing

5. December 9, 2010

Start Time: 2:18pm

End Time: 2:28pm

Weather: Clear, 24° F Wind 8-20 mph with gusts 20+ mph

Sound Sources Observed

- Wind
- Distant and nearby traffic

Location ST3 – Building #11, Near Turbine 6

1. December 7, 2010

Start Time: 2:09pm

End Time: 2:19pm

Weather: Partly Cloudy, 35 F Wind 8-20 mph

Sound Sources Observed

- Wind
- Distant and nearby traffic

2. December 7, 2010

Start Time: 3:38pm

End Time: 3:48pm

Weather: Partly Cloudy, 35 F Wind 8-20 mph

Sound Sources Observed

- Wind
- Distant traffic
- Waves

3. December 7, 2010

Start Time: 10:06pm

End Time: 10:16pm

Weather: Overcast, 28 F Wind 8-15 mph with gusts 20+ mph

Sound Sources Observed

- Wind
- Distant traffic
- Jets overhead

4. December 7, 2010

Start Time: 10:51pm

End Time: 11:11pm

Weather: Partly Cloudy, 28 F Wind 8-15 mph with gusts 20+ mph

Sound Sources Observed

- Wind
- Distant traffic
- Waves

Location ST3 – Building #11, Near Turbine 6

5. December 9, 2010

Start Time: 1:26pm

End Time: 1:36pm

Weather: Clear, 24° F Wind 8-20 mph with gusts 25+ mph

Sound Sources Observed

- Wind
- Distant traffic

Location ST4 – Near Turbine 8 next to the Navy Lodge

1. December 7, 2010

Start Time: 1:40pm

End Time: 1:50pm

Weather: Partly Cloudy, 35 F Wind 8-20 mph

Sound Sources Observed

- Wind
- Waves
- Distant and nearby traffic
- Seagulls

2. December 7, 2010

Start Time: 3:52pm

End Time: 4:02pm

Weather: Partly Cloudy, 35 F Wind 8-20 mph

Sound Sources Observed

- Wind
- Waves
- Distant and nearby traffic
- Seagulls

3. December 7, 2010

Start Time: 9:52pm

End Time: 10:02pm

Weather: Partly Cloudy, 28 F Wind 8-15 mph, gusts to 20+ mph

Sound Sources Observed

- Wind
- Distant traffic
- Waves
- Buoy bells

4. December 7, 2010

Start Time: 10:38pm

End Time: 10:48pm

Weather: Partly Cloudy, 28 F Wind 10-15 mph, gusts to 20+ mph

Sound Sources Observed

- Wind
- Distant traffic
- Waves
- Buoy bells

Location ST4 – Near Turbine 8 next to the Navy Lodge

5. December 7, 2010

Start Time: 11:17pm

End Time: 11:27pm

Weather: Cloudy, 28° F Wind 10-15 mph, gusts to 10+ mph

Sound Sources Observed

- Wind
- Distant traffic
- Waves
- Buoy bells

6. December 9, 2010

Start Time: 12:52pm

End Time: 1:02pm

Weather: Clear, 24° F Wind 8-20 mph

Sound Sources Observed

- Wind
- Local traffic
- Waves

Location ST5 – Near Turbine 11 on Coasters Island

1. December 7, 2010

Start Time: 1:13pm

End Time: 1:23pm

Weather: Partly Cloudy, 35 F Wind 8-20 mph

Sound Sources Observed

- Nearby construction
- Local traffic
- Wind

2. December 7, 2010

Start Time: 4:09pm

End Time: 4:19pm

Weather: Partly Cloudy, 35 F Wind 8-20 mph

Sound Sources Observed

- Wind
- Local traffic
- Waves

3. December 7, 2010

Start Time: 9:36pm

End Time: 9:46pm

Weather: Partly Cloudy, 28 F Wind 8-15 mph, gusts to 20+ mph

Sound Sources Observed

- Wind
- Distant traffic
- Waves
- Buoy bells

4. December 7, 2010

Start Time: 10:23pm

End Time: 10:33pm

Weather: Partly Cloudy, 28 F Wind 8-15 mph, gusts to 20+ mph

Sound Sources Observed

- Wind
- Distant traffic
- Waves
- Buoy bells

Location ST5 – Near Turbine 11 on Coasters Island

5. December 7, 2010

Start Time: 11:31pm

End Time: 11:41pm

Weather: Partly Cloudy, 28° F Wind 8-15 mph, gusts to 20+ mph

Sound Sources Observed

- Wind
- Distant traffic
- Waves
- Buoy bells

6. December 9, 2010

Start Time: 12:35pm

End Time: 12:45pm

Weather: Clear, 24° F Wind 8-20 mph with gust 20+ mph

Sound Sources Observed

- Wind
- Distant and nearby traffic
- Waves
- Buoy bells