Final

Hydroacoustic and Airborne Monitoring at the Naval Station Mayport – Interim Report

9–11 June 2015

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Interim Summary

This report summarizes underwater and airborne acoustic monitoring results for pile-driving at Naval Station Mayport in Jacksonville, Florida during 9 through 11 June 2015. Both 96.5-centimeter (cm) (38-inch [in]) × 45.7-cm (18-in) king piles and 122-cm (48-in) sheet piles were installed. All pile-driving was accomplished using an APE 300 vibratory hammer; which has an eccentric moment of 66.25 kilograms per meter (5,750 inches per pound). Noise levels were measured for 15 king piles and 17 sheet piles. The hydroacoustic monitoring took place at three distances from the pile-driving—"near," "mid-range," and "distant"—which all varied between and within days. The near and mid-range locations were manned, and the distant location had an autonomous recording system in place. Three different measures of maximum noise were taken—root mean square (RMS), sound exposure level (SEL), and cumulative SEL (cSEL). The compiled hydroacoustic data also allowed estimation of sound attenuation with range (propagation rate). **Table 1** is a summary of maximum noise levels measured during the monitoring of the king and sheet piles. On 10 June it was not possible to maintain a distance of 10 meters from the pile and the distances ranged from 8 to 13 meters these distances were normalized to 10 meters. **Table 2** shows the calculated normalized data for the 11 piles that were measured at distances greater to and less than the 10 meter position. Appendix A shows the time history and 1/3 octave band spectra measured on 9 June, Appendix B shows the data used in a excel spreadsheet format.

On 9 June, noise monitoring was completed on seven king piles and seven sheet piles (some of the sheets were driven twice). The average driving time for the king piles was approximately 18 minutes, and for the sheet piles the average driving time was less than 20 seconds each. The near position ranged from 9 and 13 m (29 – 43 ft), mid-range monitoring was done at ranges between 100 and 240 m (328–787 ft), and the distant monitoring site was at approximately 840 m (2,755 ft). Noise from ship construction at the dock near the distant measurement site masked the sound from the king-pile driving in the morning; therefore those data were not used in the analysis. Ship construction activity ceased in the afternoon when the sheet piles were installed; the afternoon data were included in the analysis.

On 10 June, noise monitoring was conducted on seven king piles. Five of the king piles were driven for 10 minutes or less. The remaining piles were driven for approximately 30 minutes each. The near position ranged from 10 and 13 m (33 – 43 ft), the mid-range position ranged between 100–240 m (330–790 ft), and distant monitoring was approximately 420 m (1,380 ft) from the source.

On 11 June, two king piles and 10 sheet piles were installed. Due to delays and the overall driving time for the first king pile, noise from only one of the two king piles installed was measured. Data were collected at the near position which was at 10 m (33ft), the Mid-range monitoring was at 110 m (360 ft), and the distant location was at approximately 400 m (1,300 ft).

Airborne (AB) noise measurements were also made from fixed locations on all three days at 10–20 m (33–66 ft) from the pile driving. The objective was to place a sound level meter (SLM) as close as possible to the pile-driving while remaining safely out of the way of construction

activities. Unfortunately, noise from the power pack and other construction activities overpowered the noise from the vibratory hammer.

On 9 June, the SLM location was at a fixed position 10 to 15m (33 – 50 ft) from the pile-driving operations. On 10 June, the AB SLM was located on the barge near the vibratory power plant at a range of 20m (65 ft) from the pile driving and 10m (33 ft) from the power plant. On 11 June, the AB SLM malfunctioned due to the high temperature and humidity at the only location available to place it.

The airborne noise levels measured are shown in **Appendix C**.

50 **Table 1 – Data Summary of Maximum Levels**

Pile Type	Start Time	Stop Time	Driving Duration	Distance (meters)	RMS (dB re: 1µPa)		SEL (dB re: 1µPa)		cSEL (dB re 1µPa^2-sec)
					Average	Range	Average	Range	
9 JUNE 2015									
King Pile	08:35:09	09:07:44	00:32:35	12	142	107-157	142	107-157	173
				110	126	117-145	126	117-142	[B]
King Pile	09:11:45	09:24:58	00:13:13	10	142	123-158	142	125-156	167
				110	127	118-147	127	118-145	[B]
King Pile	09:27:30	09:37:41	00:10:11	9	148	123-159	148	124-159	176
				240	124	118-130	124	118133	[B]
King Pile	09:43:09:	09:51:54	00:08:45	10	151	127-161	151	127-161	183
				230	124	117-129	124	117-128	[B]
King Pile	09:54:18	10:02:41	00:08:23	9	156	127-164	156	129-164	186
				235	123	118-133	123	118-129	[B]
King Pile	10:06:13	10:13:47	00:07:34	10	155	126-166	156	128-166	187
				110	128	118-134	129	118-134	[B]
King Pile	10:16:00	11:02:22	00:46:22	13	161	124-169	161	126-169	199
				115	133	118-145	133	118-145	[B]
Sheet Pile	13:08:41	13:09:28	00:00:13	12	ND	ND	ND	ND	ND
				190	146	128-151	146	137-151	164
Sheet Pile	13:10:56	13:11:10	00:00:14	10	ND	ND	ND	ND	ND
				205	139	126-144	139	125-143	165
Sheet Pile	13:12:16	13:12:31	00:00:15	9	156	124-162	156	124-162	172
				205	136	118-145	136	119-145	[B]
Sheet Pile	13:14:04	13:14:16	00:00:12	10	153	142-158	153	142-158	168
				205	134	121-143	134	121-143	[B]
Sheet Pile	13:15:49	13:16:02	00:00:13	9	154	139-160	154	141-160	170
				205	138	120-147	138	120-146	[B]
Sheet Pile	13:17:29	13:17:41	00:00:12	10	151	139-158	151	141-158	167
				205	133	121-142	125	120-142	[B]

Pile Type	Start Time	Stop Time	Driving Duration	Distance (meters)	RMS (dB re: 1µPa)		SEL (dB re: 1µPa)		cSEL (dB re 1µPa^2-sec)
					Average	Range	Average	Range	
Sheet Pile	13:19:14	13:19:27	00:00:13	10	150	139-156	150	139-157	166
				205	132	120-142	132	120-142	[B]
Sheet Pile	13:21:27	13:22:17	00:00:50	8	147	128-173	147	129-173	180
				205	132	119-152	132	120-152	161
Sheet Pile	13:24:28	13:25:29	00:01:01	9	157	137-168	157	138-166	177
				205	143	120-148	143	120-148	[B]
Sheet Pile	13:31:13	13:31:31	00:00:18	10	150	136-156	151	136-157	166
				205	138	120-146	138	120-145	[B]
Sheet Pile	13:32:09	13:32:27	00:00:18	9	152	136-162	152	137-161	170
				205	138	126-142	138	128-143	[B]
Sheet Pile	13:33:07	13:33:15	00:00:08	9	146	135-162	148	134-161	168
				205	136	127-141	136	124-141	[B]
10 JUNE 2015									
King Pile	11:37:30	11:45:19	00:07:49	10	146	127-149	146	127-149	[B]
				100	127	116-132	127	116-132	[B]
				420	ND	ND	ND	ND	ND
King Pile	11:50:35	11:56:45	00:06:10	13	141	129-146	141	128-147	[B]
				100	127	116-132	127	116-132	[B]
				420	ND	ND	ND	ND	ND
King Pile	15:37:28	15:45:17	00:07:49	10	143	128-149	143	128-149	[B]
				100	131	119-135	131	119-135	[B]
				420	125	122-126	125	122-126	[B]
King Pile	15:48:35	15:58:44	00:10:09	10	145	128-151	145	128-150	150
				100	130	118-138	130	118-137	[B]
				420	124	121-128	124	122-126	[B]
King Pile	16:00:52	16:08:12	00:07:20	10	144	130-148	144	130-147	[B]
				100	131	122-136	131	125-134	[B]
				420	123	119-126	123	120-126	[B]

Pile Type	Start Time	Stop Time	Driving Duration	Distance (meters)	RMS (dB re: 1µPa)		SEL (dB re: 1µPa)		cSEL (dB re 1µPa^2-sec)
					Average	Range	Average	Range	
King Pile	16:11:24	16:21:56	00:10:32	10	143	127-150	143	127-151	151
				100	129	116-134	129	117-134	[B]
				420	123	119-126	123	121-126	[B]
King Pile	16:26:01	16:56:20	00:30:19	10	144	128-149	144	128-148	[B]
				100	131	117-135	131	117-134	[B]
				420	123	119-131	123	122132	[B]
King Pile	16:58:47	17:26:56[B]	00:28:09	10	151	130-158	151	130-158	184
				100	138	126-148	138	128-147	[B]
				420	127	120-139	127	121-139	[B]
11 JUNE 2015									
King Pile	09:17:09	11:50:05	02:32:56	10	151	136-164	151	138-164	193
				110	136	116-150	136	116-150	[B]
				400	130	123-139	130	122-140	[B]
Sheet Pile	15:09:36	15:09:57	00:00:22	10	150	133-159	150	131-160	169
				110	137	120-145	137	120-145	[B]
				400	130	122-136	130	122-136	[B]
Sheet Pile	15:12:07	15:11:24	00:00:18	10	146	129-161	147	130-162	167
				110	138	128-148	138	128-148	[B]
				400	131	123-137	131	125-138	[B]
Sheet Pile	15:13:23	15:13:39	00:00:17	10	145	128-158	146	130-157	165
				110	139	128-145	139	128-145	[B]
				400	130	123-134	130	123-135	[B]
Sheet Pile	15:14:55	15:15:19	00:00:26	10	158	135-167	159	137-166	177
				110	146	133-150	146	133-150	150
				400	137	126-140	136	126-140	[B]
Sheet Pile	15:16:39	15:17:01	00:00:22	10	151	132-160	152	133-161	170
				110	141	133-147	141	133-147	[B]
				400	132	124-137	132	126-136	[B]

Pile Type	Start Time	Stop Time	Driving Duration	Distance (meters)	RMS (dB re: 1µPa)		SEL (dB re: 1µPa)		cSEL (dB re 1µPa^2-sec)
					Average	Range	Average	Range	
Sheet Pile	15:18:54	15:19:16	00:00:23	10	158	132-169	158	132-170	179
				110	147	128-154	147	128-154	163
				400	137	125-145	137	125-147	[B]
Sheet Pile	15:21:58	15:24:21	00:00:30	10	135	123-164	136	124-163	176
				110	125	118-148	125	118-148	154
				400	136	124-141	136	124-141	[B]
Sheet Pile	15:25:54	15:26:09	00:00:15	10	156	131-167	157	133-166	167
				110	145	132-151	145	132-151	[B]
				400	132	125-136	132	124-136	[B]
Sheet Pile	*15:27:28*	15:27:45	00:00:17	10	148	130-160	150	134-160	173
				110	140	128-146	140	128-146	[B]
				400	137	128-141	137	128-141	[B]
Sheet Pile	15:29:05	15:29:22	00:00:17	10	146	130-156	146	130-157	165
				110	140	132-149	140	132-149	[B]
				400	131	124-137	131	125-138	[B]

[B] – One-second SELs less than 150 dB do not accumulate to cause injury, per NMFS guidance

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52 **Table 2 – Data at Near Position Normalized to 10 meters**

Measured Distance	Measured RMS Level		RMS Normalized to 10 meters		Measured SEL Level		SEL Normalized to 10 meters	
	Average	Range	Average	Range	Average	Range	Average	Range
9 June 2015								
12	142	107-157	141	106-158	142	107-157	141	106-158
9	148	123-159	147	122-158	148	124-159	147	123-158
9	156	127-164	155	126-163	156	129-164	155	128-163
13	161	124-169	164	127-172	161	126-169	164	129-172
12	ND	ND	ND	ND	ND	ND	ND	ND
9	156	124-162	155	123-161	156	124-162	155	123-161
9	154	139-160	154	139-160	154	141-160	154	141-160
8	147	128-173	146	127-172	147	128-173	146	127-172
9	157	137-168	156	136-167	157	138-166	156	137-165
9	152	136-162	151	135-161	152	137-161	151	136-160
9	146	135-162	145	134-161	148	134-161	147	133-160
10 June 2015								
13	141	129-146	143	131-148	141	128-147	143	130-149

Measurement Equipment

Reson Model TC-4013 and Reson Model TC-4033 hydrophones were used for the underwater measurements. The signal from the hydrophones was fed directly into a Larson Davis Model 831 Precision Sound Level Meter (LDL 831). The LDL 831 captures the signal and stores the measurement data to be downloaded for analysis at the end of each day.

During vibratory driving, the maximum peak sound pressures (LZ_{peak}) and the fast RMS sound pressure level were measured "live" using the LDL 831. The LDL 831 SLM provided measurements of the un-weighted results for each data type, including the one-third octave band spectra for the 1-second LZ_{max}. Additional analyses of the acoustical impulses were performed using the LDL 831 SLMs as well.

Airborne measurements were made using a 0.5-inch G.R.A.S. Model 40AQ pre-polarized random-incidence microphone. The signal was fed into an LDL 820 SLM. The system was calibrated with a Larson Davis Model CAL200 Acoustic Calibrator. The microphone was calibrated at the beginning and end of each day. Pre-event and post-event calibration levels were within 0.1 decibel (dB).

Underwater Sound Descriptors

The acoustic monitoring reported data in several formats, depending on the type of pile driving and the type of acoustic measurement. Impact pile driving produces pulse-type sounds, while vibratory pile installation produces a more continuous type of sound.

For vibratory driving, data reporting included the RMS sound pressure level, the SEL, Cumulative SEL and the L_{max} average one-third octave band frequency spectrum over the entire pile-driving event.

Airborne Sound Descriptors

A-weighted airborne data were collected for vibratory driving. During data collection, 1-second and 1-minute intervals were used for measuring airborne data. The airborne data represent the 1-second "fast" C-weighted RMS (L_{max}). Due to the short driving periods for the sheet piles, the data shown are for the driving period. For the king piles, the data are the 1-minute L_{eq} and the L_{max} for the entire driving period. The tables in **Appendix B** show the data including the L_{eq} and L_{max}.

Underwater Measurement Data Management

For each day of monitoring, digital data captured by the SLMs were downloaded to a computer. Some of the readings during the monitoring were recorded in field notebooks to track levels and assess the ranges used for monitoring.

Quality Control

The underwater and airborne measurement systems were calibrated prior to use in the field with a G.R.A.S. Type 42AA pistonphone and hydrophone coupler. For the underwater systems, the pistonphone calibrator produces a continuous 136.4 or 145.3 dB (referenced to one microPascal) tone at 250 Hertz. For the airborne system the pistonphone produces a continuous 114.0 dB tone at 250 Hertz. The SLMs are calibrated to this tone and it is measured as well as recorded by the SLM at the beginning of all the data files. The system calibration status was checked at the end of the measurement event by both measuring the calibration tone and recording the post-measurement tone on the media files. Signal analysis included the measurement of the calibration tone at the beginning and end of recording events. All systems were found to be within 0.5 dB of the calibration levels. The pistonphone output has been certified at an independent facility.

All field notes were recorded in water-resistant field notebooks. Such notebook entries include calibration notes, measurement positions (i.e., distance from the source and depth of the sensor), system gain settings, and the equipment used to make each measurement. Notebook entries were copied after each measurement day and filed for safekeeping. Recorded media were labeled and stored for subsequent analysis.

Propagation Rate

The propagation rate, or acoustic spreading loss, was calculated for both the sheet piles and the king piles. The term “rate” applies to the logarithmic attenuation of noise levels as sound propagates away from the source. Empirically derived propagation rates like these provide a valuable utility in estimating sound harassment areas for future projects. The propagation rates were similar for both types of piles driven with the vibratory hammer. **Figures 1 and 2** show the acoustic spreading loss curves that can be used to calculate the overall distances to the various regulatory threshold levels. The dataset of measurement distances for the sheet piles ranged from 8 to 840 m (26 to 2,800 ft) while the distances for the king piles ranged from 9 to 400 m (30 to 1,300 ft). The propagation loss for the king piles was 14.7Log and for the sheet piles the propagation loss was 15.9Log.

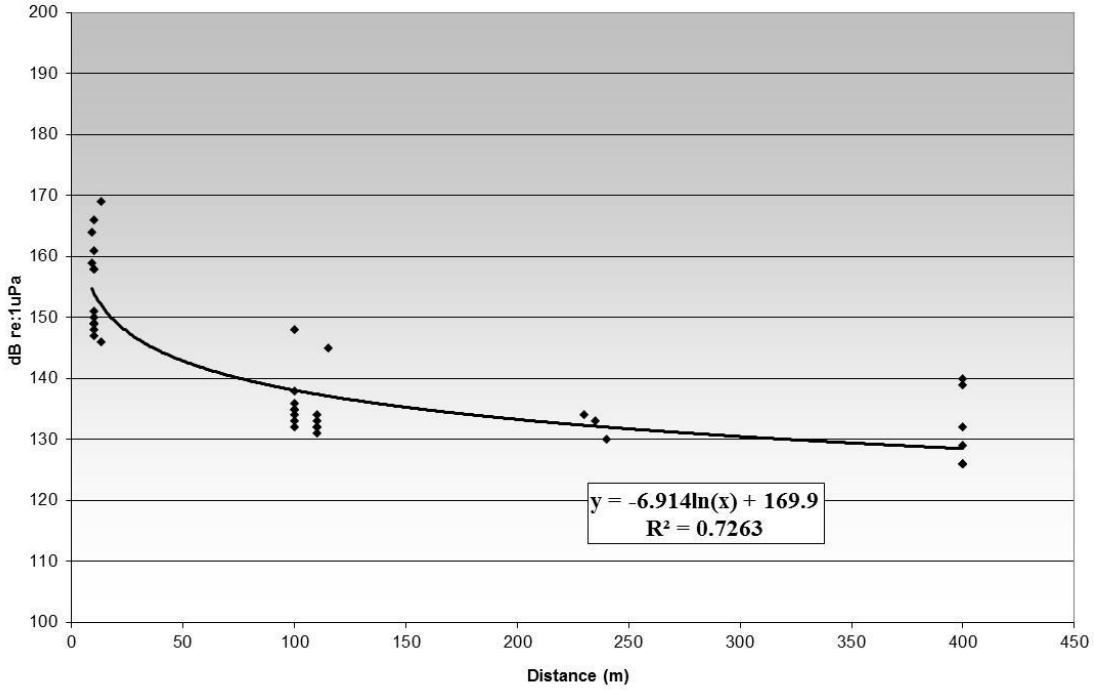

Figure 1 – Acoustic Spreading loss of RMS Levels – King Piles

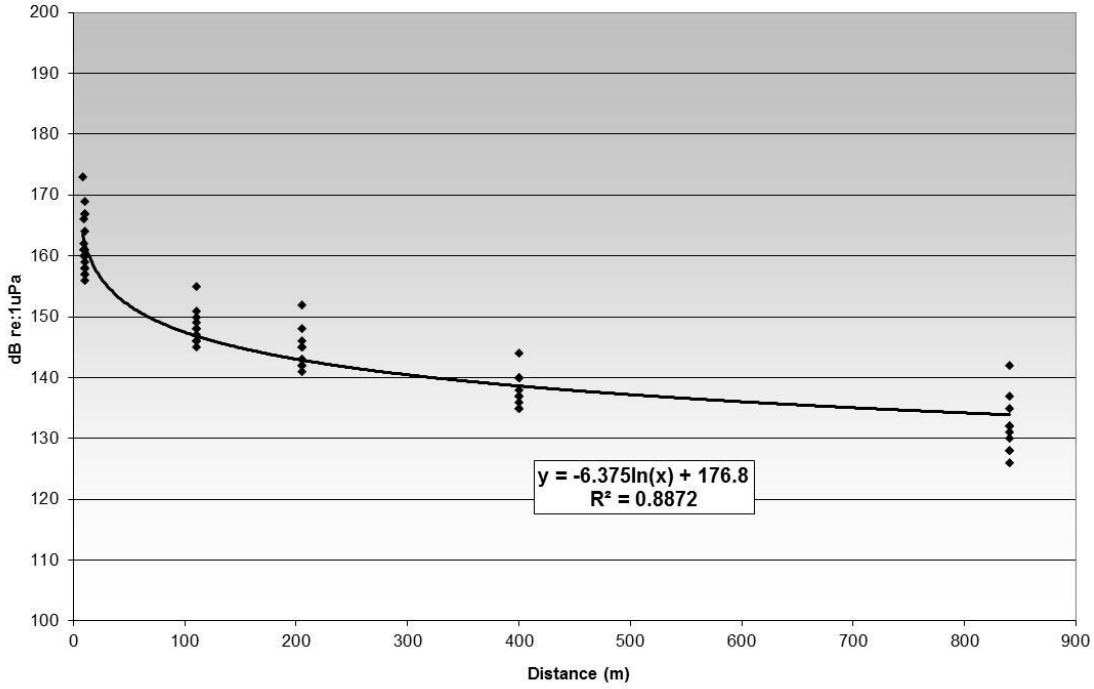

Figure 2 – Acoustic Spreading Loss RMS - Sheet Piles

Discussion

There was a considerable amount of variability in the levels measured for each type of pile driven, for example during the driving of the sheet piles the average levels range from 145 to 159 dB and the average levels when driving in the King piles ranged from 141 to 164 dB. The overall average for the sheet piles was 151 dB and for the King piles the average level was 148 dB. The installation of the sheet piles tended to be louder than the installation of the king piles; this is most likely due to the differences in the overall mas of the king pile compared to the sheet piles and the difference in the length of time it took to drive a sheet pile compared to the king piles.

The times to install a sheet pile ranged from 12 to 61 seconds while the king piles ranged from 6 minutes to 152 minutes (2.5 hours). The average time to install a sheet pile was 21 seconds and the average time to install a king pile was 24 minutes.

Glossary

Ambient sound – Normal background noise in the environment that has no distinguishable sources.

Ambient sound level – The background sound level, which is a composite of sound from all sources near and far. The normal or existing level of environmental sound at a given location. Distribution of sound pressure versus frequency for a waveform, dimension in root mean square pressure, and defined frequency bandwidth.

Background level – Is similar to Ambient Sound Level with the exception that is a composite of all sound measured during the construction period minus the pile driving.

Amplitude – The maximum deviation between the sound pressure and the ambient pressure.

Cumulative sound exposure level (SELcumulative) – In an evaluation of pile driving impacts, it may be necessary to estimate the cumulative SEL associated with a series of pile strike events. SELcumulative can be estimated from the single-strike SEL and the number of strikes that likely would be required to place the pile at its final depth by using the following equation:

$$SEL_{cumulative} = SEL_{single\ strike} + 10*\log (\#\ of\ pile\ strikes)$$

Decibel (dB) – A customary scale most commonly used for reporting levels of sound. A difference of 10 dB corresponds to a factor of 10 in sound power. 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. The reference pressure for water is 1 micro-Pascal (µPa), and for air it is 20 micro-Pascals (the threshold of healthy human audibility).

Frequency – The number of complete pressure fluctuations per second above and below atmospheric pressure. Normal human hearing is between 20 and 20,000 Hz. Infrasonic sounds are below 20 Hz and ultrasonic sounds are above 20,000 Hz. Measured in cycles per second (Hz).

Frequency spectrum – The distribution of frequencies that comprise a sound.

Hertz (Hz) – The units of frequency where 1 Hertz equals 1 cycle per second. **Fast, Slow and**

Impulse – Most sound level meters have two conventional time weightings, F = Fast and S = Slow with time constants of 125 ms and 1000 ms respectively. Some also have Impulse Time Weighting which is a quasi-peak detection characteristic with rapid rise time (35 ms) and a much slower 1.5 second decay.

F : Fast = 125 ms up and down,
S – 1 second up and down
I – Impulse - 35 ms while the signal level is increasing or 1,500 ms while the signal level is decreasing

LZF – Z-weighted, Fast, Sound Level **LZI** – Z-weighted impulse RMS sound pressure level

LZ_{eq} – Z-weighted, Leq, Sound Level

LZ_{peak} – Z-weighted peak sound level

Peak sound pressure level (L_{PEAK}) – The largest absolute value of the instantaneous sound pressure. This pressure is expressed as a decibel (referenced to a pressure of 1 micro-Pascal [µPa] for water and 20 µPa for air) or in units of pressure, such as µPa or PSI.

Project action area – The area experiencing direct and indirect project-related noise effects

Root mean square (RMS) sound pressure level – Decibel measure of the square root of mean square (RMS) pressure. For impulses, the average of the squared pressures over the time that comprise that portion of the waveform containing 90 percent of the sound energy of the impulse.

Sound – Small disturbances in a fluid from ambient conditions through which energy is transferred away from a source by progressive fluctuations of pressure (or sound waves).

Sound exposure – The integral over all time of the square of the sound pressure of a transient waveform.

Sound exposure level (SEL) – The time integral of frequency-weighted squared instantaneous sound pressures. Proportionally equivalent to the time integral of the pressure squared. Sound energy associated with a pile driving pulse, or series of pulses, is characterized by the SEL. SEL is the constant sound level in one second, which has the same amount of acoustic energy as the original time-varying sound (i.e., the total energy of an event). SEL is calculated by summing the cumulative pressure squared over the time of the event.

Sound pressure level (SPL) – An expression of the sound pressure using the decibel (dB) scale and the standard reference pressures of 1 micro-Pascal (µPa) for water, and 20 µPa for air and other gases. Sound pressure is the sound force per unit area, usually expressed in micro-Pascals (or micro-Newtons per square meter), where 1 Pascal is the pressure resulting from a force of 1 Newton exerted over an area of 1 square meter. The SPL is expressed in decibels as 20 times the logarithm to the base 10 of the ratio between the pressure exerted by the sound to a reference sound pressure (e.g., 20 micro-Pascals). SPL is the quantity that is directly measured by a sound level meter.

Z-weighted – Z-weighting is a flat frequency response of 10Hz to 20 kHz ±1.5 dB. This response replaces the older "Linear" or "Unweighted" responses as these did not define the frequency range over which the meter would be linear.

Appendix A

Time History of Pile Driving and 1/3-Octave Band Spectra

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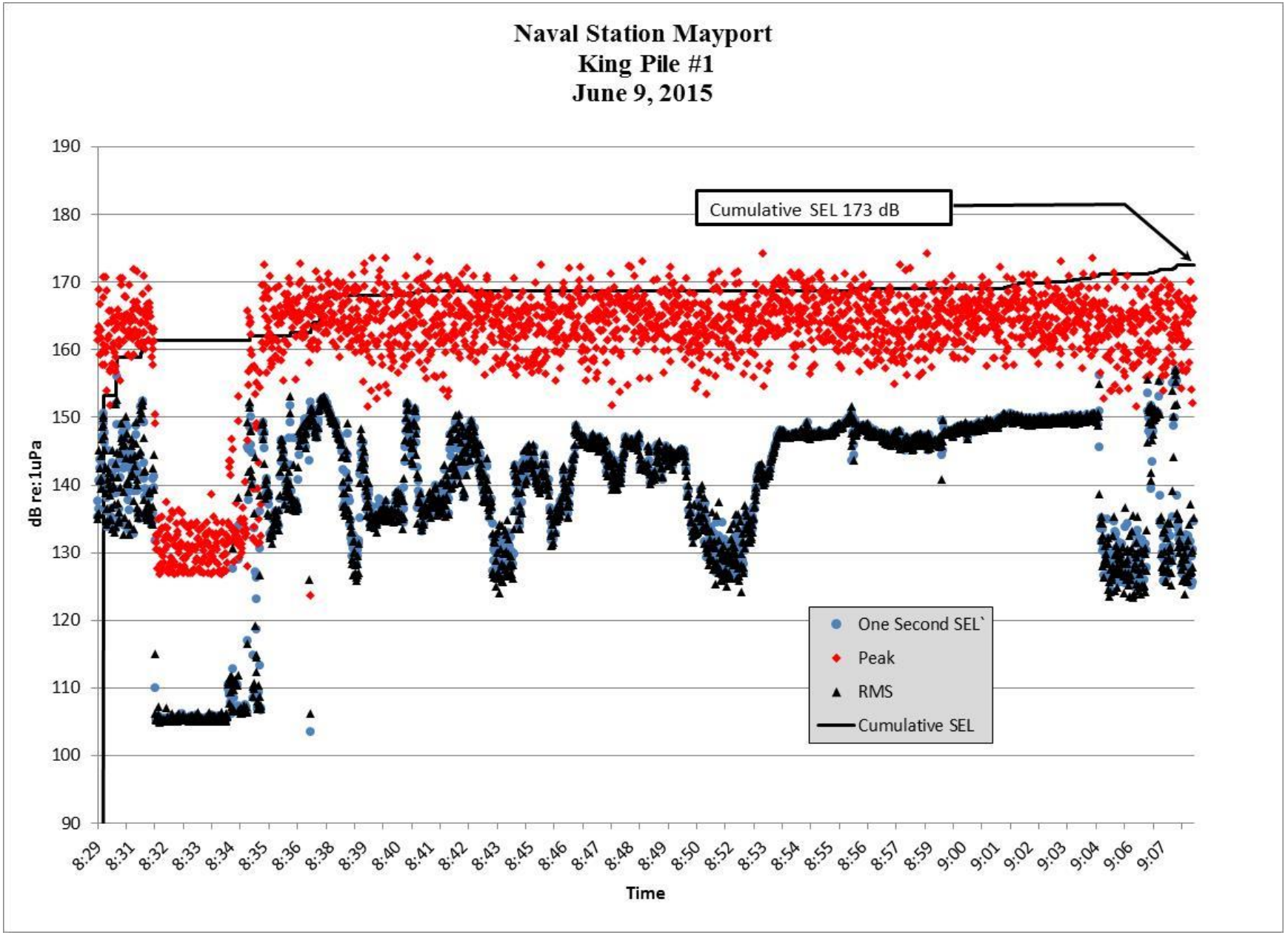
Naval Station Mayport
King Pile #1
June 9, 2015
Cumulative SEL 173 dB
dB re:1uPa
190
180
170
160
150
140
130
120
110
100
90
One Second SEL`
Peak
RMS
Cumulative SEL
8:29
8:31
8:32
8:33
8:34
8:35
8:36
8:38
8:39
8:40
8:41
8:42
8:43
8:45
8:46
8:47
8:48
8:49
8:50
8:52
8:53
8:54
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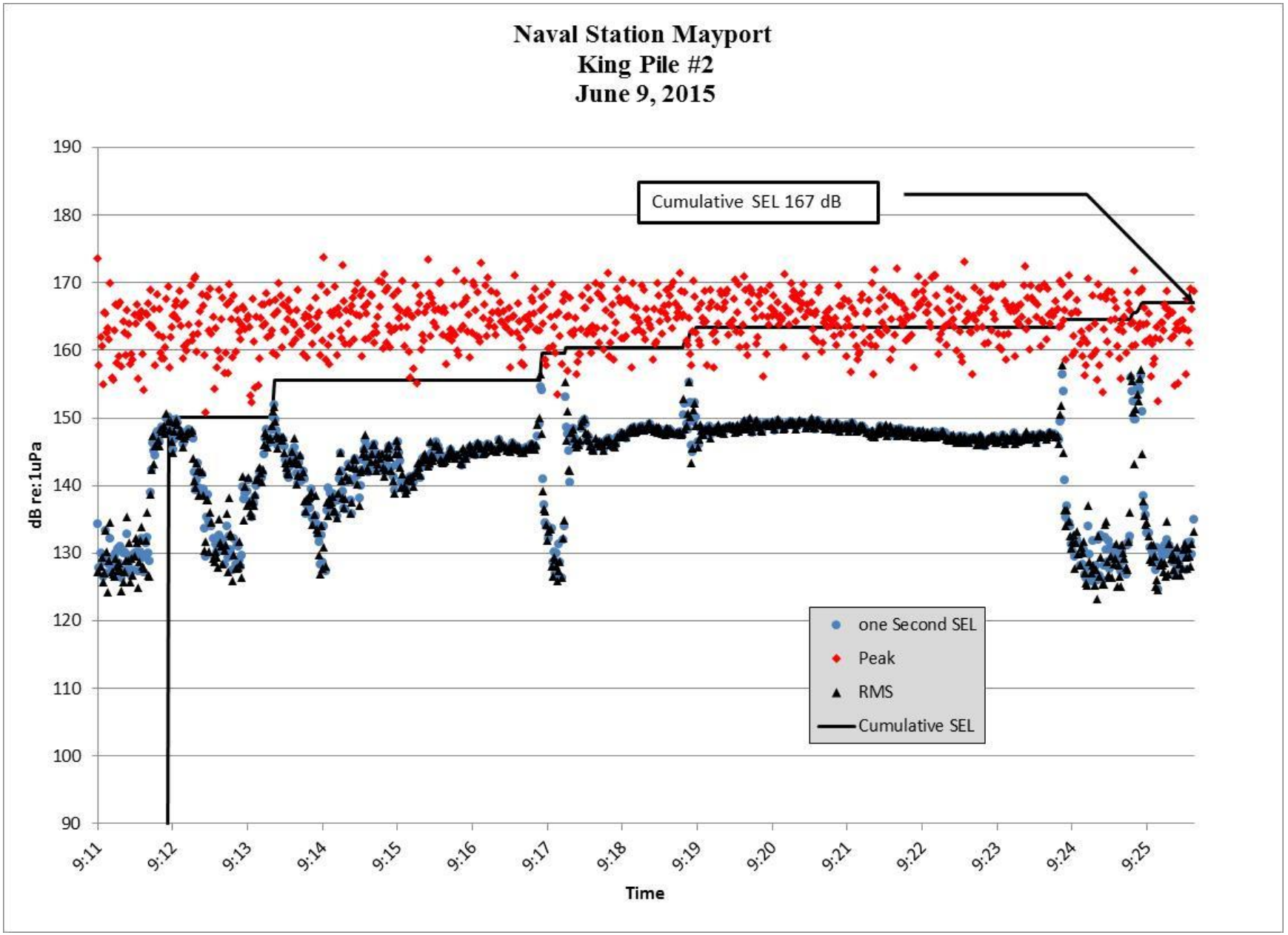
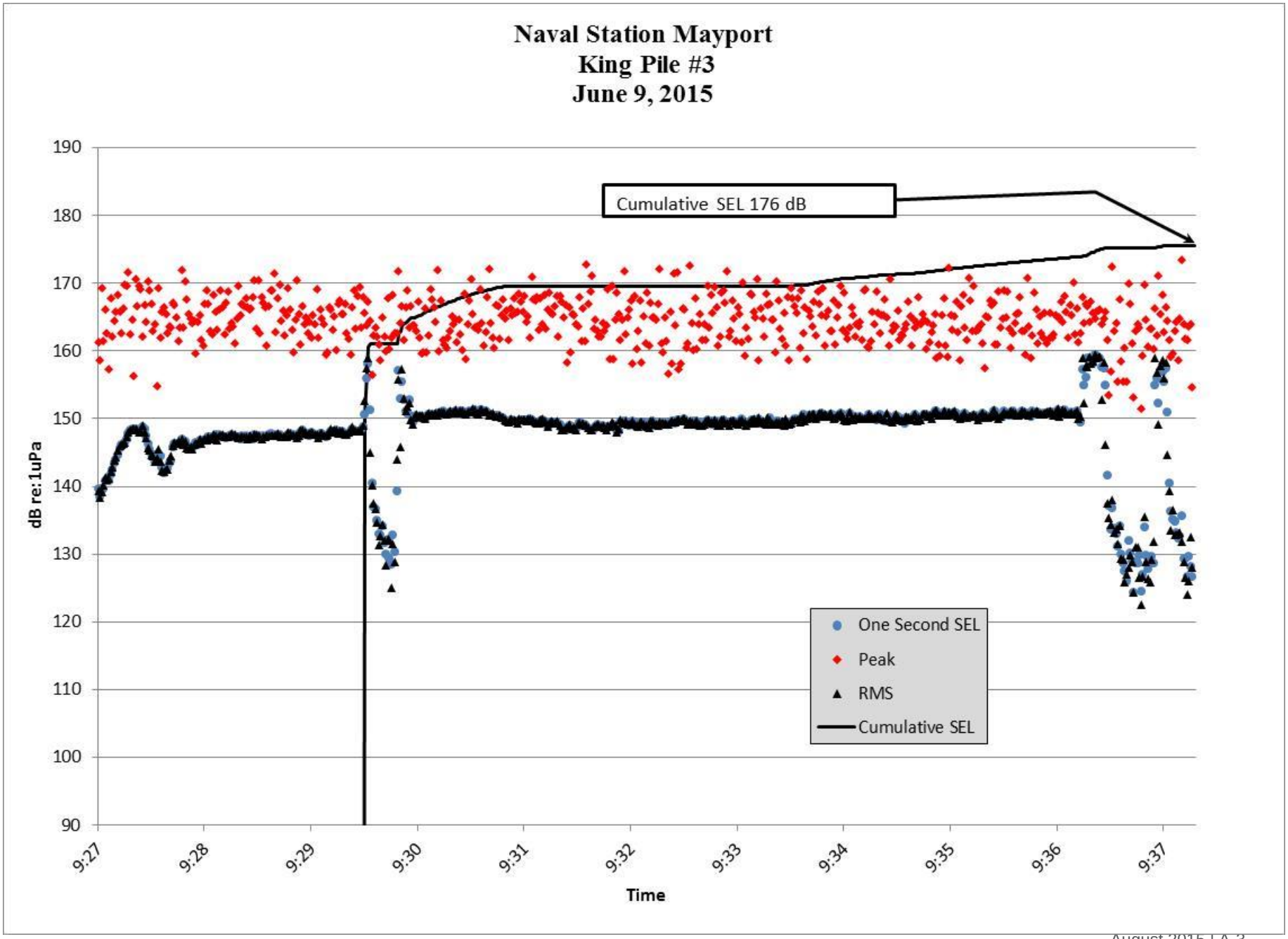
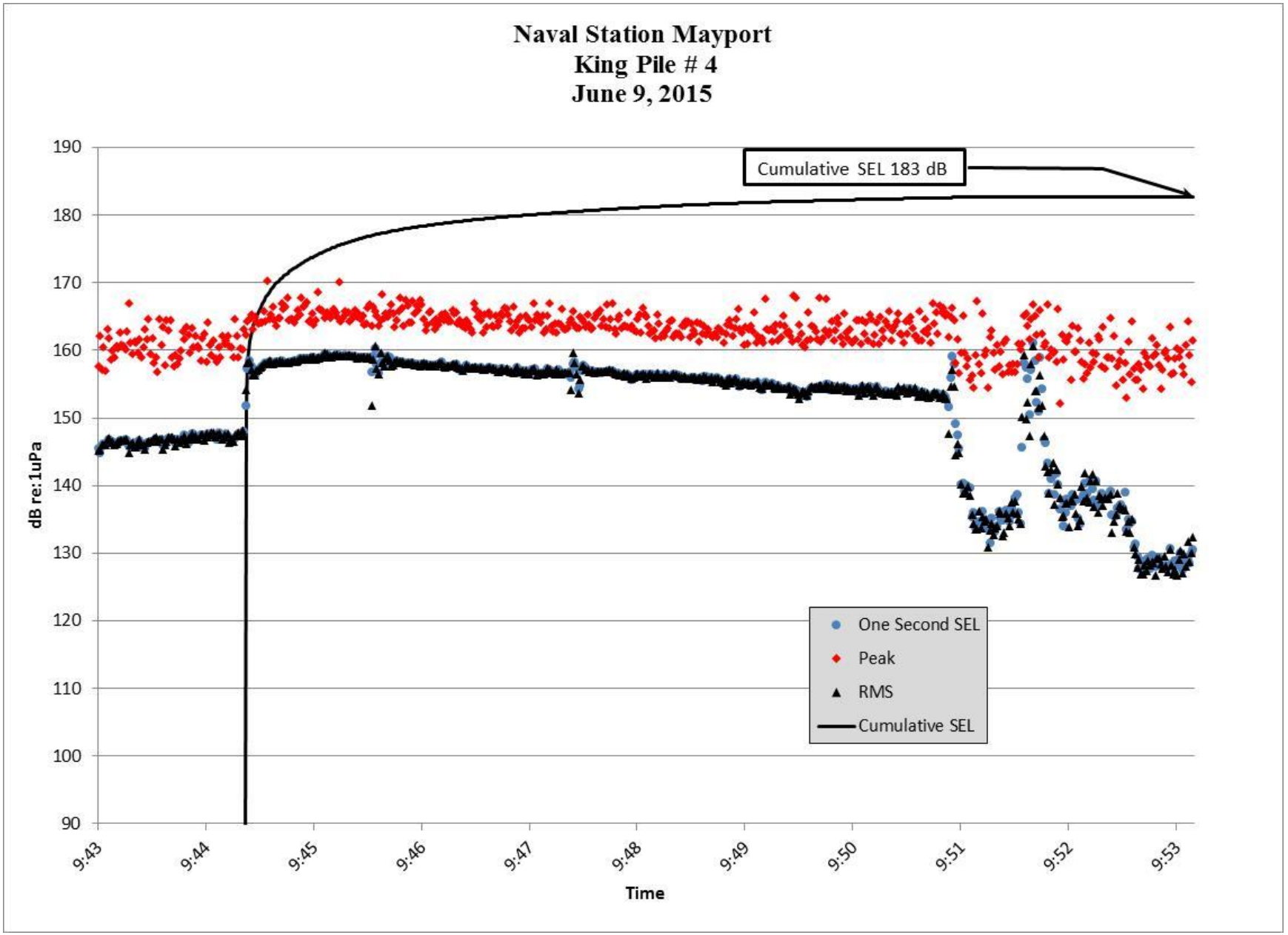
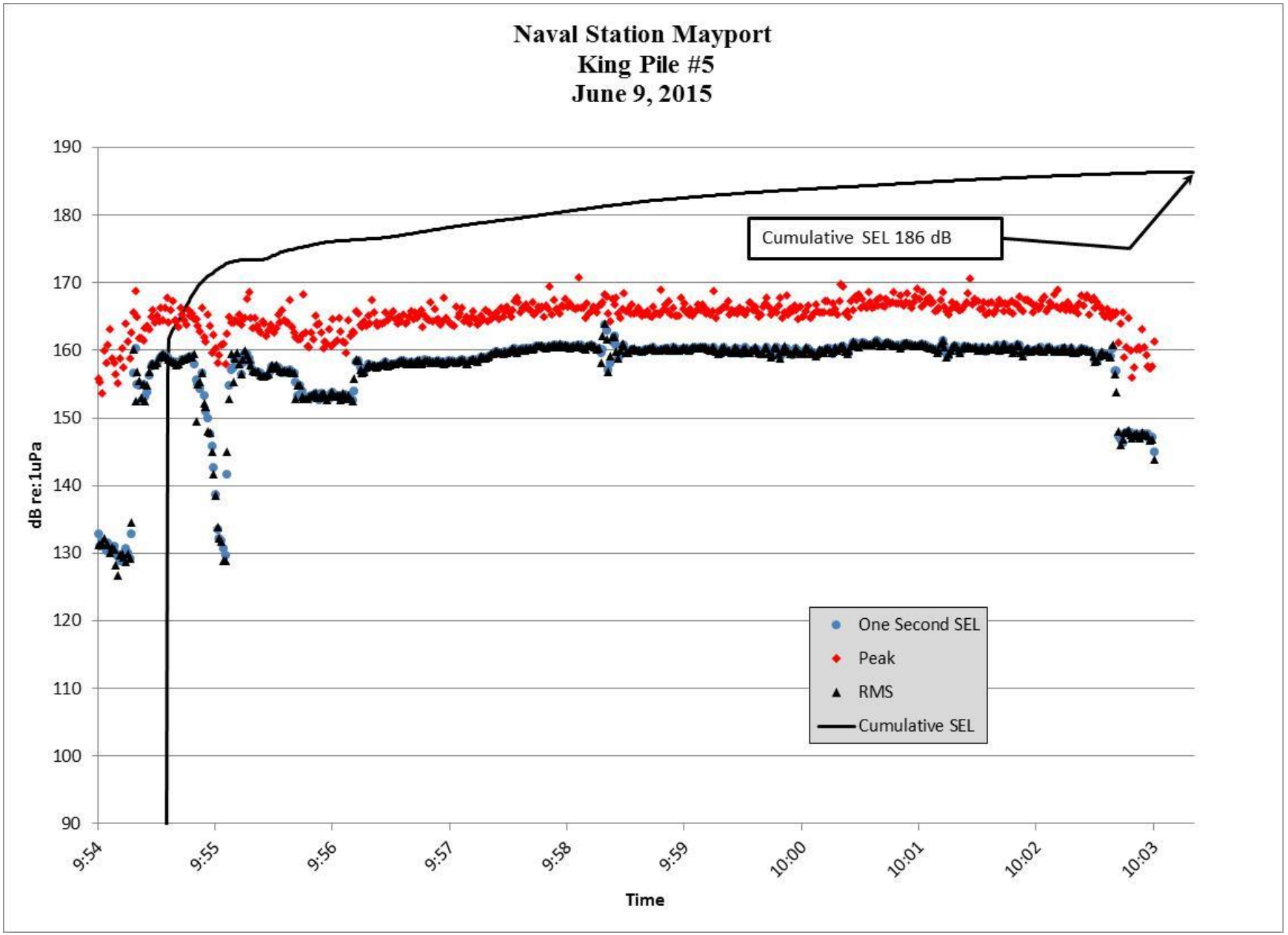
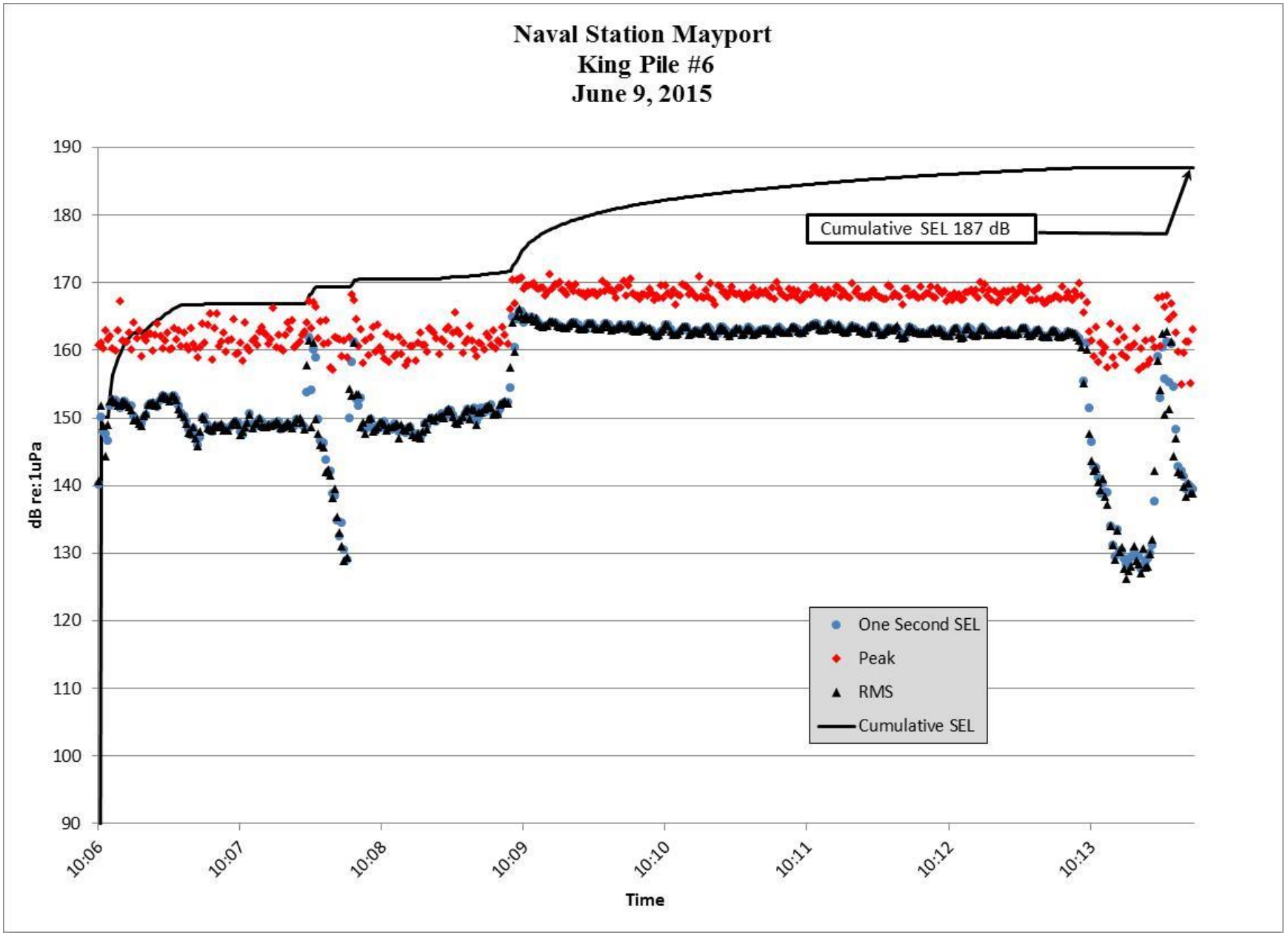
9:02
9:03
9:04
9:06
9:07
Time

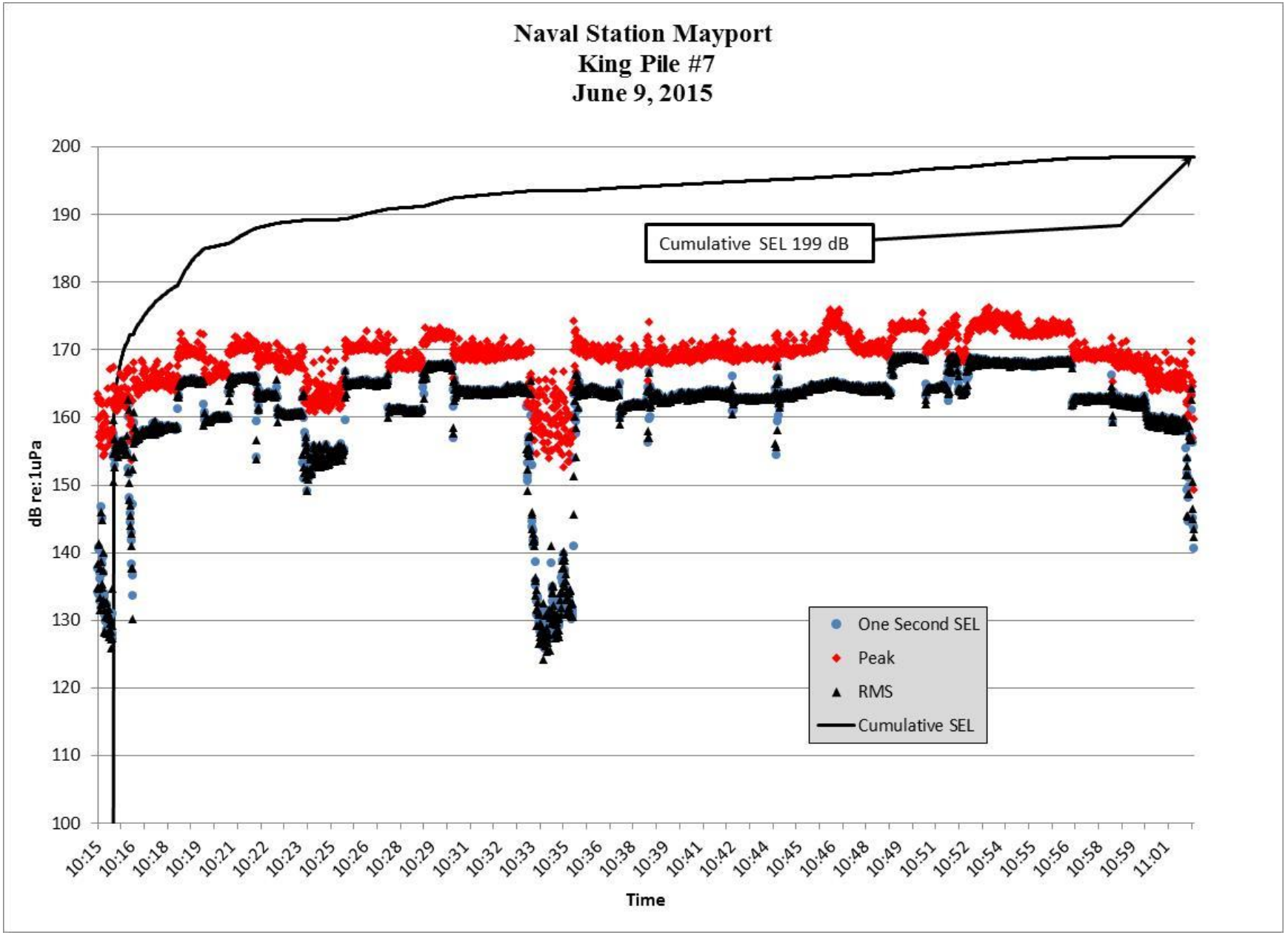

Naval Station Mayport
King Pile #2
June 9, 2015
Cumulative SEL 167 dB
one Second SEL
Peak
RMS
Cumulative SEL
dB re:1uPa
Time
190
180
170
160
150
140
130
120
110
100
90
9:11
9:12
9:13
9:14
9:15
9:16
9:17
9:18
9:19
9:20
9:21
9:22
9:23
9:24
9:25


Naval Station Mayport
King Pile #3
June 9, 2015
Cumulative SEL 176 dB
One Second SEL
Peak
RMS
Cumulative SEL
dB re:1uPa
Time
190
180
170
160
150
140
130
120
110
100
90
9:27
9:28
9:29
9:30
9:31
9:32
9:33
9:34
9:35
9:36
9:37


Naval Station Mayport
King Pile # 4
June 9, 2015
Cumulative SEL 183 dB
dB re:1uPa
190
180
170
160
150
140
130
120
110
100
90
9:43
9:44
9:45
9:46
9:47
9:48
9:49
9:50
9:51
9:52
9:53
Time
One Second SEL
Peak
RMS
Cumulative SEL


Naval Station Mayport
King Pile #5
June 9, 2015
Cumulative SEL 186 dB
One Second SEL
Peak
RMS
Cumulative SEL
dB re:1uPa
Time
190
180
170
160
150
140
130
120
110
100
90
9:54
9:55
9:56
9:57
9:58
9:59
10:00
10:01
10:02
10:03


Naval Station Mayport
King Pile #6
June 9, 2015
Cumulative SEL 187 dB
One Second SEL
Peak
RMS
Cumulative SEL
dB re:1uPa
Time
190
180
170
160
150
140
130
120
110
100
90
10:06
10:07
10:08
10:09
10:10
10:11
10:12
10:13


Naval Station Mayport
King Pile #7
June 9, 2015
Cumulative SEL 199 dB
One Second SEL
Peak
RMS
Cumulative SEL
dB re:1uPa
Time
200
190
180
170
160
150
140
130
120
110
100
10:15
10:16
10:18
10:19
10:21
10:22
10:23
10:25
10:26
10:28
10:29
10:31
10:32
10:33
10:35
10:36
10:38
10:39
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10:44
10:45
10:46
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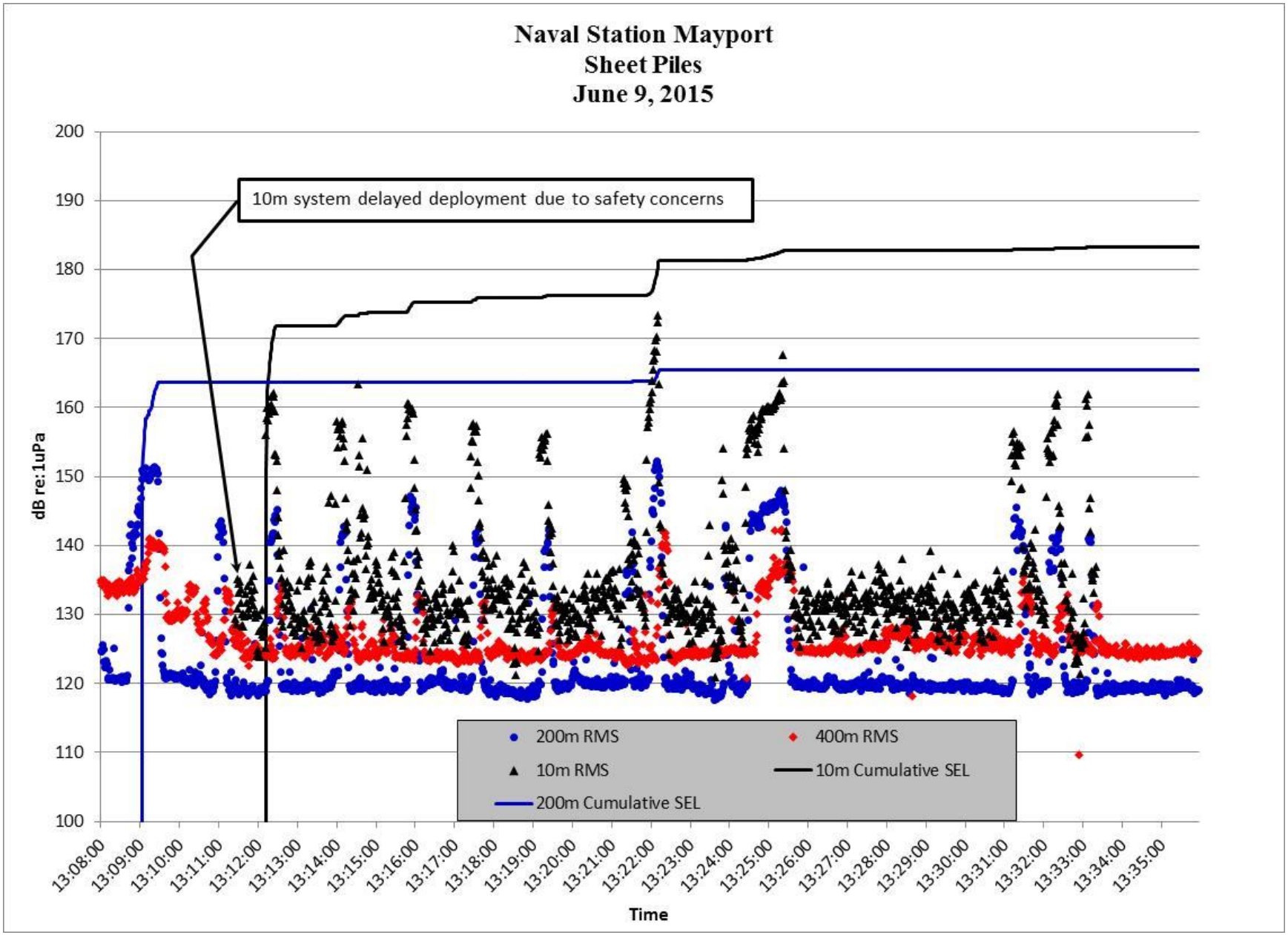
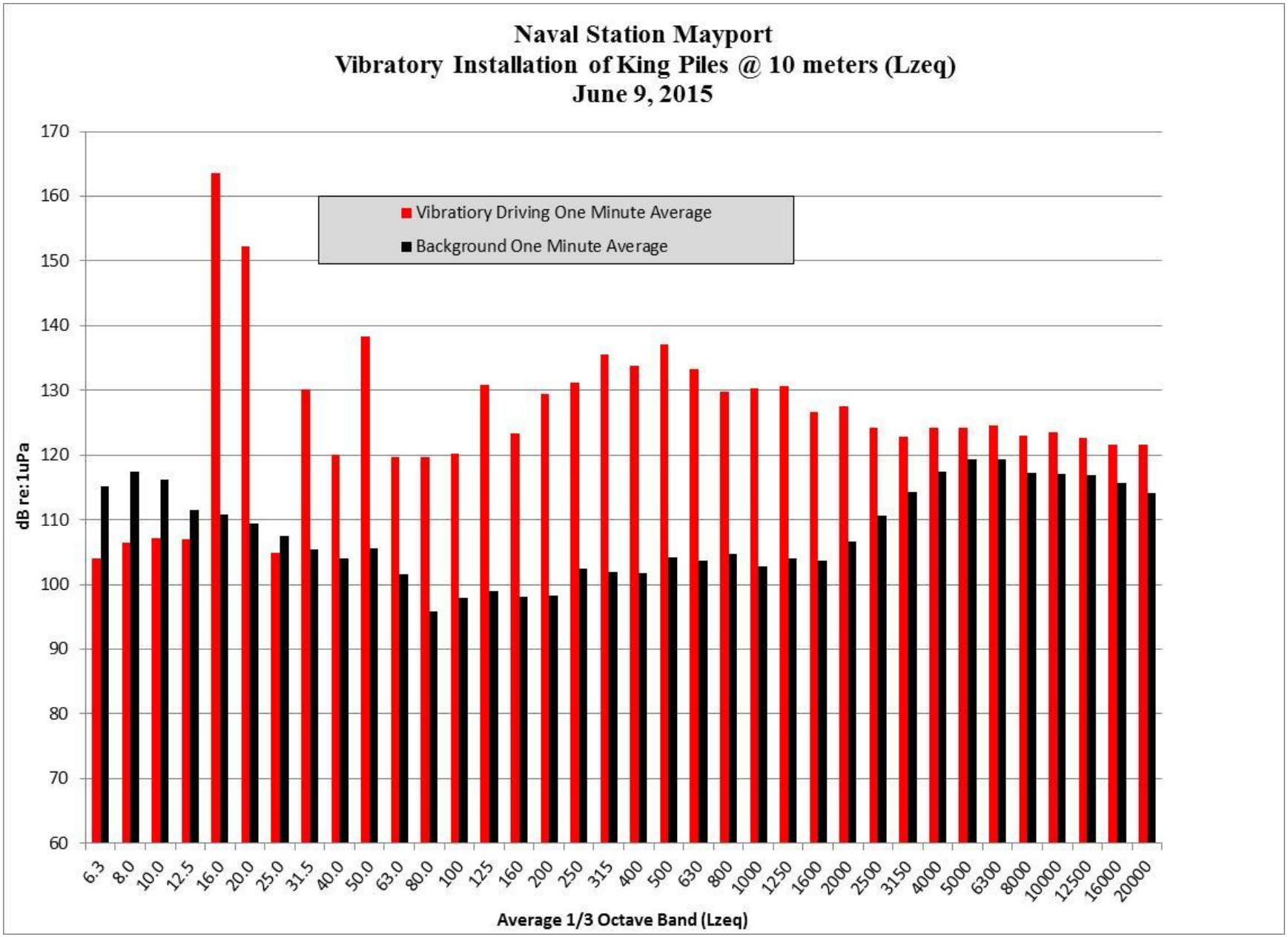
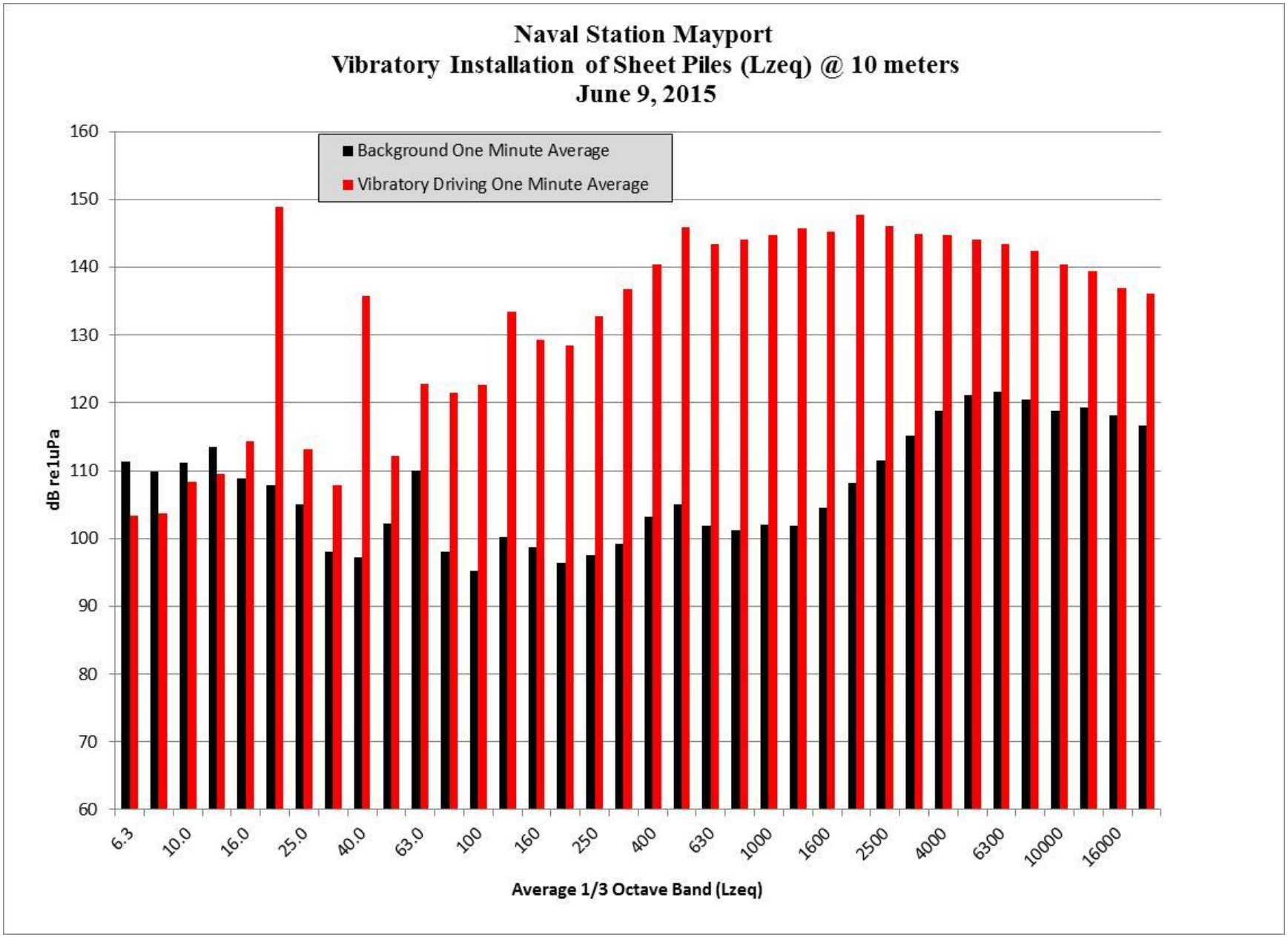
10:49
10:51
10:52
10:54
10:55
10:56
10:58
10:59
11:01


Naval Station Mayport
Sheet Piles
June 9, 2015
10m system delayed deployment due to safety concerns
dB re:1uPa
200
190
180
170
160
150
140
130
120
110
100
200m RMS
400m RMS
10m RMS
10m Cumulative SEL
200m Cumulative SEL
13:08:00
13:09:00
13:10:00
13:11:00
13:12:00
13:13:00
13:14:00
13:15:00
13:16:00
13:17:00
13:18:00
13:19:00
13:20:00
13:21:00
13:22:00
13:23:00
13:24:00
13:25:00
13:26:00
13:27:00
13:28:00
13:29:00
13:30:00
13:31:00
13:32:00
13:33:00
13:34:00
13:35:00
Time


Naval Station Mayport
Vibratory Installation of King Piles @ 10 meters (Lzeq)
June 9, 2015
Vibratiory Driving One Minute Average
Background One Minute Average
dB re:1uPa
170
160
150
140
130
120
110
100
90
80
70
60
6.3
8.0
10.0
12.5
16.0
20.0
25.0
31.5
40.0
50.0
63.0
80.0
100
125
160
200
250
315
400
500
630
800
1000
1250
1600
2000
2500
3150
4000
5000
6300
8000
10000
12500
16000
20000
Average 1/3 Octave Band (Lzeq)


Naval Station Mayport
Vibratory Installation of Sheet Piles (Lzeq) @ 10 meters
June 9, 2015
Background One Minute Average
Vibratory Driving One Minute Average
dB re1uPa
160
150
140
130
120
110
100
90
80
70
60
6.3
10.0
16.0
25.0
40.0
63.0
100
160
250
400
630
1000
1600
2500
4000
6300
10000
16000
Average 1/3 Octave Band (Lzeq)

Appendix B

Spread sheet of 1/3 Octave Band levels

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Background Spectra for Vibratory Pile Driving

Time	6.3	8.0	10.0	12.5	16.0	20.0	25.0	31.5	40.0	50.0	63.0	80.0	100	125	160	200	250	315	400	500	630	800	1000	1250	1600	2000	2500	3150	4000	5000	6300	8000	10000	12500	16000	20000
13:28:00	111.3	113.9	118.0	113.6	118.7	116.7	106.7	100.5	102.9	105.4	111.4	102.2	93.1	98.5	97.9	98.5	98.8	100.6	105.7	106.7	105.3	102.6	104.7	106.6	107.6	109.2	111.7	113.2	116.7	119.4	119.3	118.6	118.3	117.5	117.2	115.6
13:28:01	115.7	100.9	111.7	114.8	116.3	116.9	104.7	99.9	96.3	100.3	108.2	102.3	95.4	100.9	98.8	95.2	100.4	102.1	105.3	106.2	106.0	102.9	106.0	106.2	108.6	110.0	114.6	114.9	118.7	120.1	120.8	119.7	118.7	117.0	116.2	115.9
13:28:02	108.0	108.7	113.7	114.0	113.7	116.4	107.6	102.0	95.8	101.4	110.6	103.1	95.5	99.2	98.7	95.8	100.8	100.6	104.0	105.3	102.7	100.5	103.2	101.7	105.2	105.8	108.4	111.7	115.1	118.5	120.1	118.6	117.3	117.6	118.2	117.2
13:28:03	113.1	109.1	111.8	117.6	115.6	107.4	101.4	96.7	94.5	99.0	110.1	100.3	98.9	100.0	97.1	98.3	98.7	98.1	99.6	102.6	99.4	98.2	98.2	97.6	100.1	103.3	106.8	112.2	117.5	120.0	120.8	120.3	117.9	117.3	118.2	116.2
13:28:04	111.3	103.8	114.1	119.7	106.8	108.7	104.4	93.9	95.5	105.7	111.0	98.7	99.4	110.0	106.5	101.8	106.6	112.3	112.0	117.5	111.7	111.9	110.2	111.5	110.4	113.6	112.9	114.3	115.9	118.6	121.2	120.6	120.1	117.4	118.2	115.7
13:28:05	112.9	114.9	116.8	115.4	107.2	112.2	110.6	109.0	109.7	106.1	111.4	98.0	94.8	105.1	101.2	98.0	97.4	101.2	103.9	108.9	103.6	101.8	102.5	103.2	104.5	107.5	111.0	114.7	117.7	121.1	121.8	121.1	119.4	119.1	118.5	116.3
13:28:06	112.9	116.7	111.4	118.8	116.9	125.3	113.5	112.1	107.0	105.9	110.0	94.6	91.2	100.2	98.6	94.1	95.3	96.7	101.5	104.2	101.1	99.8	101.8	102.4	103.7	108.6	110.8	115.0	118.4	122.1	122.5	122.1	121.4	123.6	119.8	118.8
13:28:07	113.7	116.2	117.0	120.8	120.7	120.5	115.2	107.3	106.0	105.2	108.5	94.4	93.3	100.7	100.9	102.0	98.1	101.6	103.9	105.0	102.2	100.1	100.0	99.0	100.6	103.2	105.6	112.6	117.2	118.9	119.7	118.1	117.0	119.7	118.0	115.4
13:28:08	113.0	114.2	114.8	119.8	121.2	118.2	109.6	98.9	99.4	103.4	109.7	101.2	96.5	99.3	98.2	95.4	95.6	95.6	101.4	102.6	99.8	98.4	99.3	99.8	102.2	106.7	108.8	114.6	119.0	120.9	121.3	121.2	119.5	118.4	118.0	115.7
13:28:09	111.5	112.9	118.0	120.0	116.6	114.4	107.9	97.5	98.3	99.6	111.5	96.8	96.5	101.3	98.4	94.1	94.9	97.4	101.0	104.0	101.1	100.0	99.9	100.6	103.7	106.0	110.0	113.8	118.9	121.2	122.6	121.8	120.5	120.1	120.1	119.0
13:28:10	114.9	117.4	119.1	115.3	117.6	108.5	105.0	100.0	98.0	103.4	110.8	98.7	96.1	102.0	98.4	95.6	96.5	97.0	102.3	104.5	100.6	100.2	100.4	98.9	102.3	105.7	109.5	114.6	116.7	119.9	120.4	119.3	116.5	117.1	115.9	115.2
13:28:11	111.9	117.0	117.5	115.7	106.9	108.9	100.1	98.6	100.5	105.9	109.8	101.2	101.2	111.4	107.5	105.0	107.1	115.1	116.1	121.3	117.4	115.5	116.0	116.2	114.9	117.3	117.0	118.5	119.7	121.1	121.8	121.0	118.1	120.9	118.2	116.3
13:28:12	117.6	112.6	118.7	112.4	109.8	112.7	112.5	108.4	105.5	105.1	110.0	99.0	92.9	98.7	97.9	94.0	97.1	102.3	104.9	110.7	107.8	109.1	109.3	112.0	111.9	115.2	115.1	117.8	119.8	122.9	123.3	121.9	122.2	122.8	118.8	117.8
13:28:13	113.3	116.7	116.1	111.3	112.5	113.8	110.3	104.3	96.7	105.2	108.8	96.1	89.4	99.7	98.1	95.8	97.7	103.5	107.1	113.1	111.2	109.9	110.2	108.5	108.1	112.0	112.9	115.7	118.2	119.6	120.5	118.5	119.4	118.6	117.1	116.7
13:28:14	111.6	108.8	117.1	113.1	112.6	105.3	104.9	104.1	97.5	101.1	108.4	96.6	96.5	98.6	97.6	93.6	93.4	94.7	100.5	102.1	100.3	101.0	99.9	99.0	101.9	106.5	111.2	113.5	119.7	123.0	123.8	122.7	119.9	119.5	118.8	116.1
13:28:15	107.5	112.7	112.1	105.8	112.0	119.7	113.4	106.2	97.3	102.0	109.7	97.1	99.3	99.6	97.4	100.3	98.2	98.9	101.3	104.2	101.7	99.3	99.4	100.4	103.1	109.7	114.2	117.1	123.2	122.8	123.8	119.7	119.2	120.0	117.2	114.0
13:28:16	110.8	114.2	106.3	114.6	115.8	104.0	98.7	95.1	95.6	101.6	109.0	99.6	97.9	100.0	97.3	94.3	94.6	96.6	100.8	102.6	98.9	99.0	99.4	98.2	101.5	108.3	111.1	114.2	118.8	121.9	122.8	122.0	118.6	121.0	118.5	117.2
13:28:17	108.4	103.4	107.6	111.5	99.4	106.2	107.3	101.9	97.4	101.2	110.5	100.6	98.8	101.1	97.8	95.1	93.9	99.2	101.1	105.5	102.6	100.2	100.7	100.3	106.0	110.0	114.1	118.8	122.3	124.0	125.6	124.7	121.2	125.6	124.0	124.7
13:28:18	111.5	108.5	108.9	109.9	104.3	106.2	105.5	105.7	102.1	103.7	111.0	104.8	103.0	115.6	107.5	104.1	111.5	116.3	118.0	121.8	118.4	116.4	116.1	120.3	115.5	121.5	126.0	123.7	119.4	122.0	121.1	119.5	117.2	116.1	115.9	115.3
13:28:19	111.0	108.6	101.8	106.8	110.4	116.1	117.8	113.8	109.5	111.4	110.9	101.0	96.6	99.5	98.2	97.4	98.2	101.5	107.4	106.9	105.6	104.7	106.4	106.2	105.7	104.9	109.6	116.5	118.7	120.4	121.0	118.5	116.8	115.7	114.6	112.7
13:28:20	110.6	110.8	112.1	113.9	115.6	116.3	111.0	105.1	101.1	103.0	108.7	101.0	98.1	100.7	100.5	102.6	101.0	105.8	108.4	107.7	104.8	105.1	106.6	107.2	106.8	108.9	111.3	115.3	118.4	121.2	120.6	117.7	119.6	118.0	117.9	116.2
13:28:21	110.2	110.9	117.6	121.2	118.5	107.8	107.3	95.1	97.7	102.1	111.5	100.8	96.4	101.3	99.5	100.7	98.7	99.0	103.1	104.7	101.8	101.7	102.1	101.5	103.1	107.4	108.2	113.5	118.9	121.4	121.3	121.5	119.8	119.5	119.4	117.0
13:28:22	104.9	114.8	120.1	118.2	104.3	110.1	105.2	98.0	96.1	99.1	109.3	97.9	93.6	99.9	98.2	96.1	95.0	96.1	99.7	103.9	100.8	101.5	101.7	98.9	100.7	104.2	107.2	113.1	117.4	118.8	120.2	117.9	116.5	117.5	116.2	115.3
13:28:23	108.8	116.3	114.4	113.6	110.5	109.9	102.6	97.6	98.5	101.3	109.6	99.6	99.5	107.9	102.1	96.8	100.7	104.8	109.9	116.2	113.9	118.0	120.5	123.7	120.9	123.9	120.5	119.2	118.4	120.3	120.7	120.2	117.8	117.2	115.7	115.0
13:28:24	122.4	114.8	111.1	114.9	113.4	116.4	111.3	106.9	104.0	106.6	110.8	97.9	94.2	106.8	101.0	98.1	102.0	107.2	107.3	110.9	105.6	107.0	105.7	106.8	106.1	105.7	107.8	111.6	114.5	117.6	118.3	116.3	115.1	116.0	115.8	113.8
13:28:25	117.5	112.6	106.8	117.2	116.9	116.7	113.7	105.4	99.5	102.1	110.2	94.0	93.9	101.5	97.6	93.9	96.7	99.3	102.6	105.8	101.0	99.4	99.7	100.0	102.3	108.0	111.4	115.5	120.5	123.0	123.1	121.7	119.2	121.3	119.7	117.0
13:28:26	117.0	111.9	114.2	117.0	115.9	110.8	114.6	100.3	96.1	100.5	110.1	92.4	88.7	96.9	96.2	93.2	93.4	94.9	100.0	101.9	98.7	97.6	98.9	96.8	101.5	105.6	112.0	113.7	117.6	120.1	121.1	119.0	116.7	117.8	116.8	116.3
13:28:27	118.2	106.4	116.8	115.1	112.0	109.4	107.2	98.2	95.6	98.2	110.7	93.7	94.1	98.7	97.1	93.8	98.3	96.2	100.6	102.0	98.8	98.0	98.0	96.9	100.5	102.7	107.9	112.8	118.0	119.6	121.2	119.2	116.7	119.7	116.1	115.4
13:28:28	119.2	114.1	113.0	113.3	108.8	106.2	100.9	93.9	94.7	101.7	108.7	95.5	91.0	98.2	97.4	92.2	92.2	94.8	100.2	101.4	98.1	97.6	98.7	98.0	102.3	106.4	110.9	113.9	118.2	120.4	122.8	120.9	118.8	118.8	118.2	116.5
13:28:29	119.3	116.8	112.6	108.6	104.1	105.6	100.5	92.1	95.7	102.7	109.0	94.6	95.3	102.6	99.0	97.4	98.6	101.6	107.3	107.1	107.7	106.4	106.5	105.3	107.9	112.8	112.3	116.4	119.9	122.4	121.1	119.5	118.1	119.7	116.3	115.5
13:28:30	119.1	113.9	111.7	113.9	104.6	101.3	104.9	104.8	96.4	105.0	108.2	97.1	90.1	99.7	96.4	93.1	92.4	97.0	102.5	102.7	100.3	98.5	102.2	102.6	105.2	107.6	113.5	115.1	119.0	121.4	121.2	121.1	119.5	119.7	119.2	118.7
13:28:31	114.2	113.1	109.3	109.9	113.9	114.7	114.4	105.8	97.3	99.6	110.4	89.5	89.9	96.9	95.6	93.4	92.1	94.7	99.8	101.4	97.7	98.3	99.4	98.3	101.0	105.6	110.7	114.3	117.9	121.6	121.7	120.8	118.0	119.8	119.4	117.6
13:28:32	114.1	108.4	115.5	118.1	118.4	105.9	97.1	91.5	90.8	97.4	109.1	92.4	89.3	98.6	97.0	92.2	92.5	93.7	99.7	102.0	98.6	97.7	99.6	97.3	99.9	104.2	107.1	110.4	115.4	118.1	118.9	117.5	115.6	117.9	116.5	115.4
13:28:33	107.7	113.1	111.9	109.9	103.0	101.0	95.7	89.8	85.8	97.6	108.9	89.7	89.0	98.4	97.3	93.3	92.4	94.5	100.9	101.7	98.6	97.7	98.6	97.8	101.5	106.4	110.5	114.7	119.4	121.3	122.3	122.3	118.2	119.3	117.3	115.8
13:28:34	107.2	113.1	107.0	104.1	97.9	97.9	97.9	88.2	95.8	102.4	110.3	96.8	95.4	99.7	98.8	93.9	92.6	93.6	100.5	101.8	99.1	99.2	100.4	99.7	104.7	111.8	113.6	118.8	122.2	125.0	124.3	125.1	118.7	123.6	120.6	117.5
13:28:35	113.9	106.8	106.4	104.8	100.3	101.0	96.1	91.5	96.8	99.0	111.0	98.1	92.6	98.0	97.3	92.4	92.4	93.6	99.3	102.2	99.1	98.6	100.0	100.8	105.1	109.4	114.1	115.8	122.5	122.1	119.9	122.2	119.7	119.1	118.4	116.5
13:28:36	115.4	109.4	108.4	111.5	103.9	101.5	99.3	91.8	92.3	100.2	111.0	98.4	93.4	99.4	103.4	107.1	112.1	113.8	110.8	108.1	104.8	103.4	103.1	103.6	104.8	107.3	110.1	114.3	117.5	121.1	121.7	121.7	118.6	120.5	118.4	116.6
13:28:37	116.1	106.8	116.2	122.5	102.1	101.8	100.4	93.5	93.1	101.3	110.3	103.0	96.6	99.3	100.4	102.6	114.4	111.3	107.2	105.5	103.2	101.3	101.6	103.5	105.8	108.0	110.8	114.0	118.5	121.2	121.2	119.3	119.5	120.8	118.4	118.0
13:28:38	111.4	104.6	114.2	116.1	104.8	100.0	104.3	93.2	90.5	99.5	110.2	106.4	101.2	99.1	103.9	105.3	116.9	111.9	103.9	104.2	102.3	102.0	100.4	102.2	105.0	108.6	111.8	116.7	120.5	123.5	122.9	122.3	123.0	121.7	119.9	119.2
13:28:39	108.2	103.1	109.3	117.6	103.2	104.0	102.1	95.1	94.5	99.0	110.8	106.8	102.8	100.1	103.3	105.0	115.5	108.6	103.5	104.9	100.3	102.1	101.5	102.8	106.1	109.0	113.2	116.3	120.9	122.7	122.4	120.6	121.9	121.5	121.2	117.8
13:28:40	107.7	104.5	108.7	113.9	103.6	101.9	99.2	90.6	93.6	97.2	107.0	106.4	105.9	99.5	102.3	105.6	113.9	107.1	105.4	104.3	100.3	102.1	99.8	102.3	106.4	109.2	114.1	116.8	121.1	122.1	123.2	122.0	119.6	119.3	118.3	117.2
13:28:41	107.7	105.2	108.0	107.8	99.9	98.1	96.4	93.3	93.1	99.1	109.3	106.3	107.3	102.6	102.0	106.4	112.0	105.3	105.5	102.5	99.9	100.7	100.1	101.8	105.5	108.4	111.9	116.9	119.3	121.6	122.0	120.8	120.0	120.2	118.3	116.2
13:28:42	110.4	105.0	101.6	107.6	96.0	94.6	95.0	86.5	94.9	100.8	110.9	101.5	99.1	98.2	96.5	93.1	93.7	95.1	99.4	101.7	97.7	97.5	98.9	99.0	102.3	105.5	109.0	115.4	116.9	120.0	120.1	119.1	118.4	117.5	116.6	115.5
13:28:43	106.9	110.7	100.9	105.6	98.8	101.7	97.7	87.3	92.5	100.2	110.2	99.1	98.0	102.3	96.5	95.8	95.5	97.5	101.2	105.0	100.8	99.1	98.9	99.5	105.1	108.8	113.5	115.0	119.8	121.3	122.6	123.1	122.1	119.2	119.7	118.9
13:28:44	110.2	107.8	102.8	117.3	106.9	106.2	112.7	103.4	95.0	102.4	110.4	100.4	94.6	98.2	96.8	92.1	91.6	94.2	100.5	102.0	99.4	97.7	99.4	99.5	103.0	106.5	108.7	113.7	117.8	119.9	120.3	119.8	118.3	119.4	119.2	117.0
13:28:45	105.5	109.9	108.6	116.6	105.7	112.1	106.0	98.1	93.6	101.6	109.8	96.5	93.4	98.8	98.0	91.9	94.0	94.4	99.0	101.7	97.8	97.9	99.4	100.5	105.2	108.5	113.3	119.3	120.1	124.9	122.8	119.5	119.2	118.5	117.8	116.7
13:28:46	104.3	103.0	108.2	107.9	101.9	100.7	101.9	92.6	91.3	102.0	109.1	94.3	91.7	98.4	97.6	92.4	93.1	95.2	101.1	103.2	98.1	97.7	98.8	98.3	104.9	109.6	113.2	117.2	120.6	122.3	122.4	121.7	120.7	120.4	118.9	118.2
13:28:47	101.4	97.1	106.2	111.2	108.1	107.2	100.3	92.3	96.2	104.1	110.0	99.0	97.2	98.1	97.3	93.3	92.5	94.9	100.3	102.2	98.9	97.4	99.1	97.6	101.5	108.7	112.4	116.3	117.2	119.7	121.5	119.1	116.5	118.4	118.4	116.2
13:28:48	112.6	103.1	107.5	103.6	106.8	108.2	111.0	103.8	99.9	103.0	110.1	96.1	96.5	98.1	96.6	93.1	94.5	94.9	100.6	102.5	98.1	97.6	99.2	98.7	102.6	106.8	110.9	114.5	118.4	120.1	120.3	120.5	117.6	116.9	116.0	115.0
13:28:49	108.1	105.7	106.4	113.2	110.3	101.2	107.3	97.1	101.2	103.1	110.4	95.7	96.5	98.7	97.3	93.7	91.1	93.1	101.1	102.2	98.8	98.6	99.7	97.1	101.2	104.5	109.4	113.4	118.2	120.3	121.7	119.3	118.8	118.7	117.8	116.1
13:28:50	103.9	107.5	113.3	113.4	105.9	106.2	102.0	91.8	94.4	101.8	110.8	99.2	93.6	98.0	96.9	93.2	91.4	93.7	101.9	102.9	98.4	97.9	99.6	97.6	101.1	105.1	108.3	113.1	117.8	118.7	118.7	118.5	115.7	118.2	116.7	114.7
13:28:51	101.2	107.7	103.6	112.8	101.2	101.7	98.8	92.7	96.2	106.3	110.0	97.5	91.9	97.4	96.0	91.7	92.2	93.9	102.2	101.2	98.2	96.9	99.1	97.5	102.4	105.6	109.0	114.1	119.3	121.4	121.5	119.1	119.4	118.6	117.7	116.2
13:28:52	105.9	108.8	102.4	107.0	105.1	104.4	105.4	95.6	99.0	104.3	110.3	92.8	87.6	97.0	96.3	93.7	94.4	93.6	102.9	101.5	98.1	96.6	100.0	99.4	104.3	106.5	110.0	114.6	119.3	120.9	123.9	121.8	117.8	121.0	118.9	118.3
13:28:53	112.7	107.1	108.2	111.8	112.9	102.5	103.9	93.3	94.6	101.0	111.4	91.8	89.3	96.7	96.4	92.7	94.9	94.4	102.0	100.4	98.0	96.7	97.9	96.4	101.7	106.3	110.5	115.5	120.1	123.3	122.9	123.0	119.2	121.5	119.3	118.3
13:28:54	113.2	108.4	111.1	116.7	110.7	101.7	99.6	91.0	93.0	99.1	111.3	90.9	90.7	96.3	95.7	93.1	90.9	97.0	101.8	102.7	99.9	100.5	102.4	100.7	105.4	110.0	111.9	117.4	120.5	124.1	124.1	123.4	124.1	121.4	120.8	119.9
13:28:55	111.3	104.8	107.1	115.2	104.9	102.5	98.0	89.8	92.1	98.6	110.2	90.1	89.9	97.2	96.8	93.9	90.6	94.3	100.5	102.8	97.6	98.0	100.2	98.5	101.4	104.7	108.7	113.8	117.5	119.8	121.4	120.1	118.0	116.9	116.7	115.7
13:28:56	109.6	113.8	106.3	106.5	98.3	107.0	104.2	105.7	99.8	100.0	109.2	95.8	90.6	97.2	96.2	93.6	91.3	93.1	99.6	101.8	99.0	97.6	99.2	101.8	105.1	107.5	114.9	117.3	122.6	124.0	125.4	122.4	123.1	124.4	121.9	121.1
13:28:57	112.3	110.2	106.5	108.2	115.4	108.6	106.2	99.5	97.3	105.1	110.1	97.8	92.5	97.6	97.4	94.2	92.0	91.6	98.1	102.4	98.2	96.8	98.9	98.4	102.0	105.6	110.1	114.5	117.9	119.8	122.0	121.4	118.9	118.9	119.7	118.1
13:28:58	108.9	107.4	109.6	113.9	107.6	107.3	102.2	98.9	100.4	108.1	111.4	99.4	97.7	98.2	96.6	93.7	91.6	91.4	98.0	101.2	99.2	97.5	100.0	98.0	101.0	105.3	108.4	112.3	116.1	118.5	120.3	118.3	117.5	118.0	117.2	115.5
13:28:59	113.0	107.7	109.9	117.4	115.3	108.9	107.7	95.8	94.3	102.3	110.1	97.0	94.3	98.2	97.6	94.1	91.1	92.5	100.4	101.6	98.8	98.3	99.7	97.7	102.2	105.2	111.4	113.1	117.0	119.4	119.7	119.3	116.6	117.9	115.9	116.0
13:29:00	110.5	108.8	122.6	125.4	100.4	102.8	103.9	91.3	95.5	103.9	110.5	99.6	95.1	102.1	98.8	95.0	95.1	100.1	103.3	106.8	102.1	103.1	101.2	101.0	107.0	115.9	113.5	115.2	118.5	121.0	121.2	119.8	117.7	118.3	116.2	115.7
Background (Sheet Pile) One Minute	111.4	109.8	111.2	113.5	108.9	107.9	105.0	98.1	97.1	102.2	110.0	98.0	95.2	100.2	98.7	96.4	97.6	99.2	103.1	105.0	101.8	101.1	102.0	101.9	104.6	108.2	111.5	115.1	118.7	121.1	121.6	120.5	118.8	119.3	118.1	116.7

Vibratory Spectra for Sheet Piles

Time	6.3	8.0	10.0	12.5	16.0	20.0	25.0	31.5	40.0	50.0	63.0	80.0	100	125	160	200	250	315	400	500	630	800	1000	1250	1600	2000	2500	3150	4000	5000	6300	8000	10000	12500	16000	20000
13:24:24	108.1	101.7	101.9	103.4	100.5	100.7	96.8	98.9	92.8	104.8	104.7	95.5	102.5	110.9	105.7	103.2	108.1	109.5	115.3	122.0	117.0	116.5	116.0	119.5	116.0	119.0	116.6	116.6	119.0	122.9	122.6	121.9	119.3	120.0	119.9	118.3
13:24:25	105.1	101.4	96.0	101.9	102.8	108.2	111.4	114.5	121.4	128.8	114.2	108.3	109.8	123.1	115.5	115.4	119.5	122.0	127.2	131.2	129.0	129.0	129.7	131.4	130.7	132.5	130.0	127.6	126.9	125.6	124.7	122.8	121.3	120.6	117.8	116.8
13:24:26	99.6	103.9	101.8	111.1	130.5	132.9	132.3	133.2	129.4	133.9	118.1	112.9	111.5	125.6	119.6	119.6	123.8	125.3	129.7	135.2	132.1	133.4	133.9	135.8	134.6	136.7	134.6	134.8	132.6	132.3	130.9	128.4	125.3	125.7	122.4	120.4
13:24:27	105.9	104.0	125.8	138.9	140.7	128.6	125.0	143.5	129.6	130.6	122.7	117.2	116.7	126.3	124.4	122.8	125.9	131.4	135.3	140.4	138.5	139.3	139.8	141.1	140.4	143.6	140.8	140.5	139.2	138.8	137.8	135.7	133.7	132.5	128.9	127.9
13:24:28	103.4	108.0	130.1	136.4	150.5	141.1	113.6	137.3	138.2	127.8	126.3	117.1	119.1	131.8	126.0	127.0	130.6	133.5	138.7	143.3	140.3	141.6	142.1	143.8	143.1	145.8	143.9	143.0	142.4	142.3	141.0	138.7	136.9	135.9	132.4	131.2
13:24:29	120.7	121.9	119.6	120.0	146.6	143.2	124.0	119.7	136.9	129.5	121.8	114.4	124.6	133.6	130.1	130.6	133.4	136.0	139.8	145.1	142.6	141.8	142.2	144.0	143.5	146.1	145.2	143.8	143.3	142.2	141.1	139.5	137.4	136.8	134.5	134.1
13:24:30	117.1	118.3	114.4	114.2	126.8	140.0	132.9	108.1	138.2	126.1	124.7	126.9	116.3	133.0	128.8	130.0	132.4	138.0	140.9	143.7	142.3	142.3	143.5	144.3	144.3	147.1	145.0	144.2	144.4	142.8	141.5	140.6	139.1	138.1	135.6	135.0
13:24:31	112.8	114.6	112.1	114.5	115.9	149.1	125.4	115.4	141.7	122.7	126.2	126.4	120.1	131.7	129.6	129.7	132.7	137.3	140.7	145.0	143.1	142.5	143.7	144.9	143.9	146.6	144.6	143.8	143.4	143.2	141.8	141.0	139.2	138.4	135.9	135.4
13:24:32	110.7	113.4	111.9	116.7	128.0	151.1	115.3	111.2	142.0	114.2	124.2	121.7	123.1	131.6	128.9	130.0	132.9	138.2	140.6	146.3	144.0	143.7	143.7	145.0	143.5	145.9	144.0	142.0	141.7	141.0	140.5	139.4	138.0	137.4	134.9	134.4
13:24:33	110.3	111.3	125.0	126.2	127.6	150.2	121.6	103.2	133.7	112.2	124.6	119.8	126.5	132.9	130.8	126.0	131.3	137.9	142.1	145.4	144.7	145.1	145.6	145.6	145.0	148.1	146.3	144.4	144.7	143.5	142.8	141.9	140.6	139.3	136.9	135.8
13:24:34	105.8	119.9	117.6	112.8	113.8	151.1	126.1	102.1	127.8	113.7	124.8	118.5	129.4	134.7	130.3	128.3	131.7	138.7	141.9	145.7	144.3	145.1	144.9	145.2	144.5	147.7	145.7	143.8	144.1	143.3	142.6	141.5	139.8	139.2	136.5	135.7
13:24:35	121.3	128.2	121.3	112.1	109.8	151.9	121.6	102.7	131.9	108.9	119.3	119.6	132.1	139.3	129.1	130.1	133.3	138.7	142.6	146.7	143.4	144.2	145.9	145.3	145.1	147.0	145.2	143.6	143.3	142.5	142.3	141.2	139.7	138.8	136.3	135.5
13:24:36	122.7	114.7	107.7	110.6	111.5	150.9	110.1	103.8	127.4	110.6	126.5	114.4	126.1	137.8	126.6	126.6	132.4	137.5	141.4	146.7	144.9	145.2	146.6	145.9	145.6	148.3	145.7	144.2	144.7	143.4	142.7	141.9	140.0	139.4	136.9	136.3
13:24:37	114.5	106.7	108.6	108.8	113.0	149.1	117.8	105.9	131.7	107.9	126.6	120.0	125.8	133.6	130.8	128.4	131.8	136.6	141.8	146.5	143.6	144.1	144.5	145.4	144.5	146.3	144.8	143.0	143.1	141.7	141.2	140.0	138.6	138.0	135.5	134.5
13:24:38	112.8	107.1	105.2	110.7	113.6	150.0	119.1	105.1	132.2	109.6	123.3	117.4	129.6	133.0	131.5	126.5	132.1	135.7	141.0	145.2	143.6	143.0	144.9	145.3	144.8	147.2	144.2	142.5	142.2	141.4	141.1	139.9	138.0	137.1	134.7	133.9
13:24:39	110.2	105.5	109.5	109.6	112.2	147.7	123.1	106.7	131.9	112.1	124.5	117.4	128.5	128.3	132.0	126.4	131.1	134.4	140.3	143.7	142.4	143.7	143.9	144.7	143.9	146.0	143.7	141.4	141.7	140.6	140.2	139.1	137.2	136.3	133.7	133.0
13:24:40	111.2	103.9	102.4	114.1	110.3	147.0	122.1	106.2	133.4	110.8	118.4	115.9	124.1	130.0	131.4	124.6	131.6	134.6	139.2	145.8	142.2	143.9	145.5	145.7	145.1	147.4	145.0	143.9	143.8	143.0	142.1	141.1	138.8	137.9	135.2	134.5
13:24:41	103.9	98.5	105.5	107.0	112.7	145.8	119.3	104.1	132.2	111.7	120.5	121.1	123.4	133.2	130.7	123.6	130.9	134.1	138.8	142.6	141.8	142.7	144.2	144.9	144.6	146.6	144.7	143.1	142.8	142.3	141.6	140.4	137.9	136.8	134.3	133.3
13:24:42	101.3	101.1	103.1	107.1	112.5	145.9	121.3	111.0	129.4	114.0	121.0	119.0	122.9	132.1	130.7	125.4	130.8	136.5	138.6	144.8	142.4	144.1	144.7	145.6	145.8	147.8	145.9	144.2	144.3	144.2	143.4	142.2	139.4	138.4	135.5	134.3
13:24:43	101.7	102.5	107.6	109.2	112.2	143.4	114.9	104.3	125.7	109.2	125.3	116.8	124.0	129.8	129.1	126.3	130.7	135.3	139.3	146.1	142.2	143.7	144.1	145.1	144.3	147.3	145.5	144.3	143.9	143.9	142.6	141.6	138.9	137.7	135.0	134.0
13:24:44	106.8	104.1	102.6	110.3	108.5	144.8	117.1	102.2	129.5	109.1	118.0	111.8	120.7	133.9	132.2	124.6	131.4	135.2	139.3	143.8	141.2	141.7	143.3	143.8	143.9	145.7	143.9	141.8	141.8	141.2	139.9	137.8	136.0	135.3	133.1	132.8
13:24:45	100.6	100.2	104.9	104.1	106.1	144.8	119.5	108.1	130.5	109.7	120.8	119.4	117.6	128.5	126.0	127.6	131.6	136.7	140.6	143.6	142.3	142.7	143.8	144.8	144.0	146.9	145.0	142.8	143.0	141.7	141.0	140.0	138.6	137.5	135.2	134.9
13:24:46	101.1	103.6	101.8	114.2	117.9	147.4	115.4	107.9	138.3	110.2	117.9	123.8	129.6	135.9	129.8	129.3	134.7	137.8	141.7	146.0	143.7	143.6	144.4	145.8	145.9	148.1	146.7	144.9	144.9	145.1	144.5	144.0	141.9	140.3	137.6	136.7
13:24:47	103.5	104.9	117.6	115.8	112.7	149.0	112.0	107.1	135.5	109.4	126.5	124.4	132.0	137.4	132.4	129.0	132.6	136.9	142.5	149.4	144.1	145.5	145.9	146.7	146.4	149.1	146.8	145.8	145.7	144.7	143.9	143.2	141.5	140.7	137.9	137.0
13:24:48	95.7	100.1	114.5	113.0	110.7	148.6	115.7	106.7	136.1	106.5	121.6	126.5	129.4	138.8	129.4	129.6	134.1	138.0	142.3	148.1	145.4	145.7	145.8	146.7	146.8	148.9	147.0	145.5	145.7	145.1	144.4	143.6	142.3	141.2	138.4	137.3
13:24:49	104.8	104.4	111.2	113.9	112.6	148.4	115.4	102.3	129.2	108.5	124.7	127.7	128.1	138.0	131.6	127.7	131.2	140.2	141.6	145.2	144.6	144.7	145.1	146.9	145.7	149.1	147.3	146.0	146.0	145.5	144.4	143.6	141.9	140.8	138.0	137.2
13:24:50	107.3	110.7	114.3	107.9	108.7	148.5	115.1	101.4	137.5	105.1	125.1	125.6	127.7	136.2	125.8	128.3	131.7	140.6	142.2	147.5	144.5	145.8	146.3	147.8	146.3	149.4	148.0	147.1	146.7	147.0	146.1	145.0	143.1	141.9	139.0	138.1
13:24:51	102.8	110.0	99.6	106.0	110.8	149.5	111.2	101.8	139.4	107.0	121.7	125.9	122.6	136.7	130.0	127.8	135.4	139.0	141.8	145.1	145.4	145.2	146.5	147.5	147.5	149.6	148.2	147.8	148.3	148.4	147.7	146.3	144.3	142.5	139.7	138.5
13:24:52	105.2	107.5	106.1	104.5	102.5	150.0	107.4	106.5	139.5	105.6	127.7	127.1	113.7	136.2	130.9	129.2	134.2	139.2	141.2	147.9	144.9	145.8	145.8	147.5	146.5	149.3	148.8	148.2	148.8	149.0	148.4	147.3	144.9	143.0	140.1	138.9
13:24:53	102.5	101.3	101.0	98.3	107.2	149.9	110.1	105.6	139.5	106.1	127.7	127.2	117.9	135.8	128.9	126.3	131.9	137.9	140.7	147.7	144.9	145.0	146.3	147.2	146.8	150.1	148.5	147.9	147.4	147.1	146.6	145.7	143.4	142.0	139.4	138.5
13:24:54	97.9	103.4	103.6	105.1	108.0	150.9	109.1	104.5	139.8	109.1	127.2	128.2	121.6	130.7	125.0	127.0	132.1	138.3	140.5	147.7	145.1	144.7	147.6	147.3	146.7	149.9	148.5	147.4	147.2	146.7	146.3	145.2	143.1	141.9	139.2	138.2
13:24:55	100.7	100.1	103.0	98.6	110.1	151.6	107.8	104.3	139.6	109.9	127.7	128.1	121.3	130.8	125.9	124.3	133.4	139.6	139.7	146.5	144.0	144.9	145.9	147.1	146.6	149.3	148.5	147.1	147.0	146.6	146.4	144.8	142.7	141.8	139.0	138.1
13:24:56	99.4	100.9	111.3	106.6	109.3	151.9	112.4	107.3	140.2	107.7	126.1	128.3	119.6	129.2	133.7	128.4	135.9	142.5	140.5	148.3	146.4	144.7	146.9	147.7	146.9	149.5	147.4	147.2	146.6	146.3	145.2	144.4	143.0	141.5	139.2	138.3
13:24:57	99.2	99.6	114.4	105.2	108.3	152.8	112.4	104.4	140.8	103.9	122.7	128.8	119.8	124.8	134.0	130.7	136.9	142.1	140.2	150.6	145.3	146.5	147.0	148.0	146.9	148.8	148.1	147.2	147.1	145.9	145.6	144.8	143.3	141.8	139.4	138.5
13:24:58	96.4	97.6	107.2	104.1	111.0	152.9	104.2	103.6	140.7	106.2	118.9	127.6	120.4	130.1	134.9	132.1	136.9	139.4	142.2	149.5	144.0	146.2	147.5	147.2	147.3	149.4	148.5	147.6	147.1	146.4	145.9	145.0	143.3	141.9	139.7	139.1
13:24:59	100.2	96.7	99.7	100.2	110.3	152.8	108.6	104.9	140.7	107.5	118.2	125.4	119.5	135.7	133.9	134.2	136.6	139.0	142.7	149.3	145.2	145.7	145.6	147.3	147.2	149.4	148.2	147.1	146.5	146.5	145.4	144.8	142.8	141.6	139.4	138.8
13:25:00	95.3	97.9	102.7	107.3	108.5	153.3	109.4	105.5	140.9	105.6	116.0	124.6	121.2	136.3	131.3	134.9	138.7	139.0	142.0	149.4	146.3	145.4	146.5	147.6	147.9	149.4	148.1	147.2	147.0	145.9	145.5	144.6	142.9	141.6	139.3	138.5
13:25:01	98.9	99.7	102.1	106.6	108.2	153.4	109.6	106.0	141.1	106.9	117.5	124.6	117.9	134.5	128.6	132.9	138.0	138.9	140.6	149.1	144.8	145.1	145.6	147.2	147.0	148.7	147.9	146.1	146.2	145.8	145.0	144.7	142.8	141.2	139.1	138.4
13:25:02	104.0	97.4	110.2	110.8	111.3	153.6	107.4	100.3	140.3	106.6	120.2	123.7	120.4	134.8	127.4	133.8	134.8	139.0	142.1	148.2	144.2	144.6	146.7	148.6	147.1	148.7	147.5	146.9	146.3	146.2	145.3	144.5	143.1	141.7	139.5	138.7
13:25:03	106.6	103.1	106.2	109.2	114.0	152.8	108.9	106.0	140.6	108.0	122.1	124.2	121.9	131.4	125.2	132.5	134.4	138.2	142.0	147.5	146.2	145.6	146.0	148.6	146.7	149.2	147.3	146.8	146.5	146.2	145.3	144.5	143.2	141.9	139.8	139.1
13:25:04	106.2	102.1	102.0	106.0	114.3	153.4	110.3	106.1	140.9	108.9	120.3	124.0	121.6	132.7	126.0	129.1	133.6	137.5	141.7	148.3	145.8	147.6	145.5	147.3	146.5	149.9	148.0	147.0	146.4	145.7	144.6	144.3	142.7	141.5	139.6	138.8
13:25:05	102.1	106.7	100.2	107.1	111.0	153.8	109.9	103.3	140.4	110.5	122.4	123.3	124.2	134.1	128.0	128.5	132.6	137.9	142.4	149.8	146.0	146.1	146.0	147.1	146.7	149.1	147.5	147.0	146.5	145.7	145.1	144.2	142.5	141.1	139.3	138.4
13:25:06	103.5	105.1	102.6	103.4	111.7	153.5	109.7	106.9	139.8	108.0	119.3	123.3	125.9	135.4	127.8	127.8	131.9	137.3	140.5	147.4	145.1	145.5	147.9	147.9	146.8	149.6	147.9	147.0	146.7	145.9	145.3	144.7	142.7	141.6	139.4	138.9
13:25:07	101.2	104.7	107.3	104.9	110.4	153.5	110.1	104.4	139.2	106.0	119.7	121.6	122.7	134.5	128.4	127.6	130.4	134.1	140.5	145.9	146.4	145.7	145.6	147.8	147.3	150.3	148.9	147.3	147.1	145.9	145.7	144.8	143.1	141.7	139.6	138.8
13:25:08	101.2	102.9	111.3	102.0	108.2	153.3	113.3	106.5	139.7	106.0	124.3	122.6	121.8	134.8	124.6	125.7	132.7	134.6	139.5	147.8	145.9	145.7	148.2	148.7	147.9	150.7	149.6	148.8	147.9	146.6	145.9	144.9	143.2	142.0	139.6	138.9
13:25:09	98.7	100.7	113.2	109.7	113.8	152.9	110.0	105.3	140.3	108.2	127.0	123.1	119.3	135.7	124.3	127.7	135.2	137.8	142.4	148.9	143.8	145.9	147.0	148.3	147.3	150.2	149.2	148.4	147.6	146.7	146.0	145.5	143.5	142.2	139.9	139.2
13:25:10	101.4	101.5	109.6	104.0	111.8	153.4	103.6	105.7	140.9	108.6	128.0	120.5	119.1	137.4	126.6	132.7	135.7	139.9	144.0	147.1	146.7	144.6	145.9	148.0	147.2	150.7	148.8	148.2	147.7	146.9	146.5	145.7	143.9	142.4	140.1	139.5
13:25:11	95.7	98.9	110.7	109.1	112.8	153.4	108.6	104.7	140.6	109.1	127.7	117.5	122.7	137.2	130.8	133.7	136.2	138.6	143.5	148.1	146.5	147.3	147.3	148.2	147.8	151.4	149.6	149.3	148.3	147.1	146.9	146.1	144.0	142.8	140.4	139.7
13:25:12	94.2	94.4	109.3	105.6	110.3	153.2	109.3	103.7	139.5	106.5	126.9	118.3	123.8	136.9	133.3	134.6	138.4	140.7	144.0	148.7	147.6	147.8	148.1	149.4	148.0	151.3	150.7	149.1	148.8	147.4	147.5	146.8	144.9	143.4	141.4	140.2
13:25:13	97.4	96.4	107.4	106.0	112.8	152.9	104.9	103.7	138.7	105.9	128.4	120.5	123.0	138.3	135.2	133.5	137.1	138.2	142.6	147.8	148.5	147.9	148.4	149.1	148.6	151.2	149.6	148.3	148.7	147.7	147.4	146.6	144.8	143.5	141.3	140.3
13:25:14	97.5	100.0	104.3	109.8	111.8	153.7	109.9	106.6	138.2	105.3	126.8	115.7	118.7	137.8	135.4	132.3	135.9	136.5	141.5	147.7	146.0	148.3	149.8	149.4	148.6	150.5	149.1	148.2	148.5	147.6	147.2	146.4	144.3	143.6	141.2	140.2
13:25:15	99.7	98.4	106.3	109.8	106.7	154.3	108.6	108.4	136.2	108.3	121.7	118.5	117.7	138.3	135.8	133.4	137.0	136.7	141.1	146.3	147.0	148.3	148.4	147.8	148.6	151.1	150.5	148.1	148.7	147.9	147.2	146.5	144.4	143.4	140.9	140.0
13:25:16	100.1	90.0	109.3	107.9	108.4	154.8	109.5	105.9	135.0	106.0	114.3	122.0	125.6	138.2	134.4	132.6	134.7	139.8	143.2	147.3	147.7	147.8	147.9	148.0	147.9	151.1	150.1	149.7	149.9	147.9	146.9	146.2	144.2	143.0	140.4	139.2
13:25:17	95.1	94.7	105.1	104.2	108.0	156.2	106.0	104.5	137.6	108.8	119.1	121.9	129.2	138.7	132.7	128.6	133.0	137.3	143.6	148.4	143.4	146.4	147.2	146.8	147.3	150.6	149.6	149.1	148.6	146.5	145.5	144.8	142.7	141.7	139.2	138.1
13:25:18	99.6	99.3	105.1	106.7	114.3	157.6	105.8	104.0	142.9	119.0	128.4	124.1	130.8	135.3	131.8	129.1	133.7	140.6	140.8	146.4	143.0	146.0	147.1	146.3	147.3	149.9	148.3	147.2	146.9	145.8	144.6	143.8	142.4	141.0	138.9	138.0
13:25:19	96.3	92.4	105.9	108.1	115.2	158.3	107.1	109.1	143.1	126.6	132.2	127.0	131.4	135.2	130.3	131.5	136.9	138.3	141.6	147.3	143.5	145.3	146.7	146.4	147.1	149.1	148.8	146.6	146.2	145.4	144.6	144.0	142.3	141.2	139.0	138.1
13:25:20	97.0	100.0	106.9	108.3	116.6	157.8	105.0	106.4	140.2	128.2	129.5	127.8	128.6	136.1	132.4	133.5	135.5	138.6	143.3	146.7	144.5	146.2	146.3	146.6	147.2	148.8	148.4	146.5	146.3	146.1	144.9	144.0	142.6	141.3	138.8	138.0
13:25:21	93.3	101.5	109.1	112.8	122.4	158.9	107.3	112.5	135.2	126.9	123.8	129.1	128.3	133.8	134.0	133.1	137.1	138.3	143.3	145.3	145.8	145.2	145.4	147.3	147.5	149.7	148.1	146.6	146.6	145.7	144.7	143.7	142.3	141.1	138.7	137.8
13:25:22	93.8	102.2	103.4	108.1	139.5	161.6	108.5	118.6	133.2	121.9	120.5	125.6	125.4	136.3	133.4	132.6	136.0	137.1	143.0	147.0	144.6	145.6	145.8	145.9	145.3	146.7	145.5	144.3	144.0	142.9	142.3	141.5	140.1	138.8	136.7	135.9
Vibratory Driving (Sheet Pile) One Minute	103.4	103.8	108.3	109.5	114.4	148.8	113.2	107.8	135.7	112.1	122.8	121.5	122.7	133.5	129.2	128.4	132.8	136.8	140.4	145.8	143.5	144.0	144.8	145.7	145.2	147.7	146.1	144.9	144.7	144.1	143.3	142.3	140.5	139.4	136.9	136.1

Background Spectra for King Piles

Date	Time	6.3	8.0	10.0	12.5	16.0	20.0	25.0	31.5	40.0	50.0	63.0	80.0	100	125	160	200	250	315	400	500	630	800	1000	1250	1600	2000	2500	3150	4000	5000	6300	8000	10000	12500	16000	20000
2015/06/09	10:31:00	104.7	106.7	106.5	113.1	163.6	152.7	100.1	131.6	121.2	138.3	115.4	121.5	118.3	129.9	123.1	129.5	132.3	135.8	134.1	138.9	132.4	129.2	128.7	130.4	126.1	128.3	122.5	122.0	121.3	122.4	123.1	121.6	119.3	120.2	119.2	118.0
2015/06/09	10:31:01	109.0	101.3	109.9	106.7	163.7	152.9	101.9	131.1	121.1	137.7	109.9	122.4	120.8	130.1	124.1	130.1	132.6	137.4	133.9	137.5	132.3	129.1	130.6	131.2	127.2	126.9	124.2	123.6	123.5	123.5	123.6	120.8	121.3	120.3	118.6	117.3
2015/06/09	10:31:02	92.8	110.8	108.5	107.1	164.0	152.7	107.2	130.4	120.6	138.1	120.6	119.9	120.5	130.9	125.7	129.6	131.3	135.2	133.6	137.0	133.3	128.2	130.4	130.2	126.0	127.3	122.8	122.0	122.5	122.3	122.5	120.6	118.9	119.4	117.9	116.9
2015/06/09	10:31:03	97.9	106.7	104.2	101.7	164.0	152.5	108.7	132.4	122.0	137.7	116.7	121.8	120.5	131.1	124.6	129.2	129.3	133.4	134.9	135.5	132.9	127.6	129.1	129.4	125.6	128.6	122.7	121.4	121.9	123.1	123.9	121.9	120.7	120.4	119.0	117.6
2015/06/09	10:31:04	98.7	104.2	108.8	111.5	163.6	152.5	105.5	132.4	122.4	137.7	117.9	121.4	121.0	131.3	123.5	128.3	129.2	135.4	134.5	135.7	135.0	128.6	131.8	130.8	126.7	128.4	125.2	125.0	125.1	124.5	125.1	122.6	121.0	120.4	119.5	118.5
2015/06/09	10:31:05	99.8	108.8	109.9	109.3	163.6	152.3	107.0	131.9	122.1	138.4	116.6	118.6	121.0	131.8	124.2	129.2	132.0	134.6	133.7	136.1	137.0	129.0	130.9	131.1	126.9	127.8	124.1	123.9	124.3	123.2	122.9	120.8	119.0	118.6	117.2	114.9
2015/06/09	10:31:06	100.2	104.2	101.8	110.4	163.5	153.0	102.3	131.1	121.3	138.3	122.1	120.9	121.1	132.6	123.7	126.0	128.7	135.5	134.4	135.8	134.7	129.1	128.1	129.5	126.4	127.0	123.6	122.4	122.8	124.0	123.3	121.4	120.5	120.9	118.5	117.5
2015/06/09	10:31:07	115.3	119.0	107.3	110.5	163.9	152.5	104.9	131.1	120.5	137.8	119.9	120.4	120.5	132.0	123.9	128.0	132.5	136.2	134.4	136.7	134.8	128.3	129.6	129.0	125.5	127.3	123.2	123.5	124.4	124.0	123.7	120.8	119.9	119.9	118.9	116.8
2015/06/09	10:31:08	115.7	101.5	108.2	104.6	163.5	152.5	103.4	131.1	120.8	138.2	119.2	121.6	119.4	130.6	123.9	130.4	135.0	135.9	134.0	137.2	136.3	130.2	132.7	130.6	126.5	127.3	125.8	124.9	125.5	124.3	124.1	122.2	121.7	119.8	119.3	117.7
2015/06/09	10:31:09	105.9	98.1	111.3	108.9	163.5	152.2	107.3	128.9	118.2	138.6	110.5	120.6	119.2	131.2	123.2	129.3	128.7	136.0	135.4	137.8	134.2	128.7	130.1	130.3	126.0	126.9	122.9	122.2	123.1	123.7	123.6	120.8	120.1	119.6	119.5	118.4
2015/06/09	10:31:10	99.6	110.6	97.9	105.6	163.8	153.0	102.1	129.6	120.8	138.6	121.3	118.1	119.6	132.0	122.1	129.4	130.9	134.3	133.7	136.8	133.2	129.6	131.4	131.3	127.8	128.6	124.0	124.0	125.9	124.4	124.7	121.5	121.0	119.9	118.8	117.8
2015/06/09	10:31:11	104.8	107.4	103.6	103.7	163.9	153.0	103.5	129.6	119.0	138.3	120.0	119.4	117.2	131.3	125.0	130.5	131.9	136.6	135.9	138.5	133.7	129.1	131.1	130.9	128.2	128.1	124.8	123.8	123.1	122.5	122.0	119.9	119.0	118.5	116.6	116.3
2015/06/09	10:31:12	103.3	99.6	104.6	105.9	163.7	152.9	104.1	127.8	118.5	138.6	114.3	121.2	117.5	129.9	122.9	129.5	133.0	136.6	136.2	137.1	134.8	130.8	130.2	129.7	127.2	127.6	124.9	124.5	125.5	124.6	124.3	122.9	121.6	120.5	119.8	118.9
2015/06/09	10:31:13	105.0	102.5	110.9	105.3	163.8	152.8	106.3	130.6	120.6	137.9	122.5	123.0	121.1	131.4	123.4	128.2	133.6	137.9	136.1	138.7	134.5	130.3	128.9	130.2	126.8	128.1	123.3	122.1	123.4	123.7	124.3	123.9	122.5	122.0	121.2	120.2
2015/06/09	10:31:14	99.0	105.4	105.4	104.0	163.8	152.3	104.4	130.2	119.8	137.5	117.1	122.1	120.3	131.8	122.2	128.6	133.7	138.1	136.3	140.7	136.3	129.3	127.9	129.8	126.8	127.7	123.3	122.5	123.0	125.9	126.5	127.0	125.3	123.8	123.0	121.4
2015/06/09	10:31:15	101.3	105.2	105.2	109.4	163.2	152.0	101.4	130.6	120.3	137.8	119.9	122.2	119.6	130.0	122.5	126.7	131.2	137.6	135.2	138.1	134.8	130.2	131.7	128.9	125.6	126.8	123.9	124.2	124.8	125.8	126.1	125.4	124.3	122.6	121.6	120.9
2015/06/09	10:31:16	97.9	109.2	107.7	107.6	163.4	152.1	106.2	129.5	120.1	138.5	113.4	122.6	116.4	129.4	123.8	128.3	130.5	138.3	134.3	137.7	134.2	130.7	131.6	129.5	126.1	126.4	124.2	123.9	124.3	123.8	124.2	121.4	119.7	119.8	118.0	117.3
2015/06/09	10:31:17	94.5	100.4	98.7	103.5	163.6	153.0	102.7	128.4	118.7	138.6	121.4	120.1	117.3	131.3	123.4	126.6	132.9	136.6	134.0	139.2	134.7	130.6	130.6	128.5	126.5	127.0	123.8	122.6	125.2	125.0	125.1	122.3	122.0	120.7	118.9	117.8
2015/06/09	10:31:18	101.4	102.6	101.6	109.3	163.9	152.6	106.4	130.3	119.8	138.2	125.1	111.4	121.1	130.1	121.3	127.3	133.9	137.0	133.9	136.7	134.7	129.5	131.4	129.9	127.0	127.7	123.6	123.0	124.5	123.2	123.7	121.9	120.2	121.0	121.1	119.2
2015/06/09	10:31:19	99.8	99.1	110.6	108.2	163.7	152.0	101.4	130.6	120.5	138.0	123.1	116.9	122.4	130.8	122.8	127.7	134.9	136.1	132.5	138.1	134.3	130.0	132.1	131.0	127.2	126.7	125.2	124.9	128.2	126.0	126.0	123.6	121.7	122.0	120.1	119.5
2015/06/09	10:31:20	101.5	106.6	112.2	101.4	163.5	151.6	102.7	130.6	119.7	138.0	121.4	118.5	121.9	131.4	122.5	129.8	133.3	134.7	132.2	137.2	133.5	128.2	127.4	128.3	126.9	126.9	123.3	122.1	122.1	122.0	121.6	119.9	119.6	119.9	120.4	122.3
2015/06/09	10:31:21	103.8	106.7	101.8	99.9	163.3	152.1	100.9	130.1	119.8	137.8	122.1	119.9	121.0	131.5	123.4	126.3	132.3	135.8	134.2	135.5	133.8	129.7	128.7	128.6	126.0	127.5	124.0	124.0	124.7	123.0	123.8	122.2	120.8	121.4	122.3	127.3
2015/06/09	10:31:22	101.3	103.8	104.8	104.9	163.3	152.5	103.8	129.7	120.5	138.5	117.3	121.0	119.5	130.7	124.7	131.5	133.4	136.6	135.5	136.6	133.9	128.3	131.0	129.1	127.3	127.5	124.7	124.3	124.3	123.6	123.3	121.6	120.2	121.0	120.1	123.0
2015/06/09	10:31:23	96.3	100.3	100.6	102.9	163.6	152.9	103.4	129.1	119.0	138.7	120.0	122.2	120.3	129.9	124.0	131.4	132.5	135.5	135.8	136.4	133.1	128.3	129.5	129.4	126.5	126.4	123.8	122.7	123.3	122.6	122.4	122.0	120.2	119.9	119.7	120.1
2015/06/09	10:31:24	100.5	106.8	101.6	106.7	163.9	151.8	103.8	128.9	119.2	138.5	121.9	120.0	120.0	131.0	124.3	130.6	131.0	135.7	133.7	137.3	133.1	128.3	129.9	129.4	126.9	127.7	123.9	121.2	123.7	123.7	124.2	122.0	123.1	122.7	123.5	127.3
2015/06/09	10:31:25	99.3	101.3	103.8	107.2	163.7	151.2	106.5	131.1	119.5	138.0	117.2	121.8	120.6	131.5	123.7	129.1	132.8	134.3	133.4	137.6	131.9	127.5	128.5	129.3	125.5	127.4	123.2	120.8	122.2	124.3	124.6	124.1	127.4	126.2	129.8	129.0
2015/06/09	10:31:26	97.9	104.7	103.6	103.5	163.3	151.3	102.8	131.0	120.5	138.6	119.7	120.2	119.4	130.2	123.9	129.9	132.1	134.9	134.4	137.2	131.8	128.1	127.1	130.4	126.4	125.6	122.8	120.2	121.2	121.7	122.9	123.4	128.9	130.7	127.5	123.8
2015/06/09	10:31:27	103.9	106.0	104.2	102.4	163.5	152.2	102.4	131.9	121.7	138.5	122.1	119.7	120.5	129.5	120.2	128.6	130.2	135.1	135.3	138.6	133.0	128.7	129.2	131.8	127.1	126.7	124.2	122.5	124.9	125.6	125.9	127.1	133.7	132.5	122.9	125.2
2015/06/09	10:31:28	103.5	106.9	107.6	100.9	163.7	152.1	103.8	132.0	121.5	138.6	120.6	120.5	120.5	130.3	122.1	129.9	130.4	136.0	133.6	138.2	132.1	129.4	130.2	132.3	127.5	127.6	124.7	123.4	124.6	124.9	125.2	125.1	130.4	124.3	122.0	123.0
2015/06/09	10:31:29	107.7	106.4	107.0	99.2	163.6	151.6	110.6	128.6	117.3	138.8	111.5	115.9	121.1	131.7	124.6	131.4	129.9	135.2	134.5	136.8	133.8	130.0	130.7	132.6	127.5	128.1	125.0	122.9	123.8	123.7	123.9	124.5	128.2	122.9	123.6	124.7
2015/06/09	10:31:30	101.1	100.0	104.8	112.1	163.7	152.6	108.5	127.9	119.2	139.0	116.7	120.1	119.4	130.2	123.0	130.5	130.8	133.1	132.3	136.7	134.0	129.6	130.2	131.9	127.6	128.4	124.3	122.1	123.9	123.0	124.4	124.3	128.5	126.6	125.1	127.1
2015/06/09	10:31:31	103.5	102.4	111.2	110.9	164.0	152.8	108.9	130.0	120.3	138.4	121.3	117.2	121.5	130.6	122.1	129.4	129.4	134.9	132.5	136.9	133.1	131.0	129.9	131.4	127.8	127.9	123.9	121.5	122.2	122.6	123.5	123.5	123.0	124.2	124.0	125.7
2015/06/09	10:31:32	100.3	110.6	112.6	112.8	164.0	152.1	106.2	131.3	120.7	138.2	122.0	117.8	120.2	132.1	123.8	129.9	129.6	133.2	132.5	135.1	131.7	128.6	129.1	131.0	125.8	125.9	124.3	123.3	124.9	124.0	124.1	122.1	120.6	121.8	120.3	118.6
2015/06/09	10:31:33	113.5	117.8	108.8	108.0	163.4	152.3	104.0	130.8	120.8	138.6	121.9	119.9	121.0	130.5	123.1	130.1	128.1	134.6	132.9	134.6	131.8	132.0	131.8	130.5	126.1	127.2	125.2	124.3	125.5	124.8	125.2	123.4	122.4	122.5	121.8	120.9
2015/06/09	10:31:34	115.7	109.9	107.3	108.1	163.5	152.0	104.0	129.5	119.4	138.6	120.2	119.2	120.9	131.1	123.2	131.8	130.2	135.6	133.6	135.6	132.0	130.5	129.9	128.5	125.2	127.5	123.5	122.5	123.5	123.4	124.0	122.2	121.8	121.3	120.2	118.3
2015/06/09	10:31:35	105.5	102.0	105.0	106.4	163.7	152.3	104.6	129.2	119.0	138.5	119.7	120.3	121.3	130.4	123.5	133.1	130.0	134.5	133.1	136.0	132.1	130.6	131.3	131.0	126.9	127.0	124.8	123.7	126.7	124.7	125.0	122.8	122.1	121.2	119.4	117.0
2015/06/09	10:31:36	106.3	101.2	110.4	104.4	163.5	152.1	104.4	130.3	120.1	138.8	123.5	120.7	120.6	131.1	123.9	131.8	126.9	133.8	133.3	136.7	131.3	130.4	128.4	130.2	126.8	127.3	124.6	121.8	124.9	126.7	127.9	125.9	124.4	124.8	121.8	120.1
2015/06/09	10:31:37	103.2	102.1	108.1	104.1	163.7	151.7	105.2	131.8	121.0	138.3	122.9	121.0	119.4	129.9	122.2	133.0	132.0	134.0	133.1	136.8	133.9	130.5	128.4	130.2	124.9	127.7	123.0	120.6	120.4	122.2	122.9	121.4	121.6	122.7	120.6	119.3
2015/06/09	10:31:38	103.9	105.4	110.6	110.8	163.3	151.6	107.8	131.5	120.7	138.2	120.4	122.3	120.6	131.3	122.7	129.4	128.7	137.8	133.0	136.6	133.0	130.0	129.4	129.8	126.6	126.9	123.0	121.8	125.0	125.7	125.7	124.2	124.9	124.3	122.8	120.9
2015/06/09	10:31:39	111.0	101.7	114.1	111.4	163.4	151.8	99.8	131.9	121.3	138.5	121.5	118.9	120.5	130.2	121.3	128.2	129.1	137.2	134.8	138.5	133.3	130.0	131.1	130.4	126.0	127.8	124.2	122.0	124.9	123.8	124.3	122.1	121.9	121.7	120.7	120.0
2015/06/09	10:31:40	108.8	111.5	107.5	105.6	163.4	151.9	106.2	130.1	120.2	138.8	115.6	121.5	118.3	130.4	125.9	129.4	127.3	135.5	133.3	137.8	133.4	129.6	130.6	131.5	125.8	127.1	123.8	122.8	123.4	123.8	123.4	122.0	121.5	121.3	121.7	121.0
2015/06/09	10:31:41	109.3	107.7	104.5	111.7	163.5	152.7	103.1	128.3	119.6	138.5	112.1	121.5	116.7	129.3	125.3	130.2	127.8	133.8	133.4	137.9	132.7	130.2	130.4	131.8	125.6	126.9	124.3	122.7	123.9	123.9	124.6	121.7	121.0	121.4	119.9	120.8
2015/06/09	10:31:42	110.3	107.8	106.4	108.5	163.9	152.6	110.3	128.8	118.9	138.7	120.8	115.3	120.5	130.9	124.3	128.9	129.0	132.6	132.5	139.4	132.8	129.5	129.1	131.1	125.9	127.2	124.1	121.1	122.3	123.5	123.8	121.9	121.6	121.6	120.1	120.6
2015/06/09	10:31:43	100.3	100.3	100.4	104.6	163.9	152.1	111.7	130.2	119.4	137.8	121.0	116.9	119.9	131.1	122.7	129.7	129.7	131.9	132.1	137.1	132.6	130.2	128.5	131.3	125.4	127.6	123.4	120.9	121.7	123.1	123.3	121.0	121.3	121.1	119.5	119.2
2015/06/09	10:31:44	100.3	100.5	107.1	108.9	163.4	151.6	107.9	130.4	119.8	138.1	118.4	118.7	122.8	131.2	122.3	129.7	128.4	132.2	134.7	135.6	132.7	130.9	131.3	131.8	127.2	128.5	125.3	123.6	126.0	124.9	125.7	122.8	123.8	122.1	120.9	120.0
2015/06/09	10:31:45	103.0	104.3	113.3	113.4	163.3	151.7	107.5	130.2	121.2	138.4	117.7	119.5	120.4	130.2	124.3	130.7	128.0	133.5	134.5	137.9	132.0	129.0	130.9	131.7	126.6	127.9	125.5	122.3	122.9	123.5	122.7	120.9	121.6	120.1	118.9	119.1
2015/06/09	10:31:46	106.5	106.4	108.4	109.5	163.3	152.3	109.3	128.5	119.2	138.8	116.8	122.2	120.2	129.1	125.1	129.6	128.5	136.2	133.9	137.2	133.6	130.1	131.9	131.7	127.0	127.8	124.8	123.5	125.4	124.2	124.7	121.6	120.2	121.0	119.9	119.6
2015/06/09	10:31:47	111.4	111.5	114.9	109.8	163.9	152.8	106.7	129.9	120.0	138.6	124.5	121.0	118.2	132.5	124.1	128.8	127.7	134.8	133.6	135.5	132.6	129.5	129.3	131.1	126.5	127.0	123.7	122.2	124.9	124.9	124.5	121.5	122.9	121.6	120.6	121.8
2015/06/09	10:31:48	118.8	109.3	109.4	102.0	164.0	152.2	107.1	130.6	120.0	138.1	123.8	120.1	121.1	129.9	122.1	129.1	128.0	133.7	134.1	136.6	133.8	129.3	129.1	131.7	127.4	127.1	124.7	122.5	123.3	124.3	125.0	123.1	121.6	121.7	120.8	119.4
2015/06/09	10:31:49	108.7	112.8	104.6	107.9	163.5	151.8	107.5	131.2	120.6	138.4	123.3	120.5	120.5	131.3	124.0	129.2	127.9	132.5	134.8	137.0	134.5	130.5	130.2	131.8	126.6	128.1	124.6	120.9	122.6	122.8	123.0	121.6	122.3	122.4	122.8	125.1
2015/06/09	10:31:50	104.6	105.6	110.5	108.8	163.3	151.7	101.4	130.2	119.5	138.0	122.2	119.1	120.2	131.5	122.5	130.4	130.0	136.5	135.9	134.9	133.8	132.9	133.2	131.9	127.6	128.2	126.1	125.1	126.8	125.9	126.6	124.2	126.6	124.6	124.2	128.7
2015/06/09	10:31:51	103.1	114.3	111.4	101.8	163.2	151.6	106.1	129.3	119.1	138.9	124.6	121.1	123.2	130.6	122.5	130.4	130.5	139.0	135.4	138.4	134.4	130.5	133.2	132.2	126.9	129.0	126.2	123.4	126.0	126.0	125.5	123.4	124.7	124.3	123.9	128.0
2015/06/09	10:31:52	108.4	114.1	107.1	103.7	163.5	151.8	109.9	130.2	119.8	138.4	123.8	118.2	122.1	129.3	122.4	129.5	131.4	135.3	133.8	137.5	132.1	130.3	131.9	131.4	127.7	128.3	125.7	124.7	127.8	128.6	129.7	126.7	128.9	125.9	125.2	127.0
2015/06/09	10:31:53	103.6	112.0	112.7	104.7	163.4	151.5	103.5	129.9	118.9	138.3	122.8	114.8	120.9	128.6	120.5	128.6	134.1	138.1	134.1	135.5	132.5	130.3	132.3	130.7	128.0	127.8	125.5	124.5	126.5	125.3	126.6	124.7	127.2	125.8	124.6	128.2
2015/06/09	10:31:54	103.4	104.2	106.0	109.0	163.4	151.4	103.0	129.5	118.5	138.5	124.2	118.5	122.1	130.6	123.8	129.1	133.8	136.9	133.3	134.7	132.5	131.0	131.8	129.9	126.8	127.6	124.3	123.3	125.4	124.0	125.6	124.3	126.2	125.1	125.2	127.7
2015/06/09	10:31:55	99.6	115.7	108.7	107.2	163.2	151.4	101.4	130.2	119.6	138.2	121.3	115.2	121.2	130.4	122.1	128.4	133.8	138.2	132.7	137.8	132.1	130.0	130.0	130.9	127.6	126.8	123.6	121.9	123.3	124.5	125.1	124.0	126.9	124.9	125.6	126.3
2015/06/09	10:31:56	105.8	111.5	105.3	109.4	163.4	151.7	102.3	129.7	118.8	138.1	121.7	116.7	121.9	130.7	122.1	128.9	135.2	137.8	132.3	137.4	131.3	130.7	131.0	130.9	127.4	127.0	125.0	123.3	124.8	125.8	126.0	124.7	126.8	125.8	125.4	126.1
2015/06/09	10:31:57	95.9	103.5	105.7	105.8	163.3	151.5	104.8	128.8	119.2	139.0	115.8	117.8	119.7	132.0	126.4	131.2	135.1	136.9	130.8	137.5	132.4	131.9	132.4	132.3	127.6	128.3	125.1	123.6	124.0	124.8	125.5	124.9	128.3	125.8	126.0	126.3
2015/06/09	10:31:58	98.9	104.8	106.6	109.8	163.5	152.0	103.8	127.6	118.0	139.0	119.7	118.4	120.5	131.3	124.7	130.1	135.0	134.9	131.9	137.8	132.0	130.1	132.3	132.3	127.4	127.8	125.9	123.6	125.5	126.5	127.9	125.9	129.4	128.1	127.4	127.0
2015/06/09	10:31:59	108.9	116.6	112.6	112.1	163.9	152.0	105.3	130.0	119.3	138.4	121.0	120.0	120.1	131.5	122.7	130.0	132.9	131.5	131.4	135.5	130.3	130.1	130.6	131.2	126.6	127.0	124.5	121.3	122.8	124.5	126.8	125.0	131.5	129.4	125.4	124.4
2015/06/09	10:32:00	110.1	113.8	106.7	107.8	163.6	151.6	102.9	130.5	119.8	138.5	122.9	121.5	119.8	132.3	125.4	129.7	132.3	134.0	133.2	136.2	131.9	130.2	131.2	131.5	126.7	127.2	125.8	123.4	126.5	125.5	128.0	127.3	133.8	129.1	122.1	125.8
Background (King Pile) One Minute Average		104.0	106.5	107.1	107.0	163.6	152.2	105.0	130.2	120.0	138.3	119.8	119.7	120.3	130.8	123.4	129.5	131.1	135.5	133.9	137.0	133.3	129.7	130.4	130.6	126.7	127.5	124.3	122.9	124.2	124.2	124.6	123.0	123.5	122.7	121.6	121.6

One Minute King Pile Vibratory Data

Date	Time	6.3	8.0	10.0	12.5	16.0	20.0	25.0	31.5	40.0	50.0	63.0	80.0	100	125	160	200	250	315	400	500	630	800	1000	1250	1600	2000	2500	3150	4000	5000	6300	8000	10000	12500	16000	20000
2015/06/09	10:34:30	116.6	116.5	105.0	109.6	111.1	111.9	107.7	102.5	95.9	102.5	99.1	94.7	95.8	96.1	97.2	97.2	102.6	102.8	102.3	104.4	103.0	102.9	101.7	102.7	102.1	106.4	111.1	115.0	117.5	118.5	117.8	115.2	117.6	115.4	114.3	112.8
2015/06/09	10:34:31	113.5	106.9	108.1	115.2	109.7	106.5	99.0	91.2	95.2	105.6	97.1	95.0	95.3	96.4	97.5	97.1	101.9	101.8	101.4	105.0	104.1	103.7	102.2	103.0	103.1	106.3	111.2	114.6	117.4	118.3	119.5	116.5	117.8	115.8	117.7	115.1
2015/06/09	10:34:32	109.8	108.7	113.2	110.6	106.6	103.8	99.6	93.3	93.6	102.8	97.1	93.8	97.1	96.7	96.6	94.6	101.0	102.1	102.4	105.4	102.3	103.2	101.5	102.4	100.6	103.4	107.5	112.1	113.8	115.5	115.9	115.7	114.5	113.9	114.1	113.2
2015/06/09	10:34:33	114.6	104.1	106.1	106.3	105.5	102.3	96.0	98.8	98.6	103.2	99.5	97.9	95.4	98.9	98.8	98.7	102.3	103.3	102.5	104.9	102.6	104.4	101.5	103.5	102.9	106.7	108.3	111.9	115.5	117.7	118.5	116.5	114.6	115.6	113.7	112.7
2015/06/09	10:34:34	116.1	105.9	106.8	102.1	104.1	106.3	97.3	98.8	99.5	106.5	101.8	96.7	96.1	97.1	96.1	100.6	103.0	104.1	102.9	103.0	103.5	104.1	101.0	102.8	102.4	105.1	109.8	112.9	116.7	117.0	117.8	116.8	115.5	117.3	115.0	114.1
2015/06/09	10:34:35	110.5	109.8	108.7	102.7	112.3	103.7	97.7	97.2	99.5	101.9	99.3	93.1	95.9	96.3	96.5	96.6	100.2	100.0	99.4	102.8	103.0	103.8	101.8	102.7	101.6	105.6	107.8	112.5	115.4	120.0	119.7	118.3	115.3	116.3	114.1	114.9
2015/06/09	10:34:36	107.4	108.6	103.6	102.5	104.8	100.5	96.1	99.2	93.3	104.5	98.8	92.9	96.1	98.0	97.4	98.1	102.5	103.2	100.9	103.8	104.3	104.5	102.0	103.4	102.4	105.7	110.9	113.5	115.8	117.7	118.8	115.9	116.9	115.6	114.9	113.0
2015/06/09	10:34:37	104.8	111.2	102.9	103.0	101.8	98.2	99.7	100.1	100.9	103.8	101.7	96.1	97.3	99.8	98.1	100.6	101.6	102.7	100.7	103.5	103.9	104.7	103.3	104.1	101.3	104.7	109.4	113.7	117.4	119.5	120.5	118.6	118.0	118.4	117.5	117.5
2015/06/09	10:34:38	107.3	104.6	106.9	104.1	108.2	105.1	104.5	103.9	98.8	103.2	104.7	94.4	98.3	98.4	96.5	97.2	103.2	101.7	100.4	103.5	102.8	104.3	102.0	103.0	102.8	106.2	109.6	114.4	117.9	120.0	120.6	116.9	118.0	116.7	114.8	113.8
2015/06/09	10:34:39	106.6	101.4	113.9	115.3	108.9	102.4	100.8	97.6	97.6	105.9	102.6	94.8	98.9	97.1	97.6	96.5	101.4	102.1	99.4	103.0	103.0	104.9	102.4	104.0	102.9	107.2	111.4	116.9	119.6	122.1	122.5	120.9	119.7	118.0	116.6	115.7
2015/06/09	10:34:40	103.1	99.6	112.7	112.5	101.4	102.8	100.7	99.8	100.2	105.1	99.7	95.4	97.3	98.2	96.3	96.1	100.9	101.8	100.6	102.8	103.0	104.7	102.2	104.2	104.9	108.7	113.0	116.5	118.7	120.1	120.2	117.8	117.9	118.4	116.8	115.2
2015/06/09	10:34:41	105.5	113.8	108.2	108.0	103.2	100.0	104.1	102.4	100.8	104.7	100.2	97.2	96.6	99.2	96.9	97.7	101.4	103.2	101.3	103.7	102.4	103.4	101.2	103.1	102.0	103.6	109.0	111.4	114.3	116.5	117.2	115.5	114.9	115.3	115.0	113.0
2015/06/09	10:34:42	123.8	113.4	104.2	107.6	107.7	101.7	102.0	99.3	96.8	102.2	99.3	93.6	97.3	98.1	98.1	98.8	103.3	102.2	100.8	103.8	102.8	103.5	101.6	102.9	103.0	106.7	111.2	115.4	119.5	119.6	118.1	116.6	117.3	116.9	115.3	114.4
2015/06/09	10:34:43	113.3	107.9	114.0	108.7	110.6	101.7	104.7	99.5	96.7	105.8	98.8	96.8	95.6	95.8	97.5	96.4	100.5	100.7	99.4	103.4	103.4	104.0	101.3	104.1	104.2	106.9	111.8	114.8	116.0	118.3	118.8	116.3	116.7	115.8	115.3	113.3
2015/06/09	10:34:44	104.8	103.5	110.0	107.2	112.0	104.8	102.3	99.1	95.4	106.1	101.4	95.0	98.9	100.7	100.4	101.0	104.5	102.8	105.1	104.7	103.8	105.1	103.2	103.3	102.6	106.3	108.2	111.3	114.2	116.7	116.7	114.7	116.2	115.9	114.4	112.3
2015/06/09	10:34:45	106.0	104.8	107.0	107.0	108.6	103.8	104.4	102.0	98.5	103.2	100.9	96.3	99.4	102.9	101.1	99.1	103.8	101.5	102.3	103.6	104.9	104.9	102.6	103.6	104.1	106.7	110.8	114.2	118.1	120.4	120.4	120.4	117.5	119.1	116.8	116.2
2015/06/09	10:34:46	105.0	108.2	101.9	105.6	104.2	107.2	101.8	100.1	98.5	104.7	101.7	93.8	96.7	102.0	98.7	102.7	107.7	112.1	114.7	113.6	107.5	110.8	110.9	109.3	109.6	110.5	112.0	113.8	118.4	119.4	118.2	116.6	118.0	115.5	114.1	113.4
2015/06/09	10:34:47	113.2	108.5	107.4	114.6	104.5	100.8	102.0	98.1	97.5	105.6	103.9	99.1	96.9	100.0	98.6	97.7	100.7	98.8	98.3	103.2	103.2	103.5	101.8	103.7	102.8	106.1	110.3	112.5	116.6	118.1	118.5	116.1	117.3	116.4	116.1	114.2
2015/06/09	10:34:48	108.2	103.2	108.1	110.2	100.0	100.9	102.4	99.2	97.4	104.4	103.0	96.3	100.5	98.2	96.4	98.9	102.4	99.1	98.9	102.8	102.8	103.5	102.0	103.8	102.7	105.8	111.0	114.6	118.7	119.5	118.4	116.3	116.2	116.2	116.2	114.5
2015/06/09	10:34:49	110.1	111.4	99.3	108.1	99.2	106.4	99.4	103.1	99.2	101.4	100.4	95.9	100.2	98.2	98.4	96.5	103.3	103.8	102.3	102.8	104.5	112.1	105.7	105.9	106.4	105.9	109.8	113.3	117.1	118.0	117.8	116.9	115.8	114.6	114.0	112.2
2015/06/09	10:34:50	119.0	103.2	111.6	107.6	104.5	100.6	102.5	101.5	100.1	105.4	99.4	95.7	107.0	106.7	103.7	109.0	110.6	112.5	111.9	110.2	106.4	105.9	101.8	103.6	103.1	106.9	110.3	113.3	117.2	118.2	118.5	117.7	116.9	116.4	116.2	113.1
2015/06/09	10:34:51	103.6	106.5	107.3	106.0	105.1	112.6	118.7	119.1	116.3	111.5	113.1	110.4	112.4	112.3	106.1	109.4	110.6	110.9	106.2	106.3	104.2	104.2	100.3	102.0	102.1	104.3	108.6	112.3	115.8	117.9	117.5	115.1	114.6	114.8	113.8	112.2
2015/06/09	10:34:52	110.0	112.9	115.0	116.6	118.6	125.0	114.4	112.4	108.3	103.1	100.5	97.5	96.4	99.2	97.3	96.6	100.7	99.8	98.2	102.7	102.9	103.9	101.4	102.1	102.9	105.8	110.7	115.1	118.3	120.5	120.0	117.9	118.2	117.8	116.7	114.4
2015/06/09	10:34:53	114.6	116.8	118.6	118.5	121.7	111.3	112.2	108.0	103.5	105.0	100.9	97.2	97.9	97.6	95.0	95.6	100.5	99.0	99.1	102.5	102.8	103.7	100.9	104.2	104.8	107.2	112.1	114.0	118.1	118.7	119.3	116.2	119.9	119.1	117.5	116.0
2015/06/09	10:34:54	108.1	121.3	122.5	116.2	113.1	107.8	107.9	108.6	108.3	107.1	97.4	94.2	96.2	96.2	96.0	95.0	99.4	98.6	97.9	102.3	102.8	103.6	100.5	101.7	102.2	106.2	109.4	113.8	117.2	121.3	121.1	116.2	116.0	117.2	113.9	112.9
2015/06/09	10:34:55	122.6	120.9	118.1	118.6	113.8	109.6	110.0	106.7	108.8	102.6	100.0	96.7	99.0	98.6	97.9	97.3	102.0	99.0	101.4	102.4	103.7	102.8	102.2	103.4	102.7	105.9	109.7	114.3	117.5	119.5	120.7	118.7	116.8	117.7	116.5	114.8
2015/06/09	10:34:56	128.2	119.8	118.2	115.5	114.3	107.8	107.4	103.6	103.4	103.7	102.5	94.3	95.8	97.4	96.5	97.2	99.8	97.7	98.1	102.8	102.7	105.0	101.8	104.6	105.2	108.8	113.8	116.7	121.3	123.6	122.5	118.3	122.6	119.5	119.8	117.1
2015/06/09	10:34:57	122.0	125.0	114.2	109.3	112.4	108.7	107.0	104.8	103.7	106.1	101.7	92.4	98.5	98.6	95.9	96.8	100.3	98.9	100.9	102.2	102.9	104.7	101.7	103.8	102.1	104.4	108.7	111.6	114.8	116.5	115.1	113.9	113.5	113.5	113.3	111.6
2015/06/09	10:34:58	120.4	124.6	118.1	113.1	114.8	107.5	107.6	104.5	106.9	104.2	101.7	94.7	99.4	97.8	99.0	97.1	101.5	101.9	102.8	104.3	102.6	103.8	101.6	103.1	104.0	108.2	112.7	116.8	119.7	121.4	121.6	118.5	118.6	118.5	116.5	114.6
2015/06/09	10:34:59	120.4	122.2	117.8	111.6	107.3	104.5	108.5	104.3	105.7	101.8	99.8	94.3	99.6	98.7	95.9	96.1	101.6	106.1	105.2	106.9	106.5	108.0	108.4	108.8	111.4	112.3	110.1	113.2	117.0	119.3	118.5	117.6	117.5	117.5	115.9	113.6
2015/06/09	10:35:00	120.7	119.6	115.7	109.4	112.3	111.0	108.0	105.5	107.1	101.0	99.9	94.2	98.6	98.4	99.3	99.0	103.3	100.8	101.8	104.9	103.5	104.4	101.7	103.2	103.6	105.4	109.0	114.0	117.1	120.0	120.5	118.2	116.0	119.3	116.8	114.7
2015/06/09	10:35:01	118.6	121.2	116.7	111.5	112.7	110.8	108.9	107.5	106.1	105.3	99.5	92.7	97.3	98.7	95.2	96.6	100.9	100.5	98.5	101.8	102.3	103.4	101.3	102.6	102.0	104.9	110.2	112.8	117.0	119.1	119.1	116.6	116.2	115.6	114.7	113.4
2015/06/09	10:35:02	118.4	121.2	111.1	110.5	112.4	110.3	105.2	102.0	103.0	103.8	101.6	91.8	96.0	96.6	97.6	97.9	103.1	99.7	101.1	105.5	103.8	107.4	109.5	107.7	106.0	107.3	112.4	115.3	119.5	120.6	120.6	118.0	118.7	118.9	118.2	116.6
2015/06/09	10:35:03	117.1	122.9	115.0	112.4	110.2	107.8	109.3	104.0	101.5	105.4	101.8	98.0	98.7	108.2	110.2	101.8	104.4	108.4	111.4	116.5	112.5	108.1	112.4	116.4	115.6	116.9	119.2	122.0	123.6	126.0	124.8	119.8	118.1	116.3	115.1	113.3
2015/06/09	10:35:04	119.5	118.8	115.1	105.2	111.3	111.1	105.6	99.9	102.9	105.6	102.4	94.4	97.1	103.0	103.8	95.5	99.7	99.1	98.2	102.0	103.5	103.9	101.2	102.0	101.9	104.1	107.3	111.6	113.6	116.8	118.1	116.8	115.0	114.9	112.9	111.2
2015/06/09	10:35:05	115.9	118.2	116.2	113.9	114.8	108.1	104.5	104.0	101.1	102.4	100.7	95.5	97.0	100.1	97.4	96.7	100.7	100.7	98.9	102.6	101.8	103.9	103.9	105.2	106.4	109.3	113.0	117.8	120.0	121.4	120.4	117.3	120.6	118.2	116.5	114.7
2015/06/09	10:35:06	115.8	117.5	113.1	111.6	115.2	112.0	108.9	103.0	98.9	106.5	104.7	92.7	96.5	99.7	98.0	98.4	101.2	100.9	102.2	107.4	104.0	103.6	102.6	104.9	105.0	107.8	114.0	117.0	120.1	122.6	120.8	117.6	119.4	117.6	115.8	113.7
2015/06/09	10:35:07	113.7	118.7	117.0	114.2	114.0	113.7	109.0	103.4	102.1	102.4	101.7	93.6	95.6	97.0	96.1	96.1	100.3	98.8	98.2	101.1	101.9	103.9	101.6	102.4	102.7	105.5	110.7	114.2	117.4	118.6	118.0	116.2	116.9	116.8	115.5	113.5
2015/06/09	10:35:08	111.0	118.7	120.0	117.6	114.9	111.7	102.4	95.7	99.3	105.0	101.1	95.2	97.3	99.5	96.7	100.2	104.2	107.8	107.4	103.5	104.1	104.7	101.9	104.5	105.2	108.8	112.1	114.8	118.0	119.1	119.5	118.6	116.9	116.9	116.3	114.9
2015/06/09	10:35:09	114.2	118.3	116.6	111.5	110.2	110.0	108.0	103.9	103.1	107.4	101.4	94.5	96.5	99.2	95.5	97.7	100.8	100.9	99.4	101.7	103.8	103.7	101.2	101.9	101.6	105.6	109.1	112.3	115.6	118.6	118.6	117.8	116.7	115.0	114.5	113.2
2015/06/09	10:35:10	113.5	119.0	113.2	108.6	108.3	110.0	114.9	105.1	103.1	103.0	101.4	93.3	97.1	96.6	96.9	100.1	101.5	100.2	99.3	103.5	104.8	104.3	102.5	104.3	102.5	107.0	112.1	115.5	117.4	118.8	118.6	116.1	116.0	115.1	114.0	113.3
2015/06/09	10:35:11	112.7	118.4	118.8	113.1	114.4	112.7	108.9	105.1	99.2	104.0	99.3	98.0	96.9	97.6	97.4	96.2	101.1	101.2	100.2	104.1	103.5	105.4	102.9	104.3	106.0	107.0	111.2	113.6	117.9	119.3	119.4	119.3	117.7	118.4	116.3	114.3
2015/06/09	10:35:12	117.0	117.1	121.5	110.4	112.0	110.4	107.1	104.5	108.4	108.1	99.2	95.1	97.0	94.7	97.0	97.8	101.3	99.2	98.7	103.0	102.9	103.4	101.9	103.7	103.6	107.4	112.5	115.3	119.4	121.3	122.8	121.5	119.7	120.6	117.7	116.0
2015/06/09	10:35:13	111.6	119.4	123.3	109.3	109.5	108.8	110.3	112.3	106.9	108.6	101.9	93.7	97.5	96.0	96.5	96.2	100.9	99.0	98.1	102.0	102.2	103.5	100.7	103.3	102.2	106.5	111.8	115.1	117.9	120.4	120.8	118.6	117.5	117.7	116.7	115.2
2015/06/09	10:35:14	113.1	113.2	115.2	106.1	106.5	114.8	117.5	113.1	107.5	106.2	100.6	94.6	97.7	96.0	96.7	96.6	99.9	97.8	98.3	101.9	103.5	103.9	100.9	102.7	102.6	105.8	109.3	114.0	116.7	117.1	117.0	115.9	115.7	115.7	113.7	111.8
2015/06/09	10:35:15	109.0	122.4	120.2	115.1	110.9	112.0	115.0	107.6	106.2	108.0	102.8	95.2	97.9	95.9	95.6	98.0	101.7	98.8	98.6	102.0	102.2	103.4	101.0	103.2	102.2	105.3	109.0	113.1	116.0	116.9	118.2	117.3	115.7	116.4	115.1	114.5
2015/06/09	10:35:16	108.2	118.0	123.0	110.8	111.4	111.5	112.3	113.8	108.6	109.3	102.0	94.4	96.3	98.0	98.5	97.1	103.3	100.3	98.4	102.4	102.8	103.6	101.3	103.4	103.3	108.4	112.4	116.6	119.8	121.4	121.2	119.2	119.3	120.3	118.3	116.0
2015/06/09	10:35:17	103.8	119.4	119.1	112.0	110.0	114.8	115.1	114.1	109.9	107.4	103.9	96.3	98.8	97.4	97.5	98.6	103.3	101.0	101.4	102.2	102.7	107.9	104.2	102.5	101.3	104.7	108.6	112.9	115.6	117.3	117.2	116.1	114.9	114.9	114.9	112.7
2015/06/09	10:35:18	112.3	124.3	124.6	116.5	115.9	115.6	115.0	111.9	112.7	106.0	100.4	97.3	99.7	99.3	97.9	99.6	102.9	100.6	100.8	102.3	104.3	105.1	102.4	102.8	103.1	105.5	110.2	115.2	117.4	120.0	119.4	117.7	117.1	117.0	116.2	114.9
2015/06/09	10:35:19	118.4	125.3	122.2	113.4	111.3	118.6	113.3	114.5	111.3	106.4	101.6	97.1	100.3	99.6	99.0	96.5	100.3	100.6	101.2	103.5	102.7	103.0	101.8	103.3	102.7	104.8	110.7	114.9	117.8	119.8	119.0	117.2	116.8	119.5	117.9	114.7
2015/06/09	10:35:20	121.2	127.9	127.9	114.9	112.6	118.5	115.3	112.9	111.7	110.6	105.5	98.7	100.8	102.4	98.5	98.8	104.9	105.1	108.9	108.4	104.4	108.8	112.2	108.9	106.5	110.8	114.1	118.2	122.0	122.8	123.1	120.9	123.3	121.6	119.1	116.9
2015/06/09	10:35:21	126.0	133.9	132.1	116.1	116.8	114.5	117.5	113.7	116.5	113.9	104.8	99.7	97.6	99.6	99.7	99.9	105.8	102.9	106.9	107.8	104.4	105.3	107.0	105.0	103.0	104.6	107.5	111.4	114.4	115.8	117.0	115.3	113.0	113.9	112.3	111.1
2015/06/09	10:35:22	126.0	133.2	128.8	114.1	114.0	118.4	117.3	114.7	114.5	107.3	105.1	100.6	99.1	106.4	102.4	100.8	105.4	106.5	106.9	107.0	104.9	105.6	103.8	103.5	102.8	105.0	107.4	112.9	116.6	119.4	120.2	119.4	116.6	119.0	117.2	115.1
2015/06/09	10:35:23	123.4	128.3	128.4	116.6	114.7	117.2	113.8	113.9	115.9	109.2	106.1	99.0	99.0	102.7	99.9	101.1	106.1	104.7	104.5	108.2	104.9	106.3	104.7	103.8	103.1	106.0	110.9	114.1	117.3	118.8	118.8	116.7	118.4	117.8	116.3	114.7
2015/06/09	10:35:24	123.3	131.5	127.6	116.2	118.3	117.6	108.9	110.2	111.4	109.0	106.7	97.3	100.5	102.1	100.1	102.3	104.9	103.5	102.4	103.9	103.3	104.8	104.1	104.0	103.4	105.0	109.3	113.0	117.8	120.2	119.5	115.1	117.0	117.4	115.4	114.6
2015/06/09	10:35:25	125.7	132.5	133.3	119.0	112.3	117.3	113.3	110.9	107.8	106.4	103.4	96.4	97.2	95.2	96.5	99.1	102.4	100.9	102.7	101.5	102.8	104.4	100.9	103.3	102.2	104.7	109.1	113.0	116.1	117.5	118.5	115.1	115.7	115.5	113.9	111.7
2015/06/09	10:35:26	122.2	130.8	128.0	116.7	121.5	115.3	112.6	112.0	109.1	108.6	100.6	95.1	98.2	100.5	98.8	100.2	102.5	103.6	103.7	104.0	104.0	105.6	104.3	108.5	110.2	111.9	118.3	118.2	119.6	121.2	122.1	120.2	118.3	118.8	116.5	115.6
2015/06/09	10:35:27	125.8	136.9	130.2	118.7	113.8	115.1	109.0	112.6	109.8	105.8	103.0	92.8	96.4	95.8	96.3	95.4	100.2	98.4	97.9	102.3	103.0	104.0	101.1	102.8	102.5	105.6	110.2	113.9	116.9	118.6	117.7	116.4	117.5	115.2	114.6	112.1
2015/06/09	10:35:28	120.7	132.5	128.9	110.5	117.1	114.9	109.6	113.9	111.3	109.0	102.1	94.8	95.1	96.4	96.3	96.2	101.2	99.8	97.9	101.5	104.5	104.2	101.2	102.4	101.5	105.0	107.3	111.9	114.9	118.0	118.2	117.3	115.3	115.2	114.7	113.4
2015/06/09	10:35:29	125.9	132.0	125.6	112.9	116.4	111.4	105.7	111.7	111.6	112.0	104.3	96.9	96.9	99.6	96.5	97.6	102.2	101.6	102.3	103.6	103.0	103.9	102.0	103.7	103.5	107.5	111.0	114.2	117.7	118.9	119.5	115.4	117.7	117.2	115.8	113.6
2015/06/09	10:35:30	126.1	130.5	127.8	117.8	116.5	115.9	114.6	113.9	110.9	106.9	103.3	95.7	97.5	97.5	95.6	98.5	99.3	100.8	102.1	104.0	103.3	104.9	102.1	102.9	101.9	104.4	107.7	112.9	116.0	119.0	118.7	115.8	116.3	116.1	114.9	114.3
Vibratory Driving																																					
(King Pile) One Minute		115.1	117.5	116.2	111.5	110.9	109.5	107.5	105.4	104.1	105.6	101.7	95.7	98.0	99.0	98.1	98.3	102.4	101.9	101.7	104.1	103.7	104.8	102.8	104.0	103.7	106.6	110.6	114.2	117.4	119.3	119.3	117.2	117.1	116.9	115.6	114.1

Appendix C

One-Minute Airborne Data

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Table B-1. Airborne Data for Sheet Piles

Date	Start Time	End Time	Driving Time	LEQ	Lmax	Notes
6/9/2015	13:08:41	13:09:28	00:00:13	98.7	103.6	Distances ranged from approximately 10 to 15 meters on the existing wharf
	13:10:56	13:11:10	00:00:14	89.5	92.7	
	13:12:16	13:12:31	00:00:15	88.9	91.7	
	13:14:04	13:14:16	00:00:12	87.7	90.2	
	13:15:49	13:16:02	00:00:13	86.8	89.3	
	13:17:29	13:17:41	00:00:12	86.5	89.2	
	13:19:14	13:19:27	00:00:13	86.4	88.7	
	13:21:27	13:22:17	00:00:50	88.4	94.9	
	13:24:28	13:25:29	00:01:01	94.3	99.5	
	13:31:13	13:31:31	00:00:18	93.0	96.7	
	13:32:09	13:32:27	00:00:18	88.4	93.1	
	13:33:07	13:33:15	00:00:08	85.7	90.5	
6/9/2015	13:29:00	13:30:00	00:01:00	79.2	83.9	No Pile driving

Table B-2. Airborne Summary Data for King Piles

Date	Start Time	End Time	Driving Time	LEQ	Lmax	Notes
6/9/2015	08:35:09	09:07:44	00:32:35	82.8	91.2	On the existing wharf between 10 and 15 meters from the pile driving
	09:11:45	09:24:58	00:13:13	84.0	90.7	
	09:27:30	09:37:41	00:10:11	84.5	89.9	
	09:43:09:	09:51:54	00:08:45	88.4	94.6	
	09:54:18	10:02:41	00:08:23	82.9	86.7	
	10:06:13	10:13:47	00:07:34	82.5	86.8	
	10:16:00	11:02:22	00:46:22	88.2	94.9	
						No Pile Driving
6/10/2015	15:37:28	15:45:17	00:07:49	92.6	95.3	Air borne system was on the work barge approximately 20 meters from the pile driving and 10 meters from the power pack.
	15:48:35	15:58:44	00:10:09	92.7	94.9	
	16:00:52	16:08:12	00:07:20	91.1	93.4	
	16:11:24	16:21:56	00:10:32	91.7	93.0	
	16:26:01	16:56:20	00:30:19	91.6	94.1	
	16:58:47	17:26:56[B]	00:28:09	91..3	93.3	
6/10/2015	**15:32:00**	**15:34:00**	**00:01:00**	**81.5**	**84**	**No Pile Driving**

King Pile 1-Minute Data

Time	Leq	Lmax
09-June-15		
8:29:09	80.7	85.3
8:30:09	84.8	91.2
8:31:09	85.3	87.8
8:32:09	84.9	87.6
8:33:09	83.7	86.6
8:34:09	83.6	86.1
8:35:09	84.4	87.4
8:36:09	83.8	86.6
8:37:09	82.8	87.1
8:38:09	81.4	85.6
8:39:09	81.2	84.1
8:40:09	84.7	86.9
8:41:09	82.6	84.6
8:42:09	85.0	87.9
8:43:09	82.6	84.8
8:44:09	81.3	82.9
8:45:09	82.1	86.1
8:46:09	83.3	86.0
8:47:09	82.7	84.5
8:48:09	83.8	86.5
8:49:09	83.3	86.5
8:50:09	82.4	84.2
8:51:09	87.6	84.1
8:52:09	80.3	81.7
8:53:09	80.9	84.1
8:54:09	82.2	83.5
8:55:09	83.6	86.5
8:56:09	83.2	84.0
8:57:09	81.6	84.7
8:58:09	80.3	82.9
8:59:09	80.5	82.9
9:00:09	82.2	84.6
9:01:09	83.0	84.6
9:02:09	82.8	83.4
9:03:09	83.5	84.3
9:04:09	83.4	84.0
9:05:09	83.3	84.1
9:06:09	81.4	82.4
9:07:09	81.3	83.4
9:12:45	85.7	90.7
9:13:45	83.3	86.9
9:14:45	81.7	83.6
9:15:45	84.5	86.7
9:16:45	85.9	86.6
9:17:45	84.3	88.6
9:18:45	85.0	85.6
9:19:45	83.1	85.2
9:20:45	83.5	84.1
9:21:45	83.9	85.2
9:22:45	84.4	85.3
9:23:45	83.1	84.2
9:24:45	81.4	83.2
9:28:30	83.7	84.9
9:29:30	84.4	85.7
9:30:30	84.1	85.4
9:31:30	83.1	89.9
9:32:30	82.8	83.8
9:33:30	84.7	83.9
9:34:30	84.9	86.9
9:35:30	85.8	86.1
9:36:30	87.3	88.3
9:37:30	82.8	86.2
9:44:09	84.2	85.3
9:45:09	83.5	86.6
9:46:09	88.2	88.8
9:47:09	83.9	88.7
9:48:09	83.3	88.8
9:49:09	90.6	91.6
9:50:09	91.5	93
9:51:09	92.8	94.6
9:52:09	86.4	91.2
9:55:18	81.5	83.8
9:56:18	83.9	86.6
9:57:18	85.1	85.8
9:58:18	86.0	86.7
9:59:18	81.0	82.5
10:00:18	80.9	81.5
10:01:18	81.8	82.5
10:02:18	82.4	83.1
10:03:18	80.0	83
10:07:13	83.4	85.2
10:08:13	84.2	86.6
10:09:13	86.1	86.8
10:10:13	81.1	86.2
10:11:13	80.8	81.6
10:12:13	81.5	82
10:13:13	82.4	83
10:14:13	78.9	83.3
10:15:13	80.1	83.9
10:17:00	82.4	86.9
10:18:00	88.4	90
10:19:00	85.7	87
10:20:00	85.8	93.1
10:21:00	91.9	92.6
10:22:00	85.5	86.4
10:23:00	85.1	86.4
10:24:00	93.2	94.4
10:25:00	87.8	94.5
10:26:00	84.4	86.9
10:27:00	85.4	86.2
10:28:00	88.4	94.4
10:29:00	94.1	94.9
10:30:00	90.0	94
10:31:00	86.3	87.6
10:32:00	84.9	85.5
10:33:00	85.5	86.1
10:34:00	85.4	86.9
10:35:00	78.1	79.4
10:36:00	82.3	93.1
10:37:00	85.7	86.5
10:38:00	89.0	94
10:39:00	93.3	94
10:40:00	86.1	87
10:41:00	85.8	86.6
10:42:00	86.1	86.6
10:43:00	90.1	94.4
10:44:00	93.0	93.5
10:45:00	90.7	93.5
10:46:00	86.7	87.4
10:47:00	86.0	87
10:48:00	86.3	87
10:49:00	86.0	86.7
10:50:00	86.4	87.2
10:51:00	87.6	94
10:52:00	91.8	93.1
10:53:00	85.4	86.9
10:54:00	85.9	86.9
10:55:00	85.0	85.5
10:56:00	85.0	85.9
10:57:00	84.8	85.3
10:58:00	89.8	93
10:59:00	90.1	91.4
11:00:00	85.1	85.9
11:01:00	83.9	84.9
11:02:00	83.4	84.4