

Monthly Pile Driving Summary and Underwater Noise Monitoring Results

Pile Driving Period: May 18, 2014 - June 14, 2014
**Revised August 13, 2014 to include results of underwater
noise monitoring for this period**

DOC Reference: TA_FHWA_03052_RPT_ENV



Summary:

No sturgeon were observed to have been severely injured or killed as a result of underwater noise from pile driving during this reporting period. This conclusion was reached based on the results of sturgeon monitoring by observers on the barge and vessel-based sturgeon monitoring conducted downstream of the piles being driven.

Based on an analysis using both empirical and modeled data, recoverable injuries caused by exposure to sub-lethal levels of underwater noise could not have been sustained by more than one sturgeon during this reporting period. This conclusion was reached by considering:

- the time required to drive each pile;
- the underwater area that experienced noise levels higher than a level that could potentially result in recoverable injury to the sturgeon (206 dB re 1 μ Pa peak sound pressure level); and
- the possible number of sturgeon that could have been in that area (number of gill nets x sturgeon encounter rate).

The potential number of sturgeon likely to have experienced recoverable injuries (described as “sturgeon take”) is reported as the probability of a fish being affected by exposure to underwater noise from pile driving, as shown in the table below. If the sturgeon take is listed as 1, then 1 sturgeon was potentially exposed to recoverable noise levels. If sturgeon take is less than 1, then it is less likely that 1 sturgeon was affected. As shown at the bottom right of the table below, the cumulative sturgeon take was 0.36 sturgeon (that is, less than 1 sturgeon) for this reporting period, which is less than the 1.34 sturgeon that was anticipated based on the NMFS Biological Opinion (NMFS BO).

Introduction:

As required under the NMFS BO, dated April 2014, Reasonable & Prudent Measures #4 and #5 and Term & Condition #9, underwater noise resulting from pile installation must be monitored. The following is a summary of the installation and underwater noise monitoring of permanent and trestle piles for the time period beginning May 18, 2014 through June 14, 2014.

As required under this condition, an estimate of sturgeon take for piles driven during the most recent 30-day monitoring period is included. The sturgeon take estimate has been calculated using the times required to drive each pile (impact hammer only) and an estimate of the diameter of the 206 dB peak SPL isopleth, which has been measured for a representative number of the piles installed during this time period. For piles that were not monitored for underwater noise, the size of the isopleth was conservatively assumed to be equivalent to the largest isopleth measured for piles driven at the same pier (or other representative piles at nearby piers). The take estimate has been compared to that listed for the same piles in Table 10 of the NMFS BO to ensure that sturgeon take

is not being exceeded. Sturgeon take summarized in Table 10 applies to both shortnose and Atlantic sturgeon (i.e., it is anticipated that 37 of each species will be exposed to underwater noise equal to 206 dB re 1 μ Pa SPL_{peak} during pile driving.

Pile Installation and Underwater Noise Monitoring:

During the 30-day period from May 18 through June 14, 2014, [redacted] piles were driven ([redacted] production piles and [redacted] trestle piles). Of these, [redacted] piles were driven at [redacted] on the Rockland (western) approach, [redacted] piles at [redacted] on the Westchester (eastern) approach and [redacted] piles were driven at [redacted] at the Main Span. In addition, [redacted] trestle piles were driven with an impact hammer to support the Rockland work platform. These piles correspond to those driven during weeks 13 through 25 in Table 10¹ of the NMFS BO.

Anticipated Sturgeon Take from Table 10 of the NMFS BO

For the purposes of tracking take associated with the subset of piles from the groups of piles shown in Table 10 (i.e., Anticipated Sturgeon Take), total take for each time period was divided by the number of piles scheduled to be driven during the time period. To calculate anticipated sturgeon take per pile from Table 10, the anticipated take of 2 sturgeon for piles in the group containing [redacted] eastbound (EB) was divided by the [redacted] piles for this group and 4 sturgeon at [redacted] westbound (WB), [redacted] was divided by the [redacted] piles for that group, which resulted in an estimate of 0.020 sturgeon per pile and 0.015 sturgeon per pile, respectively for those groups. Similarly, the anticipated take of 1 sturgeon for piles in the group containing [redacted] and the Rockland trestle piles was divided by the [redacted] piles for this group and 3 sturgeon at [redacted], and the Rockland trestle piles was divided by the [redacted] piles for that group, which resulted in an estimate of 0.010 sturgeon per pile and 0.014 sturgeon per pile, respectively for those groups.

Based on these values:

- the anticipated take from Table 10 for the 95 piles driven from May 18 through June 14 was 1.34 sturgeon, which was calculated as the sum of:
 - 0.020 sturgeon per pile multiplied by [redacted] piles,
 - 0.015 sturgeon multiplied by [redacted] piles,
 - 0.010 sturgeon per pile multiplied by [redacted] piles,
 - 0.014 sturgeon multiplied by [redacted] piles.
- the cumulative take² associated with the 760 piles driven to date (which includes trestle piles, test piles, and production piles as anticipated in Table 10 of the NMFS BO) is the sum of the anticipated take values for all 760 piles, or 15.61 sturgeon.

¹ Anticipated take was calculated in Table 10 of the NMFS BO as the product of the number of piles, number of hours to drive a pile, number of gill nets to span the 206 dB peak SPL isopleth, and the sturgeon encounter rate of 0.033 sturgeon per net per hour.

² In previous Monthly Reports, trestle piles and test piles driven prior to January 17, 2014 were not included in the cumulative take estimate. Therefore, this estimate has been updated to include these piles so as to be consistent with Table 10 in the NMFS BO and now reflects the 10 sturgeon that were exempted in the BO dated April 2, 2014.

Calculated Sturgeon Take for this reporting period

Following the same method used to estimate incidental sturgeon take for Table 10, the product of pile driving time, number of gill nets to span the width of the 206 dB isopleth, and sturgeon encounter rate of 0.033 sturgeon per net per hour was used to calculate sturgeon take for the piles driven during this reporting period (i.e., Calculated Sturgeon Take). For previous piles that have been monitored for underwater noise, the diameter of the 206 dB peak SPL isopleth was measured based on the maximum peak SPL recorded during pile driving. For the unmonitored piles, the maximum recorded isopleth diameter was assigned based on noise monitoring from the test pile program or from noise monitoring of piles at each pier. Actual pile driving times for each of the piles were used in the calculations.

During this reporting period, none of the [REDACTED] piles exceeded the maximum allowable pile driving time of 1.0 hour per pile; impact pile-driving times for [REDACTED] piles were routinely shorter than anticipated (i.e., approximately 0.31 hours, on average). No underwater noise monitoring was conducted for these piles and the diameter of the isopleth for the 206 dB SPL_{peak} was assumed to be 200 feet or 60 feet for piles driven at [REDACTED], respectively, which was the maximum observed isopleth size for monitored piles at these or adjacent piers (i.e. noise measurements for [REDACTED] were used to estimate isopleth size for [REDACTED] because no underwater noise monitoring has occurred yet at [REDACTED]).

For [REDACTED] piles driven at [REDACTED] along the Westchester approach, pile-driving times averaged 0.13 hours and were shorter than the anticipated time of 0.5 hours. However, for [REDACTED] piles driven at [REDACTED] along the Rockland approach, driving times ranged from 0.45 to 0.93 hours and [REDACTED] of the [REDACTED] piles were above the anticipated time of 0.5 hours; these piles averaged 0.71 hours each to install. Piles driven along the Rockland approach, which includes [REDACTED] have routinely required 40 to 45 minutes to drive, which exceeds the estimate of 30 minutes. Although these drive times are approximately 50% longer than anticipated, the Calculated Sturgeon Take for this reporting period is still well below the Anticipated Sturgeon Take reported in Table 10 of the NMFS BO. The longer than anticipated pile-driving time for the [REDACTED] piles driven along the Rockland approach was offset by the shorter than anticipated pile-driving times for [REDACTED] piles driven along the Westchester approach. Collectively, the average pile-driving time for all 77 [REDACTED] piles driven this period was 0.47 hours, which is slightly less than the 0.50 hours in Table 10 of the NMFS BO.

Underwater noise was monitored by TZC/JASCO for [REDACTED] of the [REDACTED] piles at [REDACTED] along the Rockland approach. In general, larger diameters for the 206 dB SPL_{peak} were observed for piles at [REDACTED] compared to [REDACTED]. The 206 dB SPL_{peak} isopleth exceeded the anticipated diameter of 40 feet (range: 46 to 56 feet) for [REDACTED] of the [REDACTED] piles. Six of these [REDACTED] piles (all located at Pier [REDACTED]) also exceeded the anticipated pile-driving time of 0.5 hours per pile, as discussed above. Isopleth diameters for the other [REDACTED] piles ranged from 6 to 39 feet; the smaller than anticipated noise isopleths for these piles offset the greater than anticipated isopleths for the piles that exceeded 40 feet.

Drive times for [REDACTED] piles installed at the Rockland trestle averaged 0.09 hours per pile and did only exceed the anticipated 0.17 hours per pile for one of the piles, which required 0.18 hours to drive. None of the trestle piles were monitored by TZC/JASCO for underwater noise.

Based on the recorded pile-driving times and isopleth widths:

- the incidental sturgeon take for the [REDACTED] piles driven during the 30-day period from May 18 through June 14 was calculated as 0.45 sturgeon, which is less than the estimate of 1.34 sturgeon for the same [REDACTED] piles listed in Table 10,
- the cumulative incidental take for the [REDACTED] piles driven to date (which includes trestle piles, test piles, and production piles as anticipated in Table 10 of the NMFS BO) was calculated as 3.83 sturgeon, which is less than the anticipated take of 15.61 sturgeon for the same [REDACTED] piles in Table 10.

Despite the longer than anticipated pile-driving times for [REDACTED] piles at [REDACTED], the pile-driving times for the other piles installed during this period were considerably less than anticipated. Similarly, the larger than anticipated noise isopleths at [REDACTED] were offset by the smaller than anticipated noise isopleths at [REDACTED]. This resulted in a total observed sturgeon take for all piles that was less than the anticipated take for these piles. Therefore, incidental take for sturgeon was not exceeded during the most recent 30-day reporting period for pile driving, nor has the cumulative sturgeon take been exceeded for all piles driven to date.

Report Period: 05/18/2014 to 06/14/2014

Date	Year	Week	Net Impact Pile Driving Duration (hrs/pile)	Pile Driving Time from Table 9 of the NMFS BO (hrs/pile)	Average width of isopleth for 206-dB peak SPL (feet)	Maximum width of isopleth for 206-dB peak SPL (feet)	Number of gill nets to span the 206-dB peak SPL isopleth	Sturgeon encounter rate (fish/net/hour)	Sturgeon take
5/19/2014	2014	21	0.68	0.5	Not measured	32	0.3	0.033	0.006
5/19/2014	2014	21	0.75	0.5	Not measured	32	0.3	0.033	0.006
5/20/2014	2014	21	0.83	0.5	Not measured	32	0.3	0.033	0.007
5/20/2014	2014	21	0.70	0.5	Not measured	32	0.3	0.033	0.006
5/20/2014	2014	21	0.73	0.5	Not measured	32	0.3	0.033	0.006
5/20/2014	2014	21	0.78	0.5	Not measured	32	0.3	0.033	0.007
5/20/2014	2014	21	0.75	0.5	Not measured	32	0.3	0.033	0.006
5/20/2014	2014	21	0.20	0.5	Not measured	15	0.1	0.033	0.001
5/20/2014	2014	21	0.23	0.5	Not measured	15	0.1	0.033	0.001
5/20/2014	2014	21	0.28	0.5	Not measured	15	0.1	0.033	0.001
5/20/2014	2014	21	0.30	0.5	Not measured	15	0.1	0.033	0.001
5/21/2014	2014	21	0.10	0.5	Not measured	15	0.1	0.033	0.000
5/21/2014	2014	21	0.18	0.17	Not measured	77	0.6	0.033	0.004
5/22/2014	2014	21	0.67	0.5	Not measured	32	0.3	0.033	0.006
5/22/2014	2014	21	0.65	0.5	Not measured	32	0.3	0.033	0.005
5/22/2014	2014	21	0.62	0.5	Not measured	32	0.3	0.033	0.005
5/22/2014	2014	21	0.87	0.5	Not measured	32	0.3	0.033	0.007
5/23/2014	2014	21	0.63	0.5	Not measured	32	0.3	0.033	0.005
5/23/2014	2014	21	0.57	0.5	Not measured	32	0.3	0.033	0.005
5/23/2014	2014	21	0.63	0.5	Not measured	32	0.3	0.033	0.005
5/23/2014	2014	21	0.93	0.5	Not measured	32	0.3	0.033	0.008
5/23/2014	2014	21	0.25	1	Not measured	60	0.5	0.033	0.004
5/23/2014	2014	21	0.28	1	Not measured	60	0.5	0.033	0.004
5/23/2014	2014	21	0.28	1	Not measured	60	0.5	0.033	0.004
5/23/2014	2014	21	0.25	1	Not measured	60	0.5	0.033	0.004
5/23/2014	2014	21	0.25	1	Not measured	60	0.5	0.033	0.004
5/23/2014	2014	21	0.27	1	Not measured	60	0.5	0.033	0.004
5/27/2014	2014	22	0.68	0.5	Not measured	32	0.3	0.033	0.006
5/27/2014	2014	22	0.67	0.5	Not measured	32	0.3	0.033	0.006
5/28/2014	2014	22	0.12	0.5	Not measured	15	0.1	0.033	0.000

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5/28/2014	2014	22	0.03	0.5	Not measured	15	0.1	0.033	0.000
5/28/2014	2014	22	0.07	0.5	Not measured	15	0.1	0.033	0.000
5/29/2014	2014	22	0.28	0.5	Not measured	15	0.1	0.033	0.001
5/29/2014	2014	22	0.05	0.5	Not measured	15	0.1	0.033	0.000
5/29/2014	2014	22	0.08	0.5	Not measured	15	0.1	0.033	0.000
5/29/2014	2014	22	0.03	0.5	Not measured	15	0.1	0.033	0.000
6/2/2014	2014	23	0.75	0.5	Not measured	54	0.4	0.033	0.011
6/2/2014	2014	23	0.73	0.5	Not measured	54	0.4	0.033	0.010
6/2/2014	2014	23	0.77	0.5	Not measured	54	0.4	0.033	0.011
6/2/2014	2014	23	0.75	0.5	Not measured	54	0.4	0.033	0.011
6/2/2014	2014	23	0.87	0.5	Not measured	54	0.4	0.033	0.012
6/2/2014	2014	23	0.12	0.5	Not measured	15	0.1	0.033	0.000
6/2/2014	2014	23	0.08	0.5	Not measured	15	0.1	0.033	0.000
6/2/2014	2014	23	0.12	0.5	Not measured	15	0.1	0.033	0.000
6/2/2014	2014	23	0.05	0.5	Not measured	15	0.1	0.033	0.000
6/2/2014	2014	23	0.13	0.5	Not measured	15	0.1	0.033	0.001
6/2/2014	2014	23	0.05	0.17	Not measured	77	0.6	0.033	0.001
6/2/2014	2014	23	0.12	0.17	Not measured	77	0.6	0.033	0.002
6/3/2014	2014	23	0.77	0.5	Not measured	54	0.4	0.033	0.011
6/3/2014	2014	23	0.08	0.5	Not measured	15	0.1	0.033	0.000
6/3/2014	2014	23	0.12	0.17	Not measured	77	0.6	0.033	0.002
6/3/2014	2014	23	0.12	0.17	Not measured	77	0.6	0.033	0.002
6/3/2014	2014	23	0.08	0.17	Not measured	77	0.6	0.033	0.002
6/3/2014	2014	23	0.17	0.17	Not measured	77	0.6	0.033	0.003
6/4/2014	2014	23	0.78	0.5	Not measured	54	0.4	0.033	0.011
6/4/2014	2014	23	0.73	0.5	Not measured	54	0.4	0.033	0.010
6/4/2014	2014	23	0.78	0.5	Not measured	54	0.4	0.033	0.011
6/4/2014	2014	23	0.75	0.5	Not measured	54	0.4	0.033	0.011
6/4/2014	2014	23	0.02	0.17	Not measured	77	0.6	0.033	0.000
6/4/2014	2014	23	0.02	0.17	Not measured	77	0.6	0.033	0.000
6/4/2014	2014	23	0.02	0.17	Not measured	77	0.6	0.033	0.000

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Date	Year	Week	Net Impact Pile Driving Duration (hrs/pile)	Pile Driving Time from Table 9 of the NMFS BO (hrs/pile)	Average width of isopleth for 206-dB peak SPL (feet)	Maximum width of isopleth for 206-dB peak SPL (feet)	Number of gill nets to span the 206-dB peak SPL isopleth	Sturgeon encounter rate (fish/net/ hour)	Sturgeon take
6/5/2014	2014	23	0.78	0.5	Not measured	54	0.4	0.033	0.011
6/5/2014	2014	23	0.73	0.5	Not measured	54	0.4	0.033	0.010
6/5/2014	2014	23	0.23	0.5	Not measured	15	0.1	0.033	0.001
6/5/2014	2014	23	0.17	0.5	Not measured	15	0.1	0.033	0.001
6/5/2014	2014	23	0.15	0.5	Not measured	15	0.1	0.033	0.001
6/5/2014	2014	23	0.17	0.5	Not measured	15	0.1	0.033	0.001
6/5/2014	2014	23	0.05	0.17	Not measured	77	0.6	0.033	0.001
6/6/2014	2014	23	0.70	0.5	Not measured	56	0.4	0.033	0.010
6/6/2014	2014	23	0.77	0.5	Not measured	56	0.4	0.033	0.011
6/6/2014	2014	23	0.60	0.5	Not measured	56	0.4	0.033	0.009
6/6/2014	2014	23	0.70	0.5	Not measured	56	0.4	0.033	0.010
6/6/2014	2014	23	0.67	0.5	Not measured	56	0.4	0.033	0.010
6/9/2014	2014	24	0.72	0.5	19	32	0.2	0.033	0.004
6/9/2014	2014	24	0.73	0.5	Not measured	32	0.3	0.033	0.006
6/10/2014	2014	24	0.82	0.5	48	32	0.4	0.033	0.010
6/10/2014	2014	24	0.72	0.5	48	32	0.4	0.033	0.009
6/10/2014	2014	24	0.87	0.5	50	32	0.4	0.033	0.011
6/11/2014	2014	24	0.60	0.5	25	32	0.2	0.033	0.004
6/11/2014	2014	24	0.45	0.5	30	32	0.2	0.033	0.004
6/11/2014	2014	24	0.50	0.5	56	32	0.4	0.033	0.007
6/11/2014	2014	24	0.48	0.5	19	32	0.2	0.033	0.002
6/11/2014	2014	24	0.60	1	Not measured	60	0.5	0.033	0.010
6/11/2014	2014	24	0.13	0.5	Not measured	15	0.1	0.033	0.001
6/11/2014	2014	24	0.12	0.5	Not measured	15	0.1	0.033	0.000
6/11/2014	2014	24	0.10	0.5	Not measured	15	0.1	0.033	0.000
6/11/2014	2014	24	0.08	0.5	Not measured	15	0.1	0.033	0.000
6/11/2014	2014	24	0.13	0.5	Not measured	15	0.1	0.033	0.001
6/11/2014	2014	24	0.10	0.5	Not measured	15	0.1	0.033	0.000
6/11/2014	2014	24	0.12	0.5	Not measured	15	0.1	0.033	0.000
6/12/2014	2014	24	0.53	0.5	10	32	0.1	0.033	0.001
6/12/2014	2014	24	0.55	0.5	6	32	< 0.1	0.033	0.001

Report Period: 05/18/2014 to 06/14/2014

Date	Year	Week	Net Impact Pile Driving Duration (hrs/pile)	Pile Driving Time from Table 9 of the NMFS BO (hrs/pile)	Average width of isopleth for 206-dB peak SPL (feet)	Maximum width of isopleth for 206-dB peak SPL (feet)	Number of gill nets to span the 206-dB peak SPL isopleth	Sturgeon encounter rate (fish/net/ hour)	Sturgeon take
6/12/2014	2014	24	0.50	0.5	12	32	0.1	0.033	0.002
6/12/2014	2014	24	0.58	0.5	54	32	0.4	0.033	0.008
6/12/2014	2014	24	0.58	0.5	51	32	0.4	0.033	0.008
6/12/2014	2014	24	0.57	0.5	46	32	0.4	0.033	0.007
6/12/2014	2014	24	0.58	0.5	39	32	0.3	0.033	0.006
6/13/2014	2014	24	0.12	0.5	Not measured	15	0.1	0.033	0.000
6/13/2014	2014	24	0.08	0.5	Not measured	15	0.1	0.033	0.000
6/13/2014	2014	24	0.10	0.5	Not measured	15	0.1	0.033	0.000
6/13/2014	2014	24	0.08	0.5	Not measured	15	0.1	0.033	0.000
Monthly sturgeon take (Calculated based on pile-driving data/Anticipated from Table 10 of the April 2014 NMFS BO)									0.45/1.34
Cumulative sturgeon take to date (Calculated based on pile-driving data/Anticipated from Table 10 of the April 2014 NMFS BO)									3.83/15.61