

Monthly Pile Driving Summary and Underwater Noise Monitoring Results

Pile Driving Period: December 28, 2014 – January 24, 2015

DOC Reference: TA_FHWA_03076_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 sturgeon take for this reporting period was 0.18 sturgeon (that is, less than 1 sturgeon), which is less than the 0.52 sturgeon that was anticipated based on the NMFS Biological Opinion (NMFS BO).

Introduction:

As required under the NMFS BO, dated September 23, 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 piles for the time period beginning December 28, 2014 through January 24, 2015.

As required under this condition, an estimate of sturgeon take for piles driven during the most recent monthly 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 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 12 of the NMFS BO to ensure that sturgeon take is not being exceeded. Sturgeon take summarized in Table 12 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 monthly period from December 28, 2014 through January 24, 2015, [redacted] piles were driven. Of these, [redacted] piles were [redacted] piles driven at [redacted] and [redacted] were [redacted] piles driven at [redacted], all located on the Rockland approach. These piles correspond to those driven during weeks 30-31 of 2014 [redacted], weeks 45-46 of 2014 [redacted], and week 10 of 2015 (19EB) in Table 12 of the NMFS BO.

Anticipated Sturgeon Take from Table 12 of the NMFS BO

For the purposes of tracking take associated with the subset of piles from the groups of piles shown in Table 12¹ (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 12 for the [redacted] piles at [redacted], the anticipated take of 1 sturgeon for piles in the group that includes those Piers was divided by 56 piles for this group which resulted in an estimate of 0.02 sturgeon per pile for this group. To calculate anticipated sturgeon take per pile from Table 12 for the [redacted] at [redacted], the anticipated take of 1 sturgeon for piles in the group containing [redacted] was divided by [redacted] piles for this group which resulted in an estimate of 0.02 sturgeon per pile for this group.

The [redacted] piles driven at [redacted] are included in two separate groups of piles in Table 12. Therefore, to calculate anticipated sturgeon take per pile, the anticipated take of 3 sturgeon for piles in the group containing [redacted] of the piles at [redacted] (week 30) was divided by the [redacted] piles for this group and the anticipated take of 1 sturgeon for piles in the group containing [redacted] piles at [redacted] (week 31) was divided by the [redacted] piles for that group. The result for both groups was an estimate of 0.01 sturgeon per pile.

Based on these values:

- the anticipated take from Table 12 for the [redacted] piles driven from December 28, 2014 through January 24, 2015 was 0.52 sturgeon, which was calculated as the sum of the following 4 components:
 - 0.02 sturgeon per pile multiplied by [redacted] piles,
 - 0.02 sturgeon per pile multiplied by [redacted] piles,
 - 0.01 sturgeon per pile multiplied by [redacted] piles, and
 - 0.01 sturgeon per pile multiplied by [redacted] piles.
- the cumulative take associated with the [redacted] piles driven to date (which includes trestle piles, test piles, and production piles as anticipated in Table 12 of the NMFS BO) is the sum of the anticipated take values for all [redacted] piles, or 25.32 sturgeon.

Calculated Sturgeon Take for this reporting period

¹ Anticipated take was calculated in Table 12 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.

Following the same method used to estimate incidental sturgeon take for Table 12, 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.

Impact pile driving has been completed for [REDACTED] piles; none were driven during this reporting period.

For the [REDACTED] piles driven at [REDACTED] along the Rockland approach, pile-driving times ranged from 0.45 to 1.33 hours to install and averaged 0.79 hours, which was greater than the anticipated duration of 0.5 hours reported in Table 12 of the NMFS BO. The majority [REDACTED] of piles driven at [REDACTED] during this period exceeded the anticipated duration listed in Table 12 of the NMFS BO; many of these piles required more than 1 day of impact pile driving to fully seat the pile. No piles were monitored for underwater noise during this reporting period. Therefore, the diameter of the 206 dB SPL peak isopleth used to estimate sturgeon take was equal to 35 feet, which was the maximum diameter measured for piles monitored at [REDACTED] previously.

For the [REDACTED] piles driven at [REDACTED] along the Rockland approach, pile-driving times ranged from 0.07 to 0.22 hours to install and averaged 0.13 hours, which was less than the anticipated duration of 0.33 hours reported in Table 12 of the NMFS BO. None of the piles driven at [REDACTED] [REDACTED] during this period exceeded the anticipated duration listed in Table 12 of the NMFS BO. No piles were monitored for underwater noise during this reporting period. Therefore, the diameter of the 206 dB SPL peak isopleth used to estimate sturgeon take was equal to 77 feet, which was the maximum diameter measured for piles monitored at the Rockland trestle previously.

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

- the incidental sturgeon take for the [REDACTED] piles driven during the monthly period from December 28, 2014 through January 24, 2015 was calculated as 0.18 sturgeon, which is less than the estimate of 0.52 sturgeon for the same [REDACTED] piles listed in Table 12,
- the cumulative incidental take for the [REDACTED] piles driven to date (which includes trestle piles, test piles, and production piles as anticipated in Table 12 of the NMFS BO) was calculated as 6.61 sturgeon, which is less than the anticipated take of 25.32 sturgeon for the same [REDACTED] piles in Table 12.

Despite the longer than anticipated pile-driving times for many of the [REDACTED] [REDACTED] along the Rockland approach, the size of the 206 dB SPL peak isopleth was likely smaller than that anticipated in Table 12 of the NMFS BO based on underwater noise monitoring conducted by TZC/Jasco for representative piles. In addition, the conservatism applied to estimating sturgeon take in the NMFS BO (i.e., rounding up from 0.05 to the nearest 1 sturgeon)

resulted in a total observed sturgeon take for all piles that was less than the anticipated take for piles driven during the current reporting period. Therefore, incidental take for sturgeon was not exceeded during the most recent monthly reporting period for pile driving, nor has the cumulative sturgeon take been exceeded for all piles driven to date.

Report Period: 12/28/2014 to 1/24/2015

| Date | Year | Week | Net Impact Pile Driving Duration (hrs/pile) | Pile driving time from Table 12 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 |
|------------|------|------|---|---|--|--|--|---|---------------|
| 12/4/2014 | 2014 | 49 | 0.22 | 0.5 | Not measured | 35 | 0.3 | 0.033 | 0.002 |
| 12/4/2014 | 2014 | 49 | 0.25 | 0.5 | Not measured | 35 | 0.3 | 0.033 | 0.002 |
| 12/4/2014 | 2014 | 49 | 0.28 | 0.5 | Not measured | 35 | 0.3 | 0.033 | 0.003 |
| 12/22/2014 | 2014 | 52 | 0.08 | 0.5 | Not measured | 35 | 0.3 | 0.033 | 0.001 |
| 12/22/2014 | 2014 | 52 | 0.03 | 0.5 | Not measured | 35 | 0.3 | 0.033 | 0.000 |
| 12/22/2014 | 2014 | 52 | 0.13 | 0.5 | Not measured | 35 | 0.3 | 0.033 | 0.001 |
| 12/22/2014 | 2014 | 52 | 0.02 | 0.5 | Not measured | 35 | 0.3 | 0.033 | 0.000 |
| 12/22/2014 | 2014 | 52 | 0.07 | 0.5 | Not measured | 35 | 0.3 | 0.033 | 0.001 |
| 12/22/2014 | 2014 | 52 | 0.03 | 0.5 | Not measured | 35 | 0.3 | 0.033 | 0.000 |
| 1/5/2015 | 2015 | 2 | 0.13 | 0.33 | Not measured | 77 | 0.6 | 0.033 | 0.003 |
| 1/6/2015 | 2015 | 2 | 0.07 | 0.33 | Not measured | 77 | 0.6 | 0.033 | 0.001 |
| 1/6/2015 | 2015 | 2 | 0.22 | 0.33 | Not measured | 77 | 0.6 | 0.033 | 0.004 |
| 1/6/2015 | 2015 | 2 | 0.12 | 0.33 | Not measured | 77 | 0.6 | 0.033 | 0.002 |
| 1/6/2015 | 2015 | 2 | 0.08 | 0.33 | Not measured | 77 | 0.6 | 0.033 | 0.002 |
| 1/6/2015 | 2015 | 2 | 0.13 | 0.33 | Not measured | 77 | 0.6 | 0.033 | 0.003 |
| 1/6/2015 | 2015 | 2 | 0.18 | 0.33 | Not measured | 77 | 0.6 | 0.033 | 0.004 |
| 1/6/2015 | 2015 | 2 | 0.08 | 0.33 | Not measured | 77 | 0.6 | 0.033 | 0.002 |
| 1/6/2015 | 2015 | 2 | 0.18 | 0.33 | Not measured | 77 | 0.6 | 0.033 | 0.004 |
| 1/6/2015 | 2015 | 2 | 0.13 | 0.33 | Not measured | 77 | 0.6 | 0.033 | 0.003 |
| 1/8/2015 | 2015 | 2 | 0.47 | 0.5 | Not measured | 35 | 0.3 | 0.033 | 0.004 |
| 1/8/2015 | 2015 | 2 | 0.40 | 0.5 | Not measured | 35 | 0.3 | 0.033 | 0.004 |
| 1/8/2015 | 2015 | 2 | 0.33 | 0.5 | Not measured | 35 | 0.3 | 0.033 | 0.003 |
| 1/15/2015 | 2015 | 3 | 0.65 | 0.5 | Not measured | 35 | 0.3 | 0.033 | 0.006 |
| 1/15/2015 | 2015 | 3 | 0.65 | 0.5 | Not measured | 35 | 0.3 | 0.033 | 0.006 |
| 1/15/2015 | 2015 | 3 | 0.58 | 0.5 | Not measured | 35 | 0.3 | 0.033 | 0.005 |
| 1/16/2015 | 2015 | 3 | 0.75 | 0.5 | Not measured | 35 | 0.3 | 0.033 | 0.007 |
| 1/16/2015 | 2015 | 3 | 0.62 | 0.5 | Not measured | 35 | 0.3 | 0.033 | 0.006 |
| 1/16/2015 | 2015 | 3 | 0.58 | 0.5 | Not measured | 35 | 0.3 | 0.033 | 0.005 |
| 1/16/2015 | 2015 | 3 | 0.63 | 0.5 | Not measured | 35 | 0.3 | 0.033 | 0.006 |
| 1/19/2015 | 2015 | 4 | 0.55 | 0.5 | Not measured | 35 | 0.3 | 0.033 | 0.005 |
| 1/19/2015 | 2015 | 4 | 0.50 | 0.5 | Not measured | 35 | 0.3 | 0.033 | 0.005 |
| 1/19/2015 | 2015 | 4 | 0.58 | 0.5 | Not measured | 35 | 0.3 | 0.033 | 0.005 |

Report Period: 12/28/2014 to 1/24/2015

| Date | Year | Week | | Net Impact Pile Driving Duration (hrs/pile) | Pile driving time from Table 12 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 |
|---|------|------|--|---|---|--|--|--|---|-------------------|
| 1/19/2015 | 2015 | 4 | | 0.48 | 0.5 | Not measured | 35 | 0.3 | 0.033 | 0.004 |
| 1/20/2015 | 2015 | 4 | | 0.60 | 0.5 | Not measured | 35 | 0.3 | 0.033 | 0.006 |
| 1/20/2015 | 2015 | 4 | | 0.53 | 0.5 | Not measured | 35 | 0.3 | 0.033 | 0.005 |
| 1/20/2015 | 2015 | 4 | | 0.60 | 0.5 | Not measured | 35 | 0.3 | 0.033 | 0.006 |
| 1/20/2015 | 2015 | 4 | | 0.50 | 0.5 | Not measured | 35 | 0.3 | 0.033 | 0.005 |
| 1/20/2015 | 2015 | 4 | | 0.45 | 0.5 | Not measured | 35 | 0.3 | 0.033 | 0.004 |
| 1/20/2015 | 2015 | 4 | | 0.63 | 0.5 | Not measured | 35 | 0.3 | 0.033 | 0.006 |
| 1/20/2015 | 2015 | 4 | | 0.58 | 0.5 | Not measured | 35 | 0.3 | 0.033 | 0.005 |
| 1/21/2015 | 2015 | 4 | | 0.77 | 0.5 | Not measured | 35 | 0.3 | 0.033 | 0.007 |
| 1/21/2015 | 2015 | 4 | | 0.57 | 0.5 | Not measured | 35 | 0.3 | 0.033 | 0.005 |
| 1/21/2015 | 2015 | 4 | | 0.65 | 0.5 | Not measured | 35 | 0.3 | 0.033 | 0.006 |
| 1/21/2015 | 2015 | 4 | | 0.47 | 0.5 | Not measured | 35 | 0.3 | 0.033 | 0.004 |
| 1/21/2015 | 2015 | 4 | | 0.50 | 0.5 | Not measured | 35 | 0.3 | 0.033 | 0.005 |
| 1/21/2015 | 2015 | 4 | | 0.35 | 0.5 | Not measured | 35 | 0.3 | 0.033 | 0.003 |
| 1/21/2015 | 2015 | 4 | | 0.43 | 0.5 | Not measured | 35 | 0.3 | 0.033 | 0.004 |
| Monthly sturgeon take (Calculated based on pile-driving data/Anticipated from Table 12 of the September 2014 NMFS BO) | | | | | | | | | | 0.18/0.52 |
| Cumulative sturgeon take to date (Calculated based on pile-driving data/Anticipated from Table 12 of the September 2014 NMFS BO) | | | | | | | | | | 6.61/25.32 |

*Impact driving of piles occurred over 2-3 days during this period.