Appendix F: Ecology
F-5B Appendix to Underwater Ambient Sound Level in the Hudson River near the Tappan Zee Bridge: Short and Long Span Ambient Noise Modeling (Jasco, July 2011)
Tappan Zee Bridge Construction
Hydroacoustic Noise Modeling

Appendices

Submitted to:
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Appendix A. Cumulative cSEL Scenario Maps

A.1. Single Level Bridge: No BMPs Applied

A.1.1. Max Case 1 (also dual level bridge)
A.1.2. Max Case 2A

Multiple Strike cSEL (dB re 1 \mu Pa^2) without BMPs

P23 - 3 x 4 ft piles, 3800 strikes each,
P38 - 3 x 8 ft piles, 2100 strikes each, and
P48 - 4 x 6 ft piles, 1000 strikes each

January 27, 2011
A.1.3. Max Case 3 (also dual level bridge)

Multiple Strike cSEL (dB re 1 \mu Pa^2 s) without BMPs
P8/P15 - 3 x 4 ft piles, 3800 strikes each and
P27/P48 - 4 x 6 ft piles, 1000 strikes each

January 27, 2011
A.1.4. Typical Case 1 (also dual level bridge)
A.1.5. Typical Case 2A

Multiple Strike cSEL (dB re 1 μPa²/s) without BMPs
P23 - 2 x 4 ft piles, 3800 strikes each,
P38 - 2 x 8 ft piles, 2100 strikes each, and
P48 - 2 x 6 ft piles, 1000 strikes each

January 27, 2011
A.1.6. Typical Case 3 (also dual level bridge)

![Diagram of Typical Case 3](image)

Multiple Strike cSEL (dB re 1 µPa² s) without BMPs
P12/P23 - 2 x 4 ft piles, 3800 strikes each and
P16/P30 - 2 x 4 ft piles, 3800 strikes each

January 27, 2011
A.2. Single Level Bridge: BMPs Applied

A.2.1. Max Case 1 (also dual level bridge)
A.2.2. Max Case 2A

Multiple Strike cSEL (dB re 1 \( \mu \text{Pa}^2 \text{s} \)) with BMPs

P23 - 3 x 4 ft piles, 3800 strikes each,
P38 - 3 x 8 ft piles, 2100 strikes each, and
P48 - 4 x 6 ft piles, 1000 strikes each

January 27, 2011
A.2.3. Max Case 3 (also dual level bridge)

Multiple Strike cSEL (dB re 1 $\mu$Pa's) with BMPs
P8/P15 - 3 x 4 ft piles, 3800 strikes each and
P27/P48 - 4 x 6 ft piles, 1000 strikes each

January 27, 2011
A.2.4. Typical Case 1 (also dual level bridge)

Multiple Strike cSEL (dB re 1 \(\mu\)Pa\(^2\)s) with BMPs

P24/P44 - 1 x 10 ft pile, 2900 strikes each and
P25/P45 - 1 x 10 ft pile, 2900 strikes each

January 27, 2011
A.2.5. Typical Case 2A

Multiple Strike cSEL (dB re 1 μPa²s) with BMPs

- P23 - 2 x 4 ft piles, 3800 strikes each,
- P38 - 2 x 8 ft piles, 2100 strikes each, and
- P48 - 2 x 6 ft piles, 1000 strikes each

January 27, 2011
A.2.6. Typical Case 3 (also dual level bridge)
A.3. Dual Level Bridge: No BMPs Applied

A.3.1. Max Case 1

Sound level contours are identical to those of the single level bridge in section A.1.1. Max Case 1 (also dual level bridge).
A.3.2. Max Case 2B
A.3.3. Max Case 3
Sound level contours are identical to those of the single level bridge in section A.1.3. Max Case 3 (also dual level bridge).
A.3.4. Typical Case 1

Sound level contours are identical to those in the single level bridge section A.1.4. Typical Case 1 (also dual level bridge).
A.3.5. Typical Case 2B

Multiple Strike cSEL (dB re 1 μPa²s) without BMPs

P20 - 2 x 8 ft piles, 2100 strikes each and
P27 - 2 x 6 ft piles, 1000 strikes each

January 27, 2011
A.3.6. Typical Case 3
Sound level contours are identical to those of the single level bridge in section A.1.6. Typical Case 3 (also dual level bridge).
A.4. Dual Level Bridge: BMPs Applied

A.4.1. Max Case 1
Sound level contours are identical to those of the single level bridge in section A.2.1. Max Case 1 (also dual level bridge).
A.4.2. Max Case 2B

Multiple Strike cSEL (dB re 1 μPa s) with BMPs
P20 - 3 x 8 ft piles, 2100 strikes each and
P27 - 4 x 6 ft piles, 1000 strikes each

January 27, 2011
A.4.3. Max Case 3
Sound level contours are identical to those of the single level bridge in section A.2.3. Max Case 3 (also dual level bridge).
A.4.4. Typical Case 1

Sound level contours are identical to those of the single level bridge in section A.2.4. Typical Case 1 (also dual level bridge).
A.4.5. Typical Case 2B

Multiple Strike cSEL (dB re 1 μPa²s) with BMPs

P20 - 2 x 8 ft piles, 2100 strikes each and
P27 - 2 x 6 ft piles, 1000 strikes each

January 27, 2011
A.4.6. Typical Case 3

Sound level contours are identical to those of the single level bridge in section A.2.6. Typical Case 3 (also dual level bridge).
Appendix B. Single Strike SEL Scenario Maps

B.1. Single and Dual Level Bridge: No BMPs Applied

B.1.1. 4’ pile size
B.1.2. 6’ pile size

![Diagram showing Single Strike SEL (dB re 1 μPa²/s) without BMPs for P27/P48 - 6 ft pile.](image)

January 31, 2011
B.1.3. 8' pile size

Single Strike SEL (dB re 1 μPa²) without BMPs
P20/P38 - 8 ft pile

January 31, 2011
B.1.4. 10’ pile size

Single Strike SEL (dB re 1 μPa²/s) without BMPs
P24/P44 - 10 ft pile

January 31, 2011
B.2. Single and Dual Level Bridge: BMPs Applied

B.2.1. 4’ pile size
B.2.2. 6’ pile size
B.2.3. 8’ pile size

Single Strike SEL (dB re 1 μPa²/s) with BMPs
P20/P38 - 8 ft pile

January 31, 2011
B.2.4. 10’ pile size

Single Strike SEL (dB re 1 \mu Pa^2 s) with BMPs
P24/P44 - 10 ft pile

January 31, 2011
Appendix C. *rms* SPL Scenario Maps

C.1. Single and Dual Level Bridge: No BMPs Applied

C.1.1. 4’ pile size
C.1.2. 6’ pile size

ms SPL (dB re 1 μPa) without BMPs

P27/P48 - 6 ft pile

February 1, 2011
C.1.3. 8' pile size
C.1.4. 10' pile size

ms SPL (dB re 1 μPa) without BMPs

P24/P44 - 10 ft pile

February 1, 2011
C.2. Single and Dual Level Bridge: BMPs Applied

C.2.1. 4’ pile size
C.2.2. 6’ pile size

[Diagram showing the acoustic noise modeling results for a 6' pile size on February 1, 2011]
C.2.3. 8’ pile size
C.2.4. 10' pile size
Appendix D. Power Spectral Density Levels in 1/3-Octave Bands

D.1. Single and Dual Level Bridge: No BMPs Applied

D.1.1. 4’ pile size
Power spectral density levels (dB re 1 µPa²/Hz) for Scenario 17: Impact hammering a 4 ft diameter pile at Pier 12/23 without BMPs.

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D.1.2. 6’ pile size

Impact Hammering without BMPs
Scenario 18 [P27/48 - 6 ft ø]
Power spectral density levels (dB re 1 µPa²/Hz) for Scenario 18: Impact hammering a 6 ft diameter pile at Pier 27/48 without BMPs.

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D.1.3. 8' pile size

Impact Hammering without BMPs
Scenario 19 [P20/38 - 8 ft ø]

Power Spectral Density Level (dB re 1 μPa²/Hz)

Frequency (Hz)

Receiver Stations

- CC1
- CC2
- CC3
- CC4
- CC5
- SC1
- WC1
- WC2
- WC3
- WS1
- WS2
- WS3
- WS4
- WS5

Version 1.0
Power spectral density levels (dB re 1 µPa^2/Hz) for Scenario 19: Impact hammering an 8 ft diameter pile at Pier 20/38 without BMPs.

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D.1.4. 10’ pile size

Impact Hammering without BMPs
Scenario 20 [P24/44 - 10 ft ø]
Power spectral density levels (dB re 1 µPa²/Hz) for Scenario 20: impact hammering a 10 ft diameter pile at Pier 24/44 without BMPs.

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D.2. Single and Dual Level Bridge: BMPs Applied

D.2.1. 4’ pile size
Power spectral density levels (dB re 1 μPa²/Hz) for Scenario 21: Impact hammering a 4 ft diameter pile at Pier 12/23 with BMPs.

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D.2.2. 6’ pile size
Power spectral density levels (dB re 1 µPa²/Hz) for Scenario 22: Impact hammering a 6 ft diameter pile at Pier 27/48 with BMPs.

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D.2.3. 8’ pile size

Impact Hammering with BMPs
Scenario 23 [P20/38 - 8 ft ø]
Power spectral density levels (dB re 1 \(\mu\)Pa\(^2\)/Hz) for Scenario 23: Impact hammering an 8 ft diameter pile at Pier 20/38 with BMPs.

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D.2.4. 10' pile size

Impact Hammering with BMPs
Scenario 24 [P24/44 - 10 ft ø]

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- CC1
- CC2
- CC3
- CC4
- CC5
- SC1
- WC1
- WC2
- WC3
- WS1
- WS2
- WS3
- WS4
- WS5

Power Spectral Density Level (dB re 1 µPa²/Hz)

Frequency (Hz)
Power spectral density levels (dB re 1 µPa²/Hz) for Scenario 24: Impact hammering a 10 ft diameter pile at Pier 24/44 with BMPs.

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