ESTIMATED AUDITORY BANDWIDTHS FOR MARINE MAMMALS AND FISH

<table>
<thead>
<tr>
<th>Functional Hearing Group</th>
<th>Generalized Functional Hearing Frequency Range*</th>
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<tbody>
<tr>
<td><strong>Low-frequency Cetaceans</strong></td>
<td>Baleen whales 7 Hz to 35 kHz</td>
</tr>
<tr>
<td><strong>Mid-frequency Cetaceans</strong></td>
<td>Dolphins, toothed whales, beaked whales, bottlenose whales 150 Hz to 160 kHz</td>
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<tr>
<td><strong>High-frequency Cetaceans</strong></td>
<td>True porpoises 275 Hz to 160 kHz</td>
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<tr>
<td><strong>Phocid Pinnipeds in water</strong></td>
<td>True seals 50 Hz to 86 kHz</td>
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<tr>
<td><strong>Otariid Pinnipeds in water</strong></td>
<td>Sea lions and fur seals 60 Hz to 39 kHz</td>
</tr>
<tr>
<td><strong>Pinnipeds in air (haul outs)</strong></td>
<td>Phocids and Otariids 75 Hz to 30 kHz**</td>
</tr>
<tr>
<td><strong>Fish</strong></td>
<td>20 Hz to 1000 Hz***</td>
</tr>
</tbody>
</table>

The dominant frequencies from pile driving (impact or vibratory) are typically below 1,000 Hz. Thus, pile driving sounds are in the mid- to low-frequency range.

1 Hz = 0.001 kHz  
1 kHz = 1000 Hz

*Unless otherwise noted, source of estimated hearing ranges is NMFS (2016). Southall et al. (2007) designated these “functional hearing groups” for marine mammals and estimated the lower and upper frequencies of functional hearing of these groups. In general, animals are less sensitive to sounds at the outer edge of their functional range and most sensitive to sounds of frequencies within a smaller range somewhere in the middle of their functional hearing range (73 FR 60836).

**These ranges are essentially based on data for phocid seals, which have the broadest auditory bandwidths of the pinnipeds (Southall et al. 2007).

***Hastings and Popper (2005)