



MARINE MAMMAL COMMISSION

29 November 2019

Ms. Jolie Harrison, Chief
Permits and Conservation Division
Office of Protected Resources
National Marine Fisheries Service
1315 East-West Highway
Silver Spring, MD 20910-3225

Dear Ms. Harrison:

The Marine Mammal Commission (the Commission), in consultation with its Committee of Scientific Advisors on Marine Mammals, has reviewed the application submitted by the City of Astoria (the City) under section 101(a)(5)(D) of the Marine Mammal Protection Act. The City is proposing to take small numbers of marine mammals by harassment incidental to bridge replacement in Astoria, Oregon. The Commission also has reviewed the National Marine Fisheries Service's (NMFS) 6 November 2019 notice (83 Fed. Reg. 59773) announcing receipt of the application and proposing to issue the authorization, subject to certain conditions.

The City proposes to replace various bridges at the waterfront in Astoria, Oregon. This authorization would cover the second year of activities. Operators could install up to (1) 65 24-in permanent steel piles using a vibratory and impact hammer and (2) 65 36-in temporary steel piles using a vibratory hammer¹. They would remove 150 14-in timber piles and 65 36-in steel piles using a vibratory hammer and/or direct pull. The City would limit in-water pile-driving and -removal activities² to daylight hours on up to 21 days from December 2019 until December 2020.

NMFS preliminarily has determined that, at most, the proposed activities would temporarily modify the behavior of small numbers of California sea lions, harbor seals, and Steller sea lions. It also anticipates that any impact on the affected species and stocks would be negligible. NMFS does not anticipate any take of marine mammals by death or serious injury and believes that the potential for disturbance will be at the least practicable level because of the proposed mitigation measures. The proposed mitigation, monitoring, and reporting measures include—

- using a sound attenuation device (i.e., bubble curtain) during impact driving of piles and implementing various measures regarding performance standards;
- ceasing activities if a marine mammal comes within 10 m of any of the equipment;

¹ Pre-boring for the permanent piles may include vibratory hammering of 14-in H-piles or down-the-hole (DTH) drilling, both of which would occur within the 36-in casing.

² Additional above-water construction activities could occur from May to October 2020 for a total of 66 days.

- using two or three³ qualified protected species observers (PSOs) to monitor the Level A and B harassment zones⁴ for 30 minutes before, during, and for 30 minutes after the proposed activities⁵;
- using standard soft-start, delay, and shut-down procedures;
- using delay and shut-down procedures, if a species for which authorization has not been granted or if a species for which authorization has been granted but the authorized takes are met, approaches or is observed within the Level A and/or B harassment zone⁶;
- reporting injured and dead marine mammals to the Office of Protected Resources and the West Coast Regional Stranding Coordinator using NMFS's phased approach and suspending activities, if appropriate; and
- submitting a draft and final report

General comments

The Commission informally noted a number of issues that were not addressed prior to publication of the *Federal Register* notice (see the Addendum). Although the Commission appreciates that NMFS will resolve them accordingly in the preamble and the final authorization, it notes that to allow full and transparent public review these issues should have been identified and addressed prior to publication of the *Federal Register* notice.

Level B harassment takes of harbor seals

The Commission informally noted that NMFS vastly underestimated the number of Level B harassment takes of harbor seals. NMFS proposed to authorize up to 57 takes of harbor seals on each of the 21 days of activities, equating to 1,197 takes. For year 1 activities, the City reported that on average 11 harbor seals were taken by Level B harassment per day (OBEC Consulting Engineers and AKS Engineering & Forestry 2019). However, the PSOs only reported observations of seals out to 840 m, and the City did not extrapolate the observed numbers of takes to the total take that could have occurred in the entire Level B harassment zone, which extended to 1.6 km. Assuming PSOs were able to monitor effectively out to 1 km in year 1 and the Level B harassment zones for year 2 activities appear to extend to nearly 21 km to the northwest and 17 km to the northeast, the City easily would exceed the proposed number of Level B harassment takes.

As noted in the *Federal Register* notice, thousands of harbor seals have been reported to haul out at Desdemona Sands, which is the closest haul-out site to pile-driving and -removal activities and well within the Level B harassment zones reported herein (84 Fed. Reg. 59787). NMFS did not have actual haul-out counts of seals at Desdemona Sands or any of the other haul-out sites⁷ in the

³ Two would be used during impact installation and three would be used during vibratory installation and removal.

⁴ Level A harassment zones would be monitored daily, while Level B harassment zones would be monitored two days of every five-day work week.

⁵ PSO monitoring would occur on the first day and then every third day of each type of pile-driving and -removal activity.

⁶ The Commission informally noted that NMFS did not include this standard measure in the proposed authorization. NMFS indicated it would be included in the final authorization.

⁷ Including multiple haul-out sites in Chinook/Baker Bay, Grays Bay, and Taylor Sands and haul-out sites at Taylor Sands and in East Mooring Basin—thousands of seals have been known to haul out at those sites as well (Jeffries et al. 2000).

Level B harassment zone. Absent counts of harbor seals closer to the project site, NMFS used the maximum average count of harbor seals (n=57) at the South Jetty⁸ to estimate the number of Level B harassment takes. That number is far lower than the number of harbor seals that potentially could be taken by Level B harassment. The number of Level B harassment takes also is vastly underestimated compared to the 272 Steller sea lion takes that NMFS proposed to authorize for each of the 21 days of activities. Steller sea lions were not observed during year 1 activities and have not been reported and are not expected to occur in the project area in the thousands like harbor seals⁹.

Based on the Commission's concerns, NMFS agreed that the numbers of takes were underestimated and contacted biologists at both the Oregon and Washington Department of Fish and Wildlife (ODFW and WDFW, respectively). The ODFW biologist indicated that more than 6,000 harbor seals have been observed by WDFW during the month of February, and NMFS is still awaiting an exact count from the WDFW biologist. However, in lieu of a more exact number, NMFS indicated that it would 'increase the harbor seal takes to 6,400, assuming that the same individuals would be taken multiple times'. The Commission inquired whether that meant NMFS would authorize the taking of up to 6,400 *individual* harbor seals multiple times but no more than 21 times or that NMFS would authorize 6,400 *total takes* of harbor seals. NMFS indicated it would authorize the former, but since it would be the same individuals being taken on multiple days, the total authorized takes would be 6,400. The Commission informed NMFS that it can only authorize one or the other, it cannot be both. Either NMFS is authorizing 6,400 individual harbor seals to be taken no more than 21 times each¹⁰ or it is authorizing up to 6,400 harbor seal takes¹¹.

Based on the average number of harbor seals observed during year 1 activities (n=11) and the effective sighting distance of 1 km¹², the resulting density of harbor seals within the nearshore project area would have been 7 seals/km². NMFS indicated in Table 8 of the *Federal Register* notice that the ensonified area associated with vibratory installation and removal of 36-in piles was 212.3 km² (84 Fed. Reg. 59786), which would result in an estimate of 1,486 harbor seal takes per day and 31,206 total harbor seal takes¹³. Given that the density of harbor seals observed in the far field both beyond the actual pile-driving and -removal activities¹⁴ and near the haul-out sites where they number in the thousands likely is much greater than the density observed during pile-driving activities in the near field, it would be more appropriate for NMFS to authorize 6,400 individual harbor seals¹⁵ to be taken no more than 21 times each than to authorize only 6,400 total harbor seal takes. If NMFS does not authorize a sufficient number of harbor seal takes, the City very likely will reach the authorized limit and be forced to cease its activities before they are completed. As such, the Commission recommends that NMFS authorize the taking of 6,400 individual harbor seals to be taken no more than 21 times each rather than 1,197 harbor seal takes.

⁸ Which is outside the Level B harassment zone.

⁹ And California sea lions.

¹⁰ Which would account for the 21 days of activities and could equate to more than 134,000 takes.

¹¹ Although NMFS generally has authorized taking based on the latter option, it has in a few instances, particularly for pinnipeds, authorized taking of a specified number of individuals up to a maximum number of times.

¹² Equating to a sighting area of 1.57 km².

¹³ Based on 21 days of activities.

¹⁴ During year 2 activities, PSOs will be positioned in the far field unlike during year 1 activities.

¹⁵ Which would equate to 26 percent of the population and within what NMFS has deemed a small number previously.

As referenced in its [11 September 2019 letter](#), the Commission has identified ongoing issues regarding appropriateness of pinniped take estimates for multiple recent authorizations involving activities in the Columbia River. Although NMFS did consult with ODFW and attempted to consult with WDFW to obtain more recent aerial survey data¹⁶, that consultation process did not occur until well within the public comment period and the public was not privy to the information obtained. The Commission understands that various action proponents plan to conduct additional activities in the Columbia River in the coming year. As such, the Commission again recommends that NMFS obtain more recent pinniped haul-out count data from WDFW and ODFW before processing *any* additional authorizations for activities occurring in the Columbia River.

Bubble curtain efficacy

The Commission previously commented on the assumptions used by NMFS regarding the efficacy of bubble curtains¹⁷. NMFS has adopted a standard 7-dB source level reduction when bubble curtains are to be used during impact pile driving, and in this case, during vibratory pile driving as well. Although variability in attenuation levels can result from differences in device design and site and environmental conditions and from difficulties in properly installing and operating sound attenuation devices, bubble curtains that are placed immediately around the pile do not achieve consistent reductions in sound levels because they cannot attenuate ground-borne sound¹⁸. That is, appreciable attenuation is not observed for the sound that resonates through the ground into the far field.

In the United States, bubble curtains originally were used to minimize both lethal and sub-lethal effects on fish in the near field caused by peak sound pressure levels (SPL). Bubble curtains that are placed immediately around the pile, as proposed for Carnival's activities, are intended to minimize those near-field, lethal effects. California Department of Transportation (Caltrans) determined that effectiveness of the bubble curtain varied with direction and distance from the pile and under different tidal conditions (Caltrans 2005). In general, the bubble curtain provided the greatest reduction in SPLs in the near field¹⁹. But, even in the near field, Caltrans (2015) stated that an assumed source level reduction should be limited to 5 dB, because of the uncertainties associated with the degree of attenuation that would be provided by a bubble curtain. At distances of 400–500 m, SPLs were reduced by only 1 to 2 dB.

Similarly, Austin et al. (2016)²⁰ noted that transmission loss consistently *decreased* when a bubble curtain²¹ was used, because it only attenuated in-water sound levels and some sound propagated directly from the pile into the seafloor unattenuated, which then propagated through the seafloor refracting back into the water column at longer ranges. In short, the bubble curtain attenuated the near-source sound levels, which are dominated by water-borne propagation paths, more strongly than the long-range sound levels, resulting in an apparent decrease of the rate of

¹⁶ Surveys were flown by WDFW and ODFW in 2014 and 2015.

¹⁷ Please review the Commission's [1 August 2019 letter](#), [14 May 2019 letter](#), and [21 May 2018 letter](#) in conjunction with this letter.

¹⁸ Bubble curtains also attenuate high-frequency rather than low-frequency sound.

¹⁹ In general, the majority of the sound level measurements have been collected in the near field (well within 100 m) for studies involving unattenuated and attenuated pile driving using a bubble curtain.

²⁰ Which is referenced by NMFS to support the source level reduction factor.

²¹ And resonator systems.

sound level decay between recorders (Austin et al. 2016). As one example, the sound levels at 1 km were comparable at 163.6 dB re 1 μ Pa for the unattenuated hydraulic hammer²² and 163.8 dB re 1 μ Pa for the bubble curtain-attenuated hydraulic hammer²³ (Austin et al. 2016). If the bubble curtain was effective, the sound levels would not be similar. More telling is the fact that the sound level at 1.06 km was 169.9 dB re 1 μ Pa for the *bubble curtain-attenuated* hydraulic hammer for IP10, which is more than 6 dB *greater* than for the *unattenuated* hydraulic hammer (see Table 8 of Austin et al. 2016). Austin et al. 2016 noted that transmission loss varied greatly, ranging from 12.6 to 19.2 log R for best fit data. Specifically, for IP10, the transmission loss was estimated to be 9.8 log R²⁴ for the far-field hydrophone, which explains why the sound levels are much greater for that pile. Similar results are evident for use of bubble curtains during vibratory pile driving. The sound level at 1.06 km was 139.8 dB re 1 μ Pa for IP10 which exceeded the unattenuated sound levels of 136.9 dB re 1 μ Pa at 959 m for IP1 and 138.6 dB re 1 μ Pa at 968 m for IP5 (see Table 11 in Austin et al. 2016).

All these findings not only confirm that variability and uncertainties exist, but more importantly that, at greater distances, more of the sound emitted during impact pile driving resonates from the ground than through the water column²⁵. Bubble curtains placed immediately around the pile are not designed to, nor can they, attenuate ground-borne sound—this is the reason European wind developers place bubble curtains in the far field at 100 m or more from the pile to minimize far-field effects on marine mammals.

In support of offshore wind energy in Germany, Bohne et al. (2019) conducted a review of modeling and ground-truthing noise mitigation associated with bubble curtains²⁶. They too found that, for frequencies greater than 200 Hz, measured attenuation was less for a bubble curtain placed at approximately 84 m from the pile than one placed at approximately 102 m from the pile (Bohne et al. 2019). The researchers further indicated that, by accounting for the inclination angle of the radiated sound wave, the radial distance between the bubble curtain and the pile determined the location of incidence. A location of incidence closer to the seabed, resulting from a smaller radial distance, elicited lesser attenuation (Bohne et al. 2019).

Moreover, mitigation effectiveness during impact pile driving was recently discussed in detail at a meeting hosted by Ørsted Wind Power North America LLC (Ørsted) that the Commission, NMFS, Bureau of Ocean Energy Management, and Illingworth & Rodkin, Inc.²⁷ (Illingworth & Rodkin) attended. Specifically, the experts noted that *any* type of near-field mitigation device placed

²² Based on the best-fit regression for impact pile (IP) 1 in Figure 64.

²³ Based on the best-fit regression for IP3 in Figure 66.

²⁴ Based on the best-fit source level intercept of 199.6 dB re 1 μ Pa for IP10 in Figure 76. The best-fit regression is based on an averaged transmission loss of 13.2 log R.

²⁵ This phenomenon also was noted in Caltrans (2015). If sound was primarily being emitted through the water column, comparable reductions (or greater reductions with increasing water depths) should be produced with increasing distance from the source, not lesser reductions.

²⁶ Bohne et al. (2019) noted that Würsig et al. (2000) measured sound emitted during bubble curtain use out to 1 km from the pile and observed a reduction of the broadband sound of around 5 dB. In review of Würsig et al. (2000), the researchers observed a reduction of 3 to 5 dB in the broadband sound, with lesser reductions farther from the source. Würsig et al. (2000) also noted that sound transmission probably occurred through the substrate under the bubble curtain, which can be seen in the frequencies less than 2 kHz in Figure 5B—the bubble curtain was placed at a 25-m radial distance from the pile.

²⁷ The contracting firm that conducted the measurements, including for bubble curtain effectiveness, and drafted the associated reports for Caltrans.

immediately around the pile *would not* attenuate ground-borne sound and that in Europe only devices, such as AdBm resonator systems and hydro-sound-damper (HSD) systems, are used in the near field²⁸. Bubble curtains, including double bubble curtains, are used *only* in the far field²⁹ to attenuate the ground-borne sound that has re-entered the water column beyond the near-field mitigation device. Representatives from Illingworth & Rodkin, Inc., did not dispute any of these facts, nor did NMFS question any of those assertions.

In response to the Commission's recommendation in its [11 September 2019 letter](#) that NMFS refrain from using a source level reduction factor until such time that it consults with Caltrans, effectively Illingworth & Rodkin, regarding the appropriate source level reduction factor to use to minimize far-field effects on marine mammals, NMFS indicated that³⁰ Caltrans and other entities that have pertinent data *may be contacted* as necessary (84 Fed. Reg. 53691). NMFS is aware that bubble curtains placed in the near field are not intended to, nor do they, attenuate ground-borne sound but appears to be disregarding both the fact that ground-borne sound adds appreciably to the far-field sound levels and the plethora of data that show attenuated and unattenuated median source levels measured in the field differ by only 1 to 6 dB at 10 m, let alone in the far field. Although it is unclear why NMFS is not consulting with the relevant experts, including acousticians at the University of Washington-Applied Physics Laboratory (UW-APL), to resolve this issue, it is clear that NMFS is not basing its use of the 7-dB source level reduction factor on best available science. As such, the Commission recommends that NMFS consult with acousticians, including those at UW-APL, regarding the appropriate source level reduction factor to use to minimize far-field effects on marine mammals³¹ for all relevant incidental take authorizations and, until the experts have been consulted, refrain from using a source level reduction factor when bubble curtains are to be implemented.

Authorization conditions

For the vast majority of incidental harassment authorizations involving construction projects, action proponents conduct pile driving and removal during daylight hours only. NMFS has in turn included requirements limiting those activities to daylight hours only in its *Federal Register* notices³² and draft³³ and final authorizations³⁴. In this instance, the City did not stipulate whether it would conduct pile-driving and -removal activities during daylight hours only, and neither the *Federal Register* notice nor the draft authorization included a requirement that the activities be conducted during that timeframe. The Commission informally noted that such a requirement should have been

²⁸ To minimize low-frequency sound emitted directly into the water column.

²⁹ Approximately 100 m from the pile.

³⁰ NMFS also referenced a previous notice (84 Fed. Reg. 45985) in which it stated that the linear averaged received level reduction was 6 dB for both near (< 100 m) and far (> 100 m) distances and when only the near-distance measurements were considered, the reduction was 7 dB. Therefore, NMFS stated that there was not a significant difference in source level reductions between near and far-distance measurements, and as a *conservative approach*, NMFS used the 7-dB reduction factor. Intricacies aside, use of 6 not 7 dB would have been considered a conservative approach.

³¹ Which also includes Level A harassment in some instances.

³² For example, see 84 Fed. Reg. 56799.

³³ As one example, see condition 4(g) in the U.S. Army Corps of Engineers authorizations for pile driving and removal in Coos Bay. <https://www.fisheries.noaa.gov/webdam/download/98219947> and <https://www.fisheries.noaa.gov/webdam/download/98219946>

³⁴ As one example, see condition 3(e) in the U.S. Army Corps of Engineers authorization for installing king piles in the Columbia River. <https://www.fisheries.noaa.gov/webdam/download/97781763>

included in both the notice and draft authorization. NMFS however indicated that the requirement was not standard and that it would not be included in the final authorization. The Commission disagrees for multiple reasons.

First, it is standard practice that action proponents conduct pile-driving and -removal activities during daylight hours only. In the last decade, approximately 1 percent of the authorizations involving pile driving and removal have involved those activities occurring during nighttime. While NMFS has not always included the requirement that pile-driving and -removal activities be conducted during daylight hours as a standard measure, omission of the requirement often has been inadvertent. The Commission has drawn attention in its letters to many instances of NMFS failing to include, in both the *Federal Register* notices and draft authorizations, measures that are considered standard.

Second, NMFS appears to believe that requiring action proponents to conduct pile-driving and -removal activities during daylight hours only is unnecessary, as it just reiterates how and when the action proponent plans to conduct the activities³⁵. One could argue, in instances when action proponents stipulate that activities would be conducted only during daylight hours, reiteration of that information is unnecessary. But, as is the case in this instance, many action proponents don't specify when they would conduct the activities, leaving one to assume they would occur only during daylight hours unless specified otherwise. More importantly, stipulating that action proponents must conduct activities during daylight hours does not fall into the same category as stipulating that activities would occur during a basic five-day work week³⁶. The timeframe during which activities would occur on a given day is more than a basic methodological description of the proposed activities, as it could have direct impacts on marine mammals.

Third, for those authorizations in which activities would occur during nighttime, action proponents justify why the activities must occur³⁷ at night and request numbers of takes accordingly³⁸. NMFS then makes its small numbers and negligible impact determinations based on the numbers of animals that could be taken during the day and night³⁹. Further, NMFS prescribes mitigation measures to ensure the least practicable adverse impact on a species or stock. When pile-driving and -removal activities occur at night, delay and shut-down measures cannot be implemented as the full extents of the shut-down zones are not visible and animals approaching those zones are not able to be seen. Thus, those measures likely would not be effecting the least practicable adverse impact on the species.

Given that NMFS's determinations for the City's activities regarding small numbers and negligible impact, as well as ensuring the mitigation measures are effecting the least practicable adverse impact on the species, are predicated on whether the activities occur during daylight hours only, that condition should be included in the final authorization. An argument can be made to include such a condition in the 'general conditions' portion of the authorization, as it applies to all

³⁵ That is, it is just a basic description of the proposed activities and need not be included in a final authorization, similar to the number and types of piles to be installed, equipment to be used, etc.

³⁶ Or during a specified time to minimize impacts to listed fish species, which would fall under a basic description of the proposed activities.

³⁷ Which in general are allowed to continue into nighttime hours only until the pile is driven to depth.

³⁸ See 84 Fed. Reg. 55933.

³⁹ Similar to geophysical and seismic surveys that can occur 24 hours per day.

findings under the permit, similar to stipulating the maximum number of pile driving days³³. Alternatively, such a condition could be included in the ‘mitigation measures’ portion of the authorization³⁴. In any case, stipulating that pile driving and removal can only occur during daylight hours should be included in the final authorization. As such, the Commission recommends that NMFS condition the final authorization to stipulate that pile driving and removal can occur during daylight hours only and include those conditions consistently in all *Federal Register* notices, draft authorizations, and final authorizations that do not involve activities occurring during nighttime.

As referenced in this section and in the Addendum, many of the issues regarding inclusion of consistent conditions and measures recur in the numerous proposed authorizations⁴⁰. Many are easily fixed when identified. However, many could be addressed preemptively if NMFS’s templates for both *Federal Register* notices and draft authorizations are amended accordingly. As such, the Commission recommends that NMFS (1) update its various templates for *Federal Register* notices and draft authorizations accordingly and (2) conduct a more thorough review of the notices, draft authorizations, and final authorizations to ensure accuracy, completeness, and consistency. These ongoing issues should be given the necessary due diligence so that time can be devoted to evaluating other aspects of the authorizations.

Proposed one-year authorization renewals

NMFS has indicated that it may issue a second one-year incidental harassment authorization renewal for this and other future authorizations if various criteria are met and after an expedited public comment period of 15 days. NMFS informed the Commission that the renewal would be issued as a one-time opportunity, after which time a new authorization application would be required. NMFS also has included such verbiage in its response to comments regarding renewals. Specifically, NMFS indicated that it had modified the language for future proposed incidental harassment authorizations to clarify that all authorizations, including renewal authorizations, are valid for no more than one year and that the agency will consider *only one renewal* for a project at this time (e.g., 84 Fed Reg. 36892 from 30 July 2019). However, NMFS has yet to stipulate that a renewal is a one-time opportunity in any *Federal Register* notice requesting comments on the possibility of a renewal, on its webpage detailing the renewal process⁴¹, or in any draft or final authorization that includes a term and condition for a renewal (including section 8 of the City’s draft authorization). It is unclear why this issue has yet to be resolved, given that NMFS has been including the possibility of issuing renewals in its proposed authorizations for nearly two years.

In addition, the Commission commented in its [22 November 2019 letter](#) that NMFS was not ensuring that the renewal requirements had been met prior to proposing to issue a renewal or following its renewal process⁴². Furthermore, the Commission and various other entities (e.g., 84 Fed. Reg. 31035 and 52466) have asserted and continue to affirm that the renewal process is inconsistent with the statutory requirements under section 101(a)(5)(D) of the MMPA. As such, the Commission recommends that NMFS refrain from issuing renewals for any authorization and

⁴⁰ See the Commission’s [6 November 2011 letter](#) as well.

⁴¹ <https://www.fisheries.noaa.gov/national/marine-mammal-protection/incidental-harassment-authorization-renewals>

⁴² NMFS has not been contacting directly all commenters on the original authorization, including the Commission to inform them of the opportunity to submit any additional comments on the proposed renewal authorization. It is unclear whether other commenters have been contacted.

instead use its abbreviated *Federal Register* notice process. That process is similarly expeditious and fulfills NMFS's intent to maximize efficiencies. If NMFS chooses to continue proposing to issue renewals, the Commission recommends that it (1) stipulate that a renewal is a one-time opportunity in all *Federal Register* notices requesting comments on the possibility of a renewal, on its webpage detailing the renewal process, and in all draft and final authorizations that include a term and condition for a renewal, (2) ensure that action proponents have met all renewal requirements prior to proposing to issue a renewal in the *Federal Register*, and (3) follow its own renewal process of informing all commenters on the original authorization of the opportunity to submit additional comments on the proposed renewal.

Please contact me if you have questions regarding the Commission's recommendations.

Sincerely,



Peter O. Thomas, Ph.D.,
Executive Director

References

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Addendum

The Commission informally identified the following issues in the preamble to and draft authorization. NMFS indicated that these issues would be resolved in the City's marine mammal monitoring plan, the final authorization, and the *Federal Register* notice for the authorization issuance.

- NMFS indicated in the *Federal Register* notice that the incidental harassment authorization would cover in-water activities that would begin in November 2019 and end in October 2020. Activities would not begin until the authorization is issued in December 2019 and would cover activities until December 2020.
- NMFS cited Washington State Department of Transportation (2016) as the reference for proxy source levels for vibratory installation of 14-in H-piles and impact installation of 24-in piles in the *Federal Register* notice. Caltrans (2015) is the reference for the source level for vibratory installation of 12-in H-piles that was used as a proxy for 14-in H-piles, while Laughlin (2005b) is the reference for the source level for impact installation of the 24-in piles. In addition, Table 10 in the notice incorrectly specified that the Level A harassment zone based on the peak SPL source level was 7.4 m for phocids. The Level A harassment zone for phocids does not exist, because the source level is less than the peak SPL threshold.
- NMFS inconsistently described and denoted DTH drilling in the *Federal Register* notice and draft authorization. Due to the presence of rip rap at the project sites, DTH drilling is expected to exhibit both impulsive and non-impulsive characteristics, similar to those discussed in Reyff and Heyvaert (2019). To be conservative, NMFS assumed that the extent of the Level B harassment zone for DTH drilling would be the same as vibratory installation of the 36-in piles. However, Tables 8 and 17 in the *Federal Register* notice did not include the DTH drilling information⁴³. NMFS also assumed that the extents of the Level A harassment zones (and shut-down zones) for DTH drilling would be the same as for impact installation of the 24-in piles, but neither Table 16 in the *Federal Register* notice nor Table 3 of the draft authorization included the DTH drilling notations.
- NMFS did not specify in the *Federal Register* notice that the City would be required to (1) use a bubble curtain and implement various measures regarding performance standards⁴⁴, (2) delay pile driving and removal if poor environmental conditions restrict full visibility of the shut-down zone(s) until the entire shut-down zone is visible⁴⁵, and (3) extrapolate the Level B harassment takes recorded by PSOs, as appropriate for each species, based upon the number of observed takes and the percentage of the Level B harassment zone that was not visible *and* the number of days that monitoring did not occur⁴⁴. In addition, NMFS specified in the *Federal Register* notice that the on-site inspector⁴⁶ would shut down activities if an animal enters the 10-m shut-down zone rather than the 50-m shut-down zone for harbor seals during impact and vibratory installation and removal and the 32-m shut-down zone for Steller sea lions during impact installation. Further, NMFS did not specify the number of

⁴³ The relevant Level B harassment zones were included in the draft authorization.

⁴⁴ This measure was specified in the draft authorization.

⁴⁵ This measure was not specified in the draft authorization either.

⁴⁶ On those days that PSOs would not be monitoring.

PSOs and how often they would be required to monitor or the extents of the Level A harassment zones⁴⁷ in the draft authorization⁴⁸.

Reference

- Caltrans. 2015. Technical guidance for assessment and mitigation of the hydroacoustic effects of pile driving on fish. State of California Department of Transportation, Sacramento, California. 532 pages.
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⁴⁷ Because the shut-down zones for harbor seals and California sea lions are smaller than the Level A harassment zones.

⁴⁸ All of these measures were specified in the *Federal Register* notice.