6 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 Carnival Corporation & PLC (Carnival) seeking authorization under section 101(a)(5)(D) of the Marine Mammal Protection Act (the MMPA) to take small numbers of marine mammals by harassment. The taking would be incidental to improvements at the cruise terminal in Long Beach, California. The Commission also has reviewed the National Marine Fisheries Service's (NMFS) 25 September 2019 notice (84 Fed. Reg. 54867) announcing receipt of the application and proposing to issue the authorization, subject to certain conditions.

Carnival plans to improve its existing berthing facilities and resolve safety issues at its vessel moorings in Long Beach. Operators would install 49 36-in steel pipe piles using a vibratory and impact hammer. The proposed activities could occur on up to 26 days, weather permitting. It would limit pile-driving and -removal activities to daylight hours from 15 November 2019 to 15 April 2020.

NMFS preliminarily has determined that, at most, the proposed activities could cause Level A and B harassment of small numbers of seven marine mammal species. NMFS anticipates that any impact on the affected species and stocks would be negligible. NMFS also 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 (e.g., bubble curtain) during vibratory and impact pile driving and implementing performance standards measures for the bubble curtain;
- ceasing pile-driving and -removal activities if any marine mammal comes within 10 m of the equipment;
- using numerous qualified land- and vessel-based protected species observers (PSOs) to monitor the Level A and B harassment zones for 30 minutes before, during, and for 30 minutes after the proposed activities;
- using 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 zone;
- reporting injured and dead marine mammals to the Office of Protected Resources and the West 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 to and the final authorization[1], it notes that to allow full and transparent public review they should have been identified and addressed prior to publication of the *Federal Register* notice.

Bubble curtain efficacy

The Commission previously commented on the assumptions used by NMFS regarding the efficacy of bubble curtains[2]. 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 sound. That is, appreciable attenuation is not observed for the sound that resonates through the ground into the far field. The Commission provides the following substantive analysis.

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 field[3]. 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.

[1] As well as Figure 4 in Carnival's marine mammal monitoring plan.
[2] Please review the Commission's 1 August 2019 letter, 14 May 2019 letter, and 21 May 2018 letter in conjunction with this letter.
[3] 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.

Similarly, Austin et al. (2016)[4] noted that transmission loss consistently decreased when a bubble curtain[5] 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 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 μPa for the unattenuated hydraulic hammer[6] and 163.8 dB re 1 μPa for the bubble curtain-attenuated hydraulic hammer[7] (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 μPa 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 R[8] 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 μPa for IP10 which exceeded the unattenuated sound levels of 136.9 dB re 1 μPa at 959 m for IP1 and 138.6 dB re 1 μPa 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 column[9]. 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 curtains[10]. 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

[4] Which is referenced by NMFS to support the source level reduction factor.
[5] And resonator systems.
[6] Based on the best-fit regression for impact pile (IP) 1 in Figure 64.
[7] Based on the best-fit regression for IP3 in Figure 66.
[8] Based on the best-fit source level intercept of 199.6 dB re 1 μPa for IP10 in Figure 76. The best-fit regression is based on an averaged transmission loss of 13.2 log R.
[9] 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.
[10] 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.

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[11], (Illingworth & Rodkin) also attended. Specifically, the experts noted that *any* type of near-field mitigation device placed immediately around the pile *would not* attenuate ground-borne sound and that in Europe only devices, such as AdM resonator systems and hydro-sound-damper (HSD) systems, are used in the near field[12]. Bubble curtains, including double bubble curtains, are used *only* in the far field[13] 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 that[14] 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 those at Caltrans/Illingworth & Rodkin, JASCO Applied Sciences (JASCO), or 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 the relevant experts at Caltrans/Illingworth & Rodkin, JASCO, and/or UW-APL regarding the appropriate source level reduction factor to use to minimize far-field effects on marine mammals[15] 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.

Level A harassment takes

NMFS proposed to authorize only five Level A harassment takes of harbor seals during the 26 days that impact pile driving could occur. Carnival would be required to shut down its activities

[11] The contracting firm that conducted the measurements, including for bubble curtain effectiveness, and drafted the associated reports for Caltrans.
[12] To minimize low-frequency sound emitted directly into the water column.
[13] Approximately 100 m from the pile.
[14] 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.
[15] Which also includes Level A harassment in some instances.

when a harbor seal is observed within 50 m of the pile being driven. However, the Level A harassment zone was estimated to be 120 m, and any seal observed between 51 and 120 m of the pile would be enumerated and reported as a Level A harassment take. In addition, a seal can pop up in the 50-m shut-down zone undetected before pile driving ceases and should be enumerated and reported as a Level A harassment take[16].

To estimate Level A harassment takes, NMFS used the density estimate derived from sightings data (MBC Applied Environmental Sciences 2016), the Level A harassment ensonified area, and the number of days of activities. Although the surveys conducted by MBC Applied Environmental Sciences (2016) occurred in the Port of Long Beach area, the surveys primarily were conducted to the west and south of the cruise terminal. Thus, the number of harbor seals that occur both at the cruise terminal[17] and within and to the east of the Long Beach breakwater, which comprise the extent of the Level B harassment zones, is unknown. Because the sightings data informed the density estimate, the representativeness of that estimate also is unknown. However, NMFS proposed to authorize more than 37 takes of harbor seals *per day* by Level B harassment. Thus, five takes of harbor seals by Level A harassment could easily be met over 26 days of activities when they are known to occur in the area. To minimize unnecessary delays if the authorized numbers of Level A harassment takes are met, the Commission recommends that NMFS increase the Level A harassment takes from 5 to at least 26 based on one harbor seal occurring within the 120-m Level A harassment zone on each of the days when impact pile driving would occur.

Tallying of takes

It is unclear whether Carnival would be keeping a running tally of the extrapolated takes to ensure the authorized takes are not exceeded. The Commission does not believe that keeping track of only the observed takes is sufficient when the Level B harassment zones extend to more than 8 km. For pinnipeds, PSOs generally cannot observe the animals beyond 1 km from the observation platform[18]. Mysticetes are generally observable out to a few kilometers. Thus, adjusting the takes based on the extent of the Level B harassment zone should be a simple calculation based on the sighting distance and number of PSOs monitoring at a given time. As such, the Commission recommends that NMFS ensure that Carnival keeps a running tally of the total takes for each species to comply with section 3(i) of the authorization.

Proposed one-year authorization renewals

NMFS has indicated that it may issue a second one-year[19] incidental harassment

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[16] The issue of how Level A harassment takes should be enumerated and reported was discussed extensively in another letter from 6 November 2019 regarding Alaska Department of Transportation's construction activities in Whittier. Those portions of that letter should be reviewed and considered for this one as well. In this instance, Carnival's cruise ship, moorings, passenger bridge, berthing pier, and construction equipment could limit sighting and tracking of individual animals.

[17] Anecdotal reports have indicated that seals have been observed following arriving and departing cruise ships.

[18] Keeping in mind that that radius also applies to the vessel. Assuming the entire vessel track is observed at a given time is not appropriate.

[19] 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 has yet to specify this in any *Federal Register* notice detailing the new proposed renewal process but should do so.

authorization renewal for this and other future authorizations if various criteria are met and after an expedited public comment period of 15 days. The Commission agrees that NMFS should take appropriate steps to streamline the authorization process under section 101(a)(5)(D) of the MMPA to the extent possible. However, the Commission is concerned that the renewal process proposed in the *Federal Register* notice is inconsistent with the statutory requirements—section 101(a)(5)(D)(iii) clearly states that proposed authorizations are subject to a 30-day comment period—and Congressional expectations regarding the length of the comment period when it passed that provision[20].

Another significant issue with the proposed 15-day comment period is the burden that it places on reviewers, who will need to review the original authorization and supporting documentation[21], the draft monitoring report(s), the renewal application or request[22], and the proposed authorization and then formulate comments very quickly. Depending on how frequently NMFS invokes the renewal option, how much the proposed renewal or the information on which it is based deviates from the original authorization, and how complicated the activities are and the taking authorization is, those who try to comment on all proposed authorizations and renewals, such as the Commission, would be hard pressed to do so within the proposed 15-day comment period. Therefore, the Commission recommends that NMFS refrain from using the proposed renewal process for Carnival's authorization. The renewal process should be used sparingly and selectively, by limiting its use only to those proposed incidental harassment authorizations that are expected to have the lowest levels of impacts to marine mammals and that require the least complex analyses. Notices for other types of activities should not even include the possibility that a renewal might be issued using the proposed foreshortened 15-day comment period. If NMFS intends to use the renewal process frequently *or* for authorizations that require a more complex review or for which much new information has been generated (e.g., multiple or extensive monitoring reports), the Commission recommends that NMFS provide the Commission and other reviewers the full 30-day comment opportunity set forth in section 101(a)(5)(D)(iii) of the MMPA.

The Commission hopes you find its letter useful. Please contact me if you have questions regarding the Commission's recommendations.

Sincerely,

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

[20] See, for example, the legislative history of section 101(a)(5)(D), which states "…in some instances, a request will be made for an authorization identical to one issued the previous year. In such circumstances, the Committee expects the Secretary to act expeditiously in complying with the notice and comment requirements." (H.R. Rep. No. 439, 103d Cong., 2d Sess. 29 (1994)). The referenced "notice and comment requirements" specify a 30-day comment period.
[21] Including the original application, hydroacoustic and marine mammal monitoring plans, take estimation spreadsheets, etc.
[22] Including any proposed changes or any new information.

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Addendum

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

- NMFS omitted from the *Federal Register* notice the source level for impact pile driving based on sound pressure level root-mean-square, which informs the Level B harassment zones.
- NMFS used Jefferson et al. (2013) rather than Department of the Navy (2017) to inform densities for gray and humpback whales[23]. The density for gray whales should have been 0.01791 rather than 0.01162 whales/km^2 and 0.00908 rather than 0.00142 whales/km^2 for humpback whales[24], resulting in 12.76 and 6.49 takes of gray and humpback whales, respectively[25].
- The *Federal Register* notice, application, and marine mammal monitoring plan specified that seven land- or vessel-based PSOs would be monitoring for marine mammals during both impact and vibratory pile driving. Section 4(a) of the proposed authorization referred to Carnival's monitoring plan but then specified that four PSOs would be monitoring during impact pile driving and seven PSOs would be monitoring during vibratory pile driving—the locations of the PSOs were not denoted in the proposed authorization. NMFS clarified that (1) four PSOs would be monitoring during impact pile driving from the three closest land-based positions (see Figure 4 of the monitoring plan) and from the middle of the Port, which could be land- or vessel-based and (2) seven land- or vessel-based PSOs would be monitoring during vibratory pile driving consistent with Figure 4.
- NMFS did not specify in the proposed authorization that (1) pile driving and removal can occur only during daylight hours[26], (2) if poor environmental conditions (i.e., heavy fog, heavy rain, Beaufort sea state greater than 4) restrict full visibility of the shut-down zone(s), pile driving and removal must be delayed until the entire shut-down zone is visible[26], (3) Level B harassment takes recorded by PSOs must be extrapolated, 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[27], and (4) marine mammal field datasheets must be provided as part of the draft and final monitoring report[27]. NMFS also did not specify in the draft authorization the 120-m Level A harassment zone for phocids during impact pile driving, which is greater than the 50-m shut-down zone.

[23] Sightings data from the Port of Long Beach were used to inform density estimates for all other species based on MBC Applied Environmental Sciences (2016), which did not include data for gray or humpback whales.
[24] NMFS inadvertently transposed the gray and humpback whale densities in Table 6 and numbers of takes in Table 7 of the *Federal Register* notice.
[25] NMFS plans to reduce those takes to zero each based on implementation of mitigation measures and the presence of the breakwater, which would inhibit sound transmission offshore.
[26] This measure was specified in the *Federal Register* notice.
[27] This measure was not specified in the *Federal Register* notice either.