

5.11 NOISE

5.11.1 Significance Criteria

The CEQA Guidelines environmental checklist includes the following criteria for determining potentially significant impacts:

- Exposure of persons to or generation of noise levels in excess of standards established in the local general plan or noise ordinances, or applicable standards of other agencies.
- Exposure of persons to or generation of excessive groundborne vibration or groundborne noise levels.
- A substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project.
- A substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project.
- Exposure of people residing or working in the project area to excessive noise levels for a project located within an airport land use plan, or where such a plan has not been adopted, within 2 miles of a public airport or public use airport, or for a project within the vicinity of a private airstrip.

Based on these guidelines and relevant local, state, and federal standards, this EIR applies the following thresholds of significance. A noise impact is considered significant if it would:

- Expose ferry passengers and crew to noise levels greater than OSHA standards,
- Expose noise-sensitive (to humans) land use to “impacts” as defined by FTA,
- Expose terrestrial wildlife to 60 dBA CNEL (or greater) per the USFWS, and
- Expose aquatic wildlife to underwater sound pressure levels at or above 160 dB (re: 1 uPa) per the NMFS.

5.11.2 Impacts and Mitigation

Four impact topics have been identified and are discussed in this section.

***Impact NOI-1* Passengers and crew would be exposed to shipboard noise from proposed enroute ferry operations.**

Most existing fast ferries have large, powerful diesel engines and complex systems that produce high volumes of noise. Because of the relatively short time that passengers spend onboard the ferries (e.g., 20 to 40 minutes), they are unlikely to be at risk for hearing damage. However, these noise levels can damage crew hearing if not controlled. Compliance with Cal/OSHA regulations will ensure that ferry crews are adequately protected from potential noise hazards. The time-averaged noise exposure level to protect hearing of workers is regulated at 90 dBA over an 8-hour work shift. Areas above 85 dBA will be posted as high-noise level areas, and hearing protection will be required. The ferry operators would have to implement a hearing conservation program for applicable employees as outlined in Cal/OSHA regulations.

Summary of Impact NOI-1

- Alternative 1 would result in ferry passenger and crew exposure to engine noise. It is expected to be at acceptable levels for passengers due to limited time exposure and existing regulations that control noise level exposure. Existing and proposed ferries have to incorporate necessary noise and vibration controls to comply with USCG guidelines and Cal/OSHA limits to avoid adverse noise effects to crew members.
- Alternatives 2 and 3 would also have a potential for impact but the number of people exposed (and thus the degree of potential impact) would be lower for each alternative.
- Alternative 4 does not include expansion. Therefore, no impacts over existing conditions would occur.

Impact After Mitigation: Compliance with existing guidelines already mandates noise exposure controls for crew members. Impacts to passengers are not expected to be significant.

***Impact NOI-2* Exposure of human noise-sensitive land use to significant noise from proposed enroute ferry operations.**

Noise impacts would be considered significant if the project resulted in a determination of “impact” per the FTA guidelines described in Section 3.11.1.4. The use of the FTA’s “sliding scale” is appropriate because where ambient/background levels are low, an increase of up to 10 dB would not cause annoyance or activity interference. In contrast, if the ambient/background noise levels were high (above 65 dBA in residential areas), any perceptible increase in noise could cause an increase in annoyance, nuisance, and inability to have a conversation without raising voices.

At this stage of the environmental impact process, i.e., a programmatic EIR, it is difficult to predict the degree of noise impact from future fast ferry operations. However, limitations on the average SEL, with fairly broad assumptions, can be made to avoid an exceedance of an (FTA) “impact” criteria.

To estimate the average SEL, assumptions regarding receptor type, location and ambient noise environment are required in addition to frequency of operations experienced during daytime (7 a.m. to 7 p.m.), evening (7 p.m. to 10 p.m.) and nighttime (10 p.m. to 7 a.m.) periods. Distance from the ferry to the receptor also is variable due to the regional nature of this assessment. The following bullets contain assumptions that were applied to determine the applicable SEL.

- No FTA Category 1 (e.g., outdoor amphitheaters, concert pavilions, National Historic Landmarks with significant outdoor use) receptors exist along the shoreline.
- Dense urban FTA Category 2 (e.g., residential) receptors exist along the shoreline and have an ambient sound level of 70 dBA (L_{dn} or CNEL). These receptors would experience the noise from 50 percent of all ferry trips.
- Suburban and low-density urban FTA Category 2 (e.g., residential) receptors also exist along the shoreline and have an ambient sound level of 55 dBA (L_{dn} or CNEL). These receptors would experience the noise from 10 percent of all ferry trips.

- The ferries would pass by these receptors at a distance of no less than 1/3 mile (1,760 feet) while operating at typical cruise power and speed, their assumed mode of maximum noise output in terms of SEL.
- The remaining 40 percent of all enroute ferry trips would not influence this evaluation because they were assumed to only be experienced by Category 3 (e.g., institutional) receptors. Category 3 receptors' criterion level of impact is 5 dB higher (not as conservative) than that of Category 2 receptors.
- 85 percent of ferry trips (pass-by events) would occur during the daytime (7 a.m. to 10 p.m.), 10 percent during the evening (7 p.m. to 10 p.m.) period and 5 percent during the nighttime (10 p.m. to 7 a.m.) period.

At a distance of 1/3 mile, the sound equivalent level from ferry operations would have to exceed the thresholds listed in Table 3.11-6 for each alternative to result in a significant noise impact, as defined by the FTA in Figure 3.11-6. These thresholds vary by land use due to their differences in relative sensitivity to noise levels. For dense urban receptors, sound equivalent levels at 1/3 mile distance would have to exceed 79 dBA, 80 dBA, and 86 dBA for Alternatives 1, 2, and 3, respectively. Alternative 1 has the most limiting SEL of the three alternatives because it has the most proposed trips. For suburban receptors, the SEL would have to exceed 78 dBA, 79 dBA, and 85 dBA for Alternatives 1, 2, and 3, respectively.

A calculation of the noise output from existing and proposed ferry vessels shows that maximum noise levels are well under the significance criteria discussed above. The WTA has developed initial draft specifications for new vessels. These include "owner-imposed noise level limits" of 60 dBA (L_{max}) at 1,000 feet. A vessel designed and built to meet this specification is estimated to generate noise levels that would be about 10 dBA below the SEL criteria described above. In addition, noise measurements of an existing Golden Gate Ferry vessel in operation reported a maximum noise level up to 110 dBA on the exterior main aft deck (see Section 3.11.1.2). Comparison of this noise level to the SEL criteria shows that it would be about 15 dBA below the criteria. This indicates that the existing and proposed new vessels can achieve a less than significant noise impact.

Summary of Impact NOI-2

The determination of significant impact of this topic depends on many factors. The primary factor is the pass-by noise level generated by the proposed ferries. Other important factors include numbers of trips experienced by various categories of land use and the period of day in which those trips occur.

For ferries approaching noise-sensitive land uses by no less than 1/3 mile, dense urban residential-type receptors would be impacted if the ferry's average SEL were higher than 79 dBA, 80 dBA and 86 dBA for Alternatives 1, 2 and 3, respectively. Suburban receptors would be impacted if the ferry's average SEL were higher than 78 dBA, 79 dBA and 85 dBA for Alternatives 1, 2 and 3, respectively. If the ferry's point of closest approach was 1 mile from these receptors instead of 1/3 mile, the maximum allowable SELs would increase by 5 dBA. Calculation of vessel noise output, based on existing noise measurements a vessel and a maximum noise level specification discussed above, indicate that noise levels would be well within these criteria.

- Alternatives 1, 2, 3, and 4 could result in proposed ferry operations that result in noise levels at noise-sensitive land uses. Calculated noise levels for an existing vessel and proposed vessel specifications shown above indicates that noise levels would be well within (below) calculated noise levels that would result in “impacts” as defined by FTA, 1/3 mile or greater from a sensitive receptor. At closer distances or with the use of vessels with higher noise output than applied in this calculation, specific analysis would be required to determine if the noise levels are maintained below these criteria. For this reason, this impact is considered potentially significant.

Mitigation NOI-2.1: This study provides an evaluation of noise levels at which the ferry alternatives would exceed the significance criteria summarized earlier. Maintaining the operation of the alternative fleet below the SEL levels calculated above would avoid exceeding the significance thresholds. Mitigation measures to maintain the average noise levels below the threshold could include:

- Reduction of the noise output from the individual vessels through design measures
- Reduction of the number of trips per day (average noise levels would decrease)
- Reduction of trips during the more noise-sensitive evening hours
- Operation restrictions nearest noise-sensitive receptors. This example evaluation specifies average noise output levels at which an exceedance occurs, based on trip frequency and noise output. This methodology can be repeated for site-specific situations to determine rate specific limits.

Impact After Mitigation: This evaluation indicates that existing and proposed vessels should not exceed acceptable noise impact thresholds within 1/3 mile distance, based on the parameters used in this evaluation. The measures listed above can maintain noise levels at acceptable limits depending upon vessel type, operation, and site-specific conditions. Mitigation NOI-2.1, if needed, can provide effective noise control and reduction, but its success depends on site and route conditions and operation. Therefore, this impact remains potentially significant.

***Impact NOI-3* Sensitive land uses could be exposed to increases in ambient noise from proposed ferry terminal operations.**

Ferry terminals, like terminals of other modes of mass transit, can bustle with activity—arriving and departing ferries, automobile, and bus and truck traffic. Some existing ferry terminals in the Bay Area have Park-and-Ride lots for auto and bus commuters. Proposed ferry terminals may include rail (Amtrak and/or BART) links.

Ferry whistles or horns used in proximity to terminals for safety reasons create impulsive and directional sound. At a distance of 1,000 feet in front of, abeam, and behind a typical ferry horn, a small sample of maximum A-weighted sound levels of approximately 90 dBA, 83 dBA and 77 dBA, respectively, have been measured (BKL Consultants 2002). Horn blowing usually consists of one or two blows, which last less than 10 seconds per event.

A study of noise from ferry terminals in the State of Washington yielded anecdotal daytime hourly L_{eq} values of 55 to 60 dBA at residential locations varying from approximately 500 feet to 2,500 feet from terminal operations. These noise levels occurred during normal scheduled ferry service. Nighttime levels when ferries were not operating yielded hourly L_{eq} near 45 dBA except

at the site that was 2,500 feet away (approximately 35 dBA hourly L_{eq}). The range of DNL derived from these 24-hour measurements resulted in levels from 51 dBA at the farther site to 63 dBA at the closer sites (Magnoni 2002).

Summary of Impact NOI-3

- Alternatives 1 and 2 would introduce new terminals that could create impacts to nearby noise sensitive land use, such as adjacent residential areas. This impact is potentially significant if the exposure and noise levels exceed applicable noise thresholds
- Alternative 3 only involves existing terminal sites. Alternative 3 adds vessels and traffic to existing routes; this impact is potentially significant only if the changes exceed local noise level thresholds.
- Alternative 4 would not have any additional noise impacts to nearby land uses, as no changes would occur.

Mitigation NOI-3.1: Siting and planning of new or expanded ferry terminals should include planning to separate terminal areas away from noise-sensitive land uses. Compliance of existing or proposed ferry terminals with existing zoning ordinances should be sufficient to mitigate any potential impacts of ferry terminal operations.

Impact After Mitigation: After implementation of Mitigation NOI-3.1, no significant impact is expected.

Impact NOI-4 **Exposure of wildlife to noise from proposed ferry operations.**

The proposed project would generate noise both in air and underwater; therefore, there is a potential impact to wildlife in both media. Potential in-air and underwater environmental impacts to wildlife are addressed separately in the following section.

Mammals. Mammalian hearing varies, although abilities are fairly consistent within families (Fay 1988). In general, mammals can hear in the bandwidth from below 10 Hz to over 150 kHz. Small terrestrial mammals, small odontocetes (toothed whales), and bats hear best at high frequencies; mysticetes (baleen whales) hear best at low frequencies; and most other mammals have similar hearing to humans (20 Hz to 20 kHz). Noise-induced hearing loss usually results from inner ear hair-cell loss, which is typically permanent in mammals.

Airborne sounds as a result of the proposed project would contribute to the ambient noise to which small terrestrial mammals and marine mammals are exposed (when at the surface or when hauled out). However, little data are available on the overall sound level from specific sources. The small terrestrial mammals of particular interest to this project are the salt marsh harvest mouse and the salt marsh wandering shrew (see Section 3.5, Biological Resources). These mammals would be exposed to noise from the ferries as they pass by salt marsh habitat. The auditory sensitivity of these small mammals is at higher frequencies (Fay 1988) and the noise from the ferry would be in the low to mid-frequency range. Therefore, masking of biologically significant sounds is highly unlikely. Due to the transient nature of ferries passing by, the proposed project would likely instigate increased alertness, but not habitat avoidance or hearing loss. Furthermore, small mammals inhabiting the area are already exposed to airborne ship noise

within San Francisco Bay and are presumably habituated. These small mammals would not be impacted by underwater noise generated as a result of the project.

The marine mammals of particular interest to this project are the gray whale, Pacific harbor seal, California sea lion, and sea otter. No research has been conducted on the effects of airborne noise on the behavior of gray whales. The response of gray whales to underwater vessel noise depends on several factors, including location of vessel (i.e., breeding/calving grounds, migration route, and summering grounds), behavior of the vessel, and behavior of the whale. Gray whales are frequently attracted to vessels in the breeding/calving lagoons of Baja California (Dahlheim et al. 1981; Wisdom 2000), but often change course or stay underwater longer in the presence of vessels while migrating (Schulberg et al. 1991). Because gray whales rarely utilize the Bay, no impacts are expected as a result of the project.

Harbor seals utilize haul-out sites throughout the Bay and are of particular concern to the staff at Point Reyes National Seashore (BAC 1998). In California, small boats that approach a haul-out site often displace the seals; less severe disturbances can cause alert reactions without departure (Stewart et al. 1988; Allen 1991). In places with many boats, harbor seals may become habituated to the noise (Johnson et al. 1989). Detailed studies regarding locations of haul-out sites in relation to specific ferry routes would need to be completed in association with the Point Reyes National Seashore staff.

California sea lions also utilize the Bay, but the only known haul-out site is Pier 39. In the water, sea lions tolerate close and frequent approaches by vessels and often congregate around fishing vessels. Sea lions hauled out on land (or piers) are more responsive, but rarely react unless a boat approaches very closely (Bowles and Stewart 1980). The sea lions that utilize Pier 39 are extremely habituated to human presence and would therefore not be affected by the proposed project.

Little data are available on reactions to vessels by sea otters. However, since they rarely utilize habitat within the Bay, no significant impact as a result of the project is expected.

As stated in Section 3.11.1.4, the NMFS currently considers, as a guideline, received underwater sound pressure levels at or above 160 dB (re 1 μ Pa) as constituting harassment of marine mammals. NMFS has suggested that underwater sound pressure levels above 180 dB (re 1 μ Pa) could cause temporary hearing impairment in marine mammals.

Birds. Birds have more uniform hearing abilities than mammals and hear best from 100 Hz to 10 kHz. Hearing loss in birds is difficult to characterize because they appear to regenerate inner ear hair cells even after substantial loss (Corwin and Cotanche 1988). Domestic fowl sometimes experience declines in productivity after continuous exposure to noise at high levels, but laying rates did not change in wild waterfowl after exposure to continuous noise from a compressor station (reviewed in Bowles 1994). Persistent human disturbance or harassment by predators causes declines in productivity of colonies of birds (Anderson and Keith 1980). Birds exhibit behavioral responses to noise similar to those of mammals. At the lowest level, they become alert to the noise; at the highest level, they abandon the area. In the long term, nesting birds become more habituated and less responsive in the presence of human disturbance if they are not deliberately harassed (Burger and Gochfeld 1981). After habituation, loss rates are too low to be detected.

Noise impacts on wintering birds in the South Bay will need to be studied on specific routes (BAC 1998). Personnel associated with the Point Reyes Bird Observatory have identified sensitive foraging and breeding habitats for residential and migratory birds, including eelgrass beds. A preliminary list of birds that need further consideration in reference to specific routes has been developed, including Caspian terns (Brooks Island), least terns, phalaropes (salt ponds), cormorants on Alcatraz, and rails (black and clapper) in marshes. Wintering ducks appear to be somewhat tolerant of boat traffic, but its effect has to be assessed and minimized.

The USFWS has determined a significance criterion of 60 dBA CNEL at the line of habitat as an impact. Specific studies of each ferry route would need to determine where this 60 dBA CNEL contour line falls and develop mitigation accordingly. Mitigation would likely be constrained to the moving of ferry routes away from the lines of habitat.

Fish. Fish also use sound to obtain information about their environment and for communication (reviewed in Tavolga et al. 1981). Every species of fish has a different auditory system and therefore different hearing sensitivity. Generally, fish hear sounds at frequencies between 50 Hz and 2,000 Hz. Loud sounds may cause damage to auditory systems of fish, ranging from morphological damage to stunning and even death (Hastings 1991). Intense sound pressure levels may also cause morphological damage to other parts of the body, such as the air bladder, that plays an important role in acoustic detection and production in some fish.

A review of scientific literature and experiments summarized that several species of fish exposed to underwater sound levels of 180 dB re 1 μ Pa or higher for 2 hours or less were adversely affected (Finneran et al. 1995). Little or no data exist for fish exposed to sound levels between 149 and 180 dB re 1 μ Pa. Therefore, it is difficult to determine the potential impacts as a result of the project to fish in the area. Fish may avoid the area while a ferry is in transit, but it is unlikely that it would cause fish to completely abandon the area.

Summary of Impact NOI-4

- Alternatives 1 through 3 would have the following impacts:
 - Small mammals such as the salt marsh harvest mouse would not be impacted by project-generated underwater noise.
 - No noise impacts to gray whales are expected.
 - The potential for significant impact to harbor seals at their haul-out sites and to birds depends on the specific location of ferry routes. Placement or design of specific routes is not within the scope of this document. Although it is unlikely that fish would completely abandon ferry transit areas, available data preclude determination of impact. Wintering birds have a higher potential for disturbance from fast ferries than from conventional ferries but, like harbor seals, their impact depends on choice of specific ferry routes. The potential for significant impacts to fish and birds from noise is considered unlikely.
 - No impact is expected for sea lions and sea otters from ferry operations.
- Alternative 4 would not have increased ferry operations. Therefore, no impacts would occur.

Mitigation NOI-4.1: Existing NMFS requirements require avoidance of marine mammals (see Biology Mitigation B-14.1). For other wildlife (birds and fish), consultation with federal and

state resource agencies will be a part of development of specific routes. If additional mitigation is necessary, it would be identified and applied to specific projects through that process.

Impacts After Mitigation: It is anticipated that impacts would be less than significant with implementation of Mitigation NOI-4.1.

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