4.19 NOISE

The Environmental Impact Assessment (EIS) analysis area for this section includes the mine site, transportation corridor, port, and natural gas pipeline corridor for each alternative and variants, and the surrounding area where project-associated noise could have a direct effect on human receptors. A radius of 10 miles from the mine site was used as a screening distance for potential noise impacts; based on preliminary conservative calculations (assuming typical equipment to be used and acoustical propagation rates), noise effects are expected to be not readily detectable beyond 10 miles. Similarly, for all other non-mine site project components (transportation corridor, port, ferry terminal sites, and natural gas pipeline corridor), including all alternatives and variants, a conservative screening distance of 2 miles from the project feature or alignment was used to help locate and identify potential noise-sensitive receptor (NSR) property parcels.

4.19.1 Summary of Key Issues

Table 4.19-1 Summary of Key Issues for Noise Resources

Impact Causing Project Component/ Activity	Alternative 1a	Alternative 1 and Variants	Alternative 2 and Variants	Alternative 3 and Variant
Note: The following acronyms are used to describe three categories of potentially impacted receivers: • *RSH* = outdoor sleeping recreationists and subsistence hunters in a remote rural or wilderness setting (where 35 dBA day-night sound level [L_{dn}] is the expected existing outdoor ambient sound environment). • *SPR-W* = occupants of seasonal shelters and permanent residences in a remote rural or wilderness setting (where 35 dBA L_{dn} is the expected existing outdoor ambient sound environment). • *SPR-D* = occupants of seasonal shelters and permanent residences in a developed (e.g., Pedro Bay) setting (where exterior noise threshold of 55 dBA L_{dn} per EPA guidance would be expected to apply).				
Mine Site				
Operating stationary and mobile equipment, including occasional blasting	By project phase, distance (feet) from open pit where RSH may be disturbed: *Construction* = 17,250 *Operations* = 18,450 *Closure* = 15,900 By project phase, distance (feet) from mine site pit where SPR-W may be disturbed: *Construction* = 11,900 *Operations* = 12,900 *Closure* = 10,750	Distances from which RSH and SPR-W may be disturbed would be the same as Alternative 1a.	Distances from which RSH and SPR-W may be disturbed would be the same as Alternative 1a.	Distances from which RSH and SPR-W may be disturbed would be the same as Alternative 1a. *Concentrate Pipeline Variant* Distances would be the same as Alternative 3.
Transportation Corridor				
Operating equipment, including occasional blasting, to *construct* access road(s)	Distance (feet) from access road(s) where RSH may be disturbed: 8,800 Distance (feet) from access road(s) where SPR-W may be disturbed: 5,280	Distances from which RSH and SPR-W may be disturbed would be the same as Alternative 1a.	Distances from which RSH and SPR-W may be disturbed would be the same as Alternative 1a. *Newhalen River North Crossing Variant* Distances would be similar to Alternative 2.	Distances from which RSH and SPR-W may be disturbed would be the same as Alternative 1a. Distance (feet) from access road(s) within which SPR-D may be disturbed: 2,250

Table 4.19-1 Summary of Key Issues for Noise Resources

Impact Causing Project Component/ Activity	Alternative 1a	Alternative 1 and Variants	Alternative 2 and Variants	Alternative 3 and Variant
Seasonal (winter/summer) maintenance activities of access or spur roads	Distance (feet) from access road(s) where RSH may be disturbed: *Winter* = 7,600 *Summer* = 8,500 Distance (feet) from access road(s) where SPR-W may be disturbed: *Winter* = 4,500 *Summer* = 5,000	Distances from which RSH and SPR-W may be disturbed would be the same as Alternative 1a.	Distances from which RSH and SPR-W may be disturbed would be the same as Alternative 1a. *Newhalen River North Crossing Variant* Distances would be similar to Alternative 2.	Distances from which RSH and SPR-W may be disturbed would be the same as Alternative 1a. Distance (feet) from access road(s) within which SPR-D may be disturbed: *Winter* = 1,800 *Summer* = 2,150
Expected traffic on roadway (during operations and closure phases of the project)	Distance (feet) from road(s) where RSH may be disturbed: *Access Road* = 2,640 *Spur Road* = 1,000 Distance (feet) from access road(s) where SPR-W may be disturbed: 200	Distances from which RSH and SPR-W may be disturbed would be the same as Alternative 1a. *Summer-Only Ferry Operations Variant* Same as Alternative 1 during the summer.	Distances from which RSH and SPR-W may be disturbed would be the same as Alternative 1a. *Newhalen River North Crossing Variant* Distances would be similar to the Alternative 2 base case. *Summer-Only Ferry Operations Variant* Same as Alternative 1 during the summer.	Distances from which RSH and SPR-W may be disturbed would be the same as Alternative 1a. Distance (feet) from road(s) within which SPR-D may be disturbed: 35
Operating equipment, including occasional blasting, for *closure and reclamation* of road land(s)	Distance (feet) from access road(s) where RSH may be disturbed: 10,550 Distance (feet) from access road(s) where SPR-W may be disturbed: 6,400	Distances from which RSH and SPR-W may be disturbed would be the same as Alternative 1a.	Distances from which RSH and SPR-W may be disturbed would be the same as Alternative 1a. *Newhalen River North Crossing Variant* Distances would be similar to Alternative 2.	Distances from which RSH and SPR-W may be disturbed would be the same as Alternative 1a. Distance (feet) from access road(s) within which SPR-D may be disturbed: 3,000.
Ferry Terminals *construction*	Distance (feet) from ferry terminal where RSH may be disturbed: 8,550 Distance (feet) from ferry terminal where SPR-W may be disturbed: 5,000	Distances from which RSH and SPR-W may be disturbed would be the same as Alternative 1a. *Kokhanok East Ferry Terminal Variant* Distances from which RSH and SPR-W may be disturbed would be the same as Alternative 1.	Distances from which RSH and SPR-W may be disturbed would be the same as Alternative 1a.	Not Applicable—there are no ferry terminals under this alternative.

Table 4.19-1 Summary of Key Issues for Noise Resources

Impact Causing Project Component/ Activity	Alternative 1a	Alternative 1 and Variants	Alternative 2 and Variants	Alternative 3 and Variant
Ferry Terminals *operations*	Distance (feet) from ferry terminal where RSH may be disturbed: 2,250 Distance (feet) from ferry terminal where SPR-W may be disturbed: 1,000	Distances from which RSH and SPR-W may be disturbed would be the same as Alternative 1a. *Kokhanok East Ferry Terminal Variant* Distances from which RSH and SPR-W may be disturbed would be the same as Alternative 1. *Summer-Only Ferry Operations Variant* There would be no impacts for ferry operation during winter.	Distances from which RSH and SPR-W may be disturbed would be the same as Alternative 1a. *Summer-Only Ferry Operations Variant* There would be no impacts for ferry operation during winter.	Not Applicable—there are no ferry operations under this alternative.
Aviation traffic at airports/airstrips during project *construction*	Distance (miles) from Amakdedori airstrip or Kokhanok Airport where RSH may be disturbed = 6.5 (takeoff); 4.5 (approach) Distance (miles) from Amakdedori airstrip or Kokhanok Airport where SPR-W may be disturbed = 3.4 (takeoff); 1.8 (approach)	Distances from which RSH and SPR-W may be disturbed would be the same as Alternative 1a.	Distance (miles) from existing Pile Bay airstrip where RSH may be disturbed = 6.5 (takeoff); 4.5 (approach) Distance (miles) from existing Pile Bay airstrip, where SPR-W may be disturbed = 3.4 (takeoff); 1.8 (approach)	Distances from which RSH and SPR-W may be disturbed would be the same as Alternative 2.
Aviation traffic at airports/airstrips during project *operations*	Distance (miles) from Kokhanok Airport where RSH may be disturbed = 6.5 (takeoff); 4.5 (approach) Distance (miles) from Kokhanok Airport where SPR-W may be disturbed = 3.4 (takeoff); 1.8 (approach)	Distances from which RSH and SPR-W may be disturbed would be the same as Alternative 1a.	Not Applicable	Not Applicable
Port Site				
Port site *construction*	Distance (feet) from port site where RSH may be disturbed: 8,550 Distance (feet) from port site where SPR-W may be disturbed: 4,900	Distances from which RSH and SPR-W may be disturbed would be the same as Alternative 1a. *Pile-supported Dock Variant* Distances would be the same as Alternative 1.	Although the port location is at Diamond Point rather than Amakdedori, distances from which RSH and SPR-W may be disturbed would be the same as Alternative 1a. *Pile-Supported Dock Variant* Distances would be the same as Alternative 1.	Although the port location is north of Diamond Point rather than Amakdedori, distances from which RSH and SPR-W may be disturbed would be the same as Alternative 1a.

Table 4.19-1 Summary of Key Issues for Noise Resources

Impact Causing Project Component/ Activity	Alternative 1a	Alternative 1 and Variants	Alternative 2 and Variants	Alternative 3 and Variant
Port site *operation*	Distance (feet) from port site where RSH may be disturbed: 9,750 Distance (feet) from port site where SPR-W may be disturbed: 5,800	Distances from which RSH and SPR-W may be disturbed would be the same as Alternative 1a.	Distances from which RSH and SPR-W may be disturbed would be the same as Alternative 1a.	Distances from which RSH and SPR-W may be disturbed would be the same as Alternative 1a.
Port site *closure and reclamation*	Distance (feet) from port site where RSH may be disturbed: 10,550 Distance (feet) from port site where SPR-W may be disturbed: 6,400	Distances from which RSH and SPR-W may be disturbed would be the same as Alternative 1a.	Distances from which RSH and SPR-W may be disturbed would be the same as Alternative 1a.	Distances from which RSH and SPR-W may be disturbed would be the same as Alternative 1a.
Natural Gas Pipeline				
Mainline *construction*	Depending on activity, distance (feet) from mainline where RSH may be disturbed: 5,100 to 19,500 Depending on activity, distance (feet) from mainline where SPR-W may be disturbed: 2,600 to 14,000 Depending on activity, distance (feet) from mainline where SPR-D (Anchor Point) may be disturbed: 990 to 8,300	Distances from which RSH, SPR-W, and SPR-D may be disturbed would be the same as Alternative 1a.	Distances from which RSH, SPR-W, and SPR-D may be disturbed would be the same as Alternative 1a.	Distances from which RSH, SPR-W, and SPR-D may be disturbed would be the same as Alternative 1a.
Compressor station *construction*	Distance (feet) from compressor station where SPR-D (Anchor Point) may be disturbed: 2,150	Distance from which SPR-D (Anchor Point) may be disturbed would be the same as Alternative 1a.	Distance from which SPR-D (Anchor Point) may be disturbed would be the same as Alternative 1a.	Distance from which SPR-D (Anchor Point) may be disturbed would be the same as Alternative 1a.
Mainline *maintenance*	Distance (feet) from mainline where RSH may be disturbed: 8,550 Distance (feet) from mainline where SPR-W may be disturbed: 5,000 Distance (feet) from mainline where SPR-D (Anchor Point) may be disturbed: 2,150	Distances from which RSH, SPR-W, and SPR-D may be disturbed would be the same as Alternative 1a.	Distances from which RSH, SPR-W, and SPR-D may be disturbed would be the same as Alternative 1a.	Distances from which RSH, SPR-W, and SPR-D may be disturbed would be the same as Alternative 1a.

Table 4.19-1 Summary of Key Issues for Noise Resources

Impact Causing Project Component/ Activity	Alternative 1a	Alternative 1 and Variants	Alternative 2 and Variants	Alternative 3 and Variant
Compressor station *operation*	Distance (feet) from compressor station where SPR-D (Anchor Point) may be disturbed: 2,150	Distance from which SPR-D (Anchor Point) may be disturbed would be the same as Alternative 1a.	Distance from which SPR-D (Anchor Point) may be disturbed would be the same as Alternative 1a.	Distance from which SPR-D (Anchor Point) may be disturbed would be the same as Alternative 1a.
Mainline and compressor station *closure and reclamation* of land(s)	Distance (feet) from pipeline feature where RSH may be disturbed: 8,550 Distance (feet) from pipeline feature where SPR-W may be disturbed: 5,000 Distance (feet) from pipeline feature where SPR-D (Anchor Point) may be disturbed: 2,150	Distances from which RSH, SPR-W, and SPR-D (Anchor Point) may be disturbed would be the same as Alternative 1a.	Distances from which RSH, SPR-W, and SPR-D (Anchor Point or Pedro Bay) may be disturbed would be the same as Alternative 1a.	Distances from which RSH, SPR-W, and SPR-D (Anchor Point or Pedro Bay) may be disturbed would be the same as Alternative 1a.

This section addresses primarily direct effects on human receptors during all project phases. Potential noise impacts resulting from the project on other resources are addressed in other sections of the EIS: Section 4.5, Recreation; Section 4.9, Subsistence; Section 4.11, Aesthetics; Section 4.23, Wildlife Values; Section 4.24, Fish Values; and Section 4.25, Threatened and Endangered Species.

The analysis area includes the mine site, transportation corridor, and airports, port, and natural gas pipeline corridor for all alternatives and variants where project-associated noise could have a direct effect on human receptors. The analysis area includes a 10-mile zone around the mine site (rationale for this distance is described in Section 3.19, Noise), and a 2-mile zone around the other project components where project effects of noise could be expected to occur (see Figure 3.19-1).

Scoping comments were received on impacts of noise pollution as a result of project construction and mining operations. Specifically, commenters requested that the EIS discuss noise impacts of blasting in the project area; describe the blasting methods that would be used; and consider noise in the water created by the ice-breaking ferry and the impacts to fish, bears, and other wildlife.

4.19.2 Noise Impacts Analysis Methodology

The methodology framework applied to assessing direct noise-related impacts was based on four factors of magnitude (intensity) of project-attributed sound (or the resulting increase in outdoor ambient sound level over existing [pre-project] conditions); the duration over which that project-caused noise would be expected to occur; geographic extent of noise transmission; and the potential for the impacts to occur.

The analysis factors and how they are assessed to determine impacts are described below.

- **Magnitude**—Impacts are assessed on the basis of noise level, which may be comparable to natural (ambient) sound; readily detectable at the nearest sensitive receptor; dominate the soundscape at the nearest sensitive receptor; or the level could cause a risk of hearing impairment to (human) sensitive receptor(s).

- **Duration**—Impact duration may be short-term, intermittent, or last only through the construction phase; may last several years through the operations phase; intermittent and persisting through closure; or long-term and last beyond closure and post-closure (monitoring and maintenance).
- **Extent**—Impact may be limited geographically; extend beyond a local area, potentially affecting the whole analysis area; or impacts may affect receptors beyond the analysis area.
- **Potential**—Impacts would be certain to occur if the project would be permitted and built. In this section, potential is certain for this resource under the alternatives and associated variants, and this factor is not further discussed.

The quantitative and qualitative descriptions in this section use US Environmental Protection Agency (EPA) noise concepts and guidelines (EPA 1978) to assess the degree of noise impacts at noise-sensitive receptors (NSRs) for each project phase, and for each alternative, component, and variant.

To quantitatively assess potential noise impacts at NSRs, this analysis considers the aggregate of project-attributed noise sources of interest, on average, emitting from a common point (or in some cases, a line segment, such as for transportation routes), and applies the following sound attenuation factors:

- **Geometric divergence**—For point-source sound propagation, this yields 6 A-weighted decibels (dBA) of noise reduction per doubling of distance (DD) traveled by the sound, or 3 dBA per DD for a line source.
- **Atmospheric absorption**—Although frequency-dependent, the rate of sound attenuation due to sound energy absorbed by the air can typically be expressed as 1 dBA per 1,000 feet traveled.
- **Ground absorption**—Given acoustically absorptive ground surfaces near the source of noise emission and the receiver, up to 5 dBA can be realized.

Although natural terrain may offer trees, vegetation, and ridgelines that might occlude the direct sound paths between project noise source(s) and the NSRs of interest in the noise analysis area, these additional attenuation factors are, conservatively, not incorporated into these analyses.

Reference sound levels of equipment, vehicles, and activities associated with the project are provided in AECOM 2018c. AECOM 2018c also includes acoustical terminology and concepts used during analysis and discussed in this section.

4.19.3 No Action Alternative

Under the No Action Alternative, federal agencies with decision-making authorities on the project would not issue permits under their respective authorities. The Applicant's Preferred Alternative would not be undertaken, and no construction, operations, or closure activities specific to the Applicant's Preferred Alternative would occur. Although no resource development would occur under the Applicant's Preferred Alternative, Pebble Limited Partnership (PLP) would retain the ability to apply for continued mineral exploration activities under the State's authorization process (ADNR 2018-RFI 073) or for any activity not requiring federal authorization. In addition, there are many valid mining claims in the area, and these lands would remain open to mineral entry and exploration by other individuals or companies.

It would be expected that current State-authorized activities associated with mineral exploration and reclamation, as well as scientific studies, would continue at levels similar to recent post-exploration activity. The State requires that sites be reclaimed at the conclusion of their State-

authorized exploration program. If reclamation approval is not granted immediately after the cessation of activities, the State may require continued authorization for ongoing monitoring and reclamation work as it deems necessary.

It is possible for permitted exploration to continue under this alternative (PLP 2018-RFI 073) that could include noise from activities such as drilling and aircraft overflights. This noise would be expected to be at current levels, or less.

The State requires reclamation of sites at the conclusion of their State-authorized exploration program. The State has authority to grant reclamation approval after the cessation of reclamation activities and may request continued authorization for ongoing monitoring and reclamation work as deemed necessary. Although these activities would also cause some noise and disturbance, reclamation would benefit the setting.

4.19.4 Alternative 1a

Alternative 1a consists of the mine site; a transportation corridor with a mine access road to a ferry terminal at Eagle Bay; a southern crossing of Newhalen River; a ferry crossing of Iliamna Lake to a southern ferry terminal west of Kokhanok; continuation of the transportation corridor with a port access road to the western side of Cook Inlet; a port at Amakdedori with a caisson dock design; and a natural gas pipeline from the Kenai Peninsula to the mine site. There are no variants presented under Alternative 1a. The following sections describe the potential noise-related impacts of project components (mine site, transportation corridor, Amakdedori port, and natural gas pipeline).

4.19.4.1 Mine Site

The following rationale was used in the noise impact analyses, and would be common to all project phases for the mine site component:

- There is no known residential land use or other type of possible NSR within 10 miles of the mine site (see Section 3.19, Noise). However, subsistence hunters and recreationists may be temporarily present within the 10-mile analysis distance.
- The existing ambient noise level at the mine site and its adjoining vicinity would be estimated to be comparable to “wilderness ambient” per Table 3.19-1; therefore, baseline ambient sound level would be 35 dBA day-night average sound levels (L_{dn}).

Although there are caribou, moose, bear, and other wildlife in the Bristol Bay Area Plan Management Unit Region 9 (ADNR 2013a) area that surrounds the mine site, there are no unique resources, or resources protected by legislation with respect to noise. Impacts from noise on terrestrial wildlife are addressed in Section 4.23, Wildlife Values.

Mine Site Noise Sources

AECOM (2018c) lists noise levels emitted by expected mobile and stationary machinery that would be operated at the mine site during construction, operations, and closure.

Construction—Construction of the mine site would occur over a 4-year period, including excavation of overburden and construction of mine site facilities such as the mill and ore processing facilities, water treatment plants, water management ponds, power plant, and other infrastructure supporting utilities, mine maintenance, and safety. Construction would require use of heavy equipment such as wheel-loaders, dozers, drills, and haul trucks.

Typical construction noise levels are rarely steady; instead, they fluctuate and are intermittent, depending on the number and type of equipment in use at any given time. There would be times

when no large equipment would be operating, and noise would be at or near existing ambient levels. In addition, construction-related sound levels experienced by an NSR in the vicinity of construction activity would be a function of distance, and the presence and extent of vegetation and intervening topography between the noise source and the sensitive receptor (although the potentially beneficial influences of intervening topography were not considered in the calculated impact distances).

Operations—Mine site operations would involve noise-producing activities and processes that include extracting rock from the ground (including heavy equipment operation, haul trucks, and blasting) and delivering ore by truck to the milling facilities. Routine and preventive maintenance of support facilities and infrastructure would occur in the mine site area for management and safety practices. It was also assumed that all operational activity could occur during daytime or nighttime periods.

Closure—In addition to reclamation activities conducted during mine closure, concurrent reclamation would be performed during operations whenever possible in areas that are no longer required for operations. Closure earthwork activities would require major grading, contouring, and possible growth media placement using industry-standard heavy equipment; operation of this heavy equipment would in turn cause noise.

Mine Site Noise Impacts Analysis

Sound attenuation factors considered in prediction of noise impacts are described above under "Noise Impacts Analysis Methodology." Table 4.19-2 presents results of the predicted noise analyses, listing distances where adverse noise effects would be expected for the indicated NSR types, as described below.

Table 4.19-2: Distances from Mine Site where Noise-Sensitive Receptors in Wilderness (35 dBA L_{dn}) Would Be Impacted

Project Phase	Operational Season/Notes	Distance from Mine Site (feet), where 30 dBA L_{eq} Predicted	Distance from Mine Site (feet), where > 10 dBA over Existing L_{dn} Predicted
Construction	Summer and Winter	17,250	11,900
Operations	Summer and Winter	18,450	12,900
Closure	Summer and Winter	15,900	10,750

Notes:
> = greater than
dBA = A-weighted decibel
L_{eq} = equivalent sound level (e.g., hourly)
L_{dn} = day-night sound level, expressed as dBA; presumes outdoor ambient noise is 35 dBA L_{dn} (wilderness)

Recreationists and subsistence hunters sleeping outdoors and subject to disturbance—In terms of magnitude and extent of impacts, when the predicted mine site noise level would exceed 30 dBA equivalent noise level (L_{eq}) at a location, it could still be audible (even in a 35 dBA L_{dn} environment), and it would risk causing sleep disturbance for recreationists and subsistence hunters sleeping outdoors during their seasonal activities on lands considered "wilderness ambient" per Table 3.19-1. This 30 dBA L_{eq} threshold at night is based on World Health Organization (WHO) guidance for sleep disturbance (WHO 1999), assuming these receptors are not housed, and therefore fully exposed to the outdoors (e.g., fabric tents, "lean-to" structures,

hunting blinds, and other temporary structures assumed to provide no meaningful noise reduction).

Occupants of structures—In terms of magnitude and extent of impacts, the noise level attributed to the mine site would exceed 45 dBA L_{dn} at a building exterior, and therefore be 10 dBA greater than the existing outdoor ambient sound level at a potential NSR (taking into account the minimal 10 dBA noise reduction of a temporarily occupied seasonal shelter).

In terms of duration of impacts, the opportunity for noise effects at potential NSRs in the indicated distances would be short-term, lasting as long as the project phase under consideration. The only NSRs that could be impacted by the long-term mine site noise are the possible occasional NSRs described above: 1) recreationists and subsistence hunters sleeping outdoors and subject to disturbance; and 2) occupants of structures. Impacts would last only as long as the project phase, and as long as the possible NSR is present.

4.19.4.2 Transportation Corridor

The facilities associated with the Alternative 1a transportation corridor are discussed below in terms of the subcomponents of surface transportation, air transportation, and water transportation.

Surface Transportation

The primary road segments in Alternative 1a are the mine access road to Eagle Bay ferry terminal, port access road, and Kokhanok spur road. Road segments were studied individually and by project phase, as described in the following paragraphs.

Mine Access Road to Eagle Bay

This road would provide mine access from the Eagle Bay ferry terminal, a distance of approximately 35 miles through mostly undeveloped area typical of wilderness ambient sound conditions.

Construction—AECOM 2018c (Table 5) provides an estimated roster of equipment required to construct the mine access road. This analysis conservatively assumes that all equipment in AECOM 2018c (Table 5) would be operating and emitting noise from a common geographic point along the road alignment. As road construction progresses, this acoustical center point would slowly travel from one endpoint (the mine site) to the other (Eagle Bay ferry terminal). Therefore, an NSR would only be as close to the construction activity as its perpendicular distance to the road alignment.

Operations—During operations, truck traffic along the mine access road would require up to 35 round-trips per day to deliver concentrate, fuel, reagents, and consumables. Given this anticipated average daily truck volume, plus an assumed similar number of light vehicles expected for transport of locally residing mine workers (i.e., not staying in the on-site camp), traffic noise can be estimated with general assessment techniques from Federal Transit Administration (FTA) guidance, with inputs as follows:

- Reference sound exposure levels (SEL) of 82 dBA at 50 feet for the big vehicles, and 74 dBA for the passenger vehicles (pick-up trucks and vans)
- Maximum road speed of 25 miles per hour (mph)
- Speed constants (C_s) of 15 for the large diesel-engine vehicles, and 30 for the passenger vehicles

With these inputs, the traffic noise estimate, in terms of L_{dn}, is as follows:

- In terms of magnitude and extent, within approximately 200 feet of the mine access road, the estimated traffic-attributed noise level would be greater than 45 dBA L_{dn} at a building exterior, and therefore 10 dBA greater than the existing outdoor ambient sound level for a potential NSR (e.g., a temporarily occupied seasonal shelter).
- With respect to a subsistence hunter or recreationist who may be sleeping outdoors at some distance from the mine access road, the highest level of noise from operations-phase traffic would be a concurrent pass-by of two trucks, traveling in opposite directions. The sleep disturbance criteria in this context would be the aforementioned 45 dBA L_{max} value per WHO guidance (WHO 1999); therefore, the perpendicular distance from the mine access road where an unhoused receptor might be awakened would be 0.5 mile.

In addition to traffic noise from vehicles on the mine access road, noise from regular road maintenance activities would also occur during summer and winter seasons, with the noise impact magnitude, extent, and potential depending on distance, as shown in Table 4.19-3. The duration of anticipated noise effects associated with project-attributed traffic and road maintenance would be long-term, lasting through the operations phase.

Closure—Any reclamation activities for areas adjoining the mine access road would be expected to involve equipment similar to the roster presented under closure in AECOM 2018c (Table 4), and generate the same predicted magnitude, duration, extent, and potential for noise impact, depending on distance and type of NSR (i.e., housed or unhoused receptor).

Mine Access Road Impacts

The predicted magnitude and extent of noise impacts relevant to the mine access road to Eagle Bay are presented in Table 4.19-3, showing distances where adverse noise effects would be expected for two types of NSRs: 1) recreationists and subsistence hunters sleeping outdoors and subject to disturbance; and 2) occupants of structures.

Table 4.19-3: Distances from Mine Access Road where Noise-Sensitive Receptors in Wilderness (35 dBA L_{dn}) Would Be Impacted

Project Phase or Activity(ies)	Operational Season/Notes	Distance from Alignment (feet), where 30 dBA L_{eq} Predicted	Distance from Alignment (feet), where > 10 dBA over Existing L_{dn} Predicted
Construction	Summer and Winter	8,800	5,280
Operations	Summer	8,500	5,000
Operations	Winter	7,600	4,500
Closure	Summer and Winter	10,550	6,400

Notes:
dBA = A-weighted decibel
L_{eq} = equivalent sound level (e.g., hourly)
L_{dn} = day-night sound level, expressed as dBA; presumes outdoor ambient noise is 35 dBA L_{dn} (wilderness)

During construction, the duration of these noise impacts would be short-term, lasting for as long as the construction phase occurs, and only as long as the NSR would be present.

During operations, and with respect to a subsistence hunter or recreationist who may be sleeping outdoors at some distance from the mine access road, the sleep disturbance criteria would be the aforementioned 30 dBA L_{eq} value per WHO guidance (WHO 1999); therefore, in terms of magnitude and extent, the perpendicular distance from the road where this truck noise might awaken an unhoused receptor is about 800 feet. Although not included in this calculated value, should wide expanses of dense, linearly occluding vegetation or the presence of terrain features

like ridgelines or hills obscure the receptor's view of the mine access road, the actual traffic noise L_{eq} value should be less at this distance. Put another way, a line-of-sight blocking ridgeline could potentially yield up to a 10 dBA reduction in the propagated sound, which would enable the outdoors-sleeping receptor to be up to 2,500 feet away from the road without experiencing sleep disturbance from traffic.

In terms of duration, the anticipated noise impacts would be long-term, lasting for as long as the operations phase occurs, and only as long as the NSR would be present.

Port Access Road

Construction—The port access road would connect the south ferry terminal with the Amakdedori port site. Construction of the port access road would be expected to involve the same type of equipment shown in AECOM 2018c (Table 5). Therefore, magnitude and extent of anticipated noise levels would be similar to those predicted for the mine access road, and the distances at which 30 dBA L_{eq} and 45 dBA L_{dn} occur would also be the same (Table 4.19-3). Given these distances, noise impacts may be realized, depending on the location of potential inhabited structures, recreationists, or subsistence hunters. However, duration of these impacts would be short-term.

Operations—The port access road traffic would largely be trucks, with a few expected lighter vehicles (e.g., passenger cars, vans) for commuting project workers and approved visitors who may originate at Kokhanok. As a result, the predicted traffic noise levels along the port access road would be comparable to those of the mine access road, adjusted by using the same FTA-based mathematical expression and input parameters, but only a fraction (10 percent) of the passenger vehicle traffic assumed for the mine access road. The resulting traffic noise estimate, in terms of L_{dn}, is as follows:

- In terms of magnitude and extent, within a distance of approximately 200 feet from the port access road, the estimated traffic-attributed noise level would be greater than 45 dBA L_{dn} at a building exterior, and therefore 10 dBA greater than the existing outdoor ambient sound level for a potential NSR (e.g., a temporarily occupied seasonal shelter).
- With respect to a subsistence hunter or recreationist who may be sleeping outdoors at some distance from the port access road, the highest level of noise from operations phase traffic would be a concurrent pass-by of two trucks, traveling in opposite directions. The sleep disturbance criteria in this context would be the aforementioned 45 dBA L_{max} value per WHO guidance (WHO 1999); therefore, the perpendicular distance from the port access road where an unhoused receptor might be awakened would be 0.5 mile.

In addition to traffic noise from vehicles on the port access road, noise from regular road maintenance activities would also occur during summer and winter seasons with the same noise impact magnitude, extent, and potential, depending on distance, as shown in Table 4.19-3. The duration of anticipated noise effects associated with project-attributed traffic and road maintenance would be long-term, lasting through the operations phase.

Closure—Any reclamation activities for areas adjoining the port access road would be expected to involve equipment similar to the roster presented under closure in AECOM 2018c (Table 4), and generate the same predicted magnitude, duration, extent, and potential for noise impact, depending on distance and type of NSR (i.e., housed or unhoused receptor).

Kokhanok Spur Road

Construction—The Kokhanok spur road would connect the port access road with the community of Kokhanok and its airport. Construction of Kokhanok spur road would be expected to involve

the same type of equipment listed in AECOM 2018c (Table 5). Therefore, the magnitude, duration, extent, and potential of anticipated noise levels would be similar to those predicted for the mine access road, and the distances at which 30 dBA L_{eq} and 45 dBA L_{dn} occur would also be the same (Table 4.19-3). Given these distances, noise impacts may be realized depending on the location of potential inhabited structures, recreationists, or subsistence hunters in the vicinity of the Kokhanok spur road.

Operations—Because the Kokhanok spur road would be essentially a short connection between the existing Kokhanok Airport and its community and the port access road, the type of traffic would probably be limited to lighter vehicles (e.g., passenger cars, vans) for commuting project workers and approved visitors. The regular flow of truck traffic making deliveries to and from the south ferry terminal would tend to not use the Kokhanok spur road; and as a result, the magnitude and extent of predicted traffic noise levels along the Kokhanok spur road would be much less than that of the mine access road. Using the same FTA-based mathematical expression and input parameters, but without the trucks, and only a fraction (10 percent) of the light vehicle traffic as expected on the mine access road on the northern side of Iliamna Lake, the traffic noise estimate for Kokhanok spur road in terms of L_{dn} would be as follows:

- With respect to a subsistence hunter or recreationist who may be sleeping outdoors at some distance from the road, the highest level of noise from project traffic would be a concurrent pass-by of two vehicles on the Kokhanok spur road, traveling in opposite directions. The sleep disturbance criteria in this context would be the aforementioned 45 dBA L_{max} value per WHO guidance (WHO 1999); therefore, in terms of magnitude and extent, the perpendicular distance from the roadway where an unhoused receptor might be awakened would be 1,000 feet. Should linearly occluding forest or ground terrain features block line-of-sight and yield a 10-dBA reduction in the propagated sound, the distance at which sleep disturbance might occur would shorten to 330 feet.

In addition to traffic noise from vehicles on the Kokhanok spur road, noise from routine road maintenance activities would also occur during summer and winter seasons. Road maintenance would be expected to have the same noise impact potential as that assessed for the mine access road, and impacts would depend on distance of the receptor. The anticipated noise effects associated with project-attributed traffic and road maintenance would be long-term, lasting through operations.

Closure—Reclamation activities for areas adjoining the Kokhanok spur road would be expected to involve equipment similar to closure, presented in AECOM 2018c (Table 4), and generate the same predicted magnitude, duration, extent, and potential for noise impact, depending on distance (as shown on Table 4.19-3) and type of NSR (i.e., unhoused or housed receptor).

Air Transportation

Existing airfields at Iliamna and Kokhanok are already constructed and operating as public airports, and would be expected to experience project-related aviation traffic. However, the Kokhanok Airport would not be used to support project construction until the Kokhanok spur road would be completed. Therefore, for the first year of construction, the airstrip at Amakdedori port would be temporarily used as described in the following paragraphs.

Amakdedori Port Airstrip

The Amakdedori airstrip would be constructed as part of Alternative 1a. To support the project construction phase, the Amakdedori airstrip would be expected to experience between 20 and 40 flights per month by a Twin Otter (Bombardier DHC-6 or similar aircraft type) during the May-September periods of the first and second years of project construction (PLP 2018-RFI 027a).

Between these periods, during the winter months, up to 20 flights per month may be required. According to Federal Aviation Administration (FAA) data, the Twin Otter is estimated to exhibit 67 dBA (at 4 miles from takeoff start roll) during takeoff; and 78 dBA (at 1.2 miles from runway threshold) during approach.

With respect to a subsistence hunter or recreationist who may be sleeping outdoors at some distance from the airstrip; in terms of magnitude, the highest level of noise from project air traffic activity would be an aircraft takeoff or landing at night. Using the same sleep disturbance criterion of 45 dBA L_{max}, the extent of the perpendicular distances where an unhoused receptor might be awakened would be 6.5 miles and 4.5 miles for takeoff and approach, respectively.

For potential receptors in shelters, where exterior noise levels not exceeding 45 dBA L_{dn} would be expected for avoiding adverse effects with respect to existing outdoor ambient noise levels (35 dBA L_{dn}), the extent of perpendicular distances would need to be within 3.4 miles for takeoff and 1.8 miles for approach.

In terms of magnitude, noise associated with project flights during use of the Amakdedori port airstrip would be expected to be from aircraft similar to those described above, with equivalent noise levels. In terms of magnitude and duration, the frequency and number of flights would be expected to be much less than during the project construction phase, because workers would be flown to Iliamna or Kokhanok (PLP 2018-RFI 027) during operations and closure.

Iliamna Airport

An airport at Iliamna is already constructed and operating as a public facility.

Operations—During airport operations, major noise sources would consist of operating aircraft and on-site facility operations. These are pre-existing sources of noise that contribute to the outdoor sound environment close to the airport.

For the 12-month period ending December 31, 2015, the airport had 15,400 aircraft operations, an average of 42 per day: 73 percent general aviation, and 27 percent air taxi (AirportIQ™ 5010 2018).

In terms of magnitude of impacts from noise, the project would be expected to increase the frequency of fixed-wing and rotary-wing aircraft by an average quantity of 11 aircraft per week, and include Twin Otter and Q400 (Bombardier DHC-8)-type aircraft. Assuming the airport's stationary noise sources do not change, the increase in noise from the airport would primarily be due to the increase in aviation traffic. The average increase in daily operations of no more than 2 per day represents less than a 5 percent increase in traffic volumes. Unless the size and/or power of project-related aircraft are substantially different than those composing existing aviation traffic, the per-event magnitude, duration, and extent of sound levels associated with aircraft takeoff, landing, and taxiing would not change.

Closure—At closure, noise levels would likely revert to pre-project conditions.

Kokhanok Airport

An airfield at Kokhanok is already constructed and operating as a public airport. Major noise sources would consist of operating aircraft and on-site facility operations. These are presumably pre-existing sources of noise that acoustically contribute to the outdoor sound environment close to the airport. However, for the 12-month period ending December 31, 2013, the airport had no aircraft operations (AirportIQ™ 5010 2018).

Operations—The magnitude of impacts would be that the project would be expected to add an average quantity of up to 10 Twin Otter type aircraft flights per week during project construction,

and 5 to 10 Twin Otter aircraft flights per week during project operations. Assuming the airport's stationary noise sources do not change, the increase in noise from the airport would primarily be due to the increase in aviation traffic. If levels of aircraft activity at Kokhanok continue to be modest or non-existent, then these project-attributed operations could be considered relatively new sources of noise, and—for purposes of this analysis—could be assessed in a manner similar to what was previously described for the temporary reliance on the Amakdedori port airstrip. In terms of extent, distances where adverse effects would be anticipated for outdoor subsistence hunters, recreationists, or occupants of shelters and other structures due to Twin Otter takeoffs and landings would be the same as those presented for Amakdedori port. The impacts would be expected to be long-term, lasting through the operations phase.

Closure—On closure, anticipated aviation traffic at Kokhanok would likely return to pre-project levels.

Water Transportation—Iliamna Lake Ferry Terminals

The following discussion of noise impacts applies to Iliamna Lake ferry terminals in general, and describes distances where NSRs would be affected. Alternative 1a includes two ferry terminals on Iliamna Lake: the Eagle Bay ferry terminal; and the south ferry terminal. The predicted noise analysis findings for Iliamna Lake ferry terminals are listed in Table 4.19-4.

Table 4.19-4: Distances from Iliamna Lake Ferry Terminals where Noise-Sensitive Receptors in Wilderness (35 dBA L_{dn}) would be Impacted

Project Phase or Activity(ies)	Operational Season/ Notes	Distance from Alignment (feet), where 30 dBA L_{eq} Predicted	Distance from Alignment (feet), where > 10 dBA over Existing L_{dn} Predicted
Construction	Summer and Winter	8,550	5,000
Operations	Summer and Winter	2,250	1,000
Closure	Summer and Winter	10,600	6,500

Notes:
> = greater than
dBA = A-weighted decibel
L_{eq} = equivalent sound level (e.g., hourly)
L_{dn} = day-night sound level, expressed as dBA; presumes outdoor ambient noise is 35 dBA L_{dn} (wilderness)

The anticipated noise impacts within the two above-stated distances would last only as long as the project phase noise occurs.

The ferry terminals would serve as transfer points for cargo conveyed over the lake via an ice-breaking ferry, at an expected average frequency of one round trip per day. Consistent with the project description (PLP 2020d), this analysis assumes that each terminal has a manned office with a generator and some equipment (e.g., forklifts) to handle loading and unloading of cargo between the moored ferry and trucks. The ferry engine would be shut down during loading and unloading.

Construction—Construction activities associated with the ferry terminals would include ground preparation and development of ferry terminal facilities. In terms of magnitude and extent of impacts, this analysis assumes that the intensity of construction activity, as well as type and quantity of equipment and vehicles involved, would resemble AECOM 2018c (Table 5) for the mine access road, and thereby demonstrate an overall reference sound level of 88 dBA L_{eq} at 50 feet. Based on PLP 2018-RFI 037, construction of the ferry terminals would occur from June through September in one construction year (Year 2); therefore, these impacts would be considered short-term.

Operations—This analysis assumes the local power supply (generator) at each ferry terminal would conservatively operate continually (day and night) and represents the dominant site sound source (apart from intermittent forklift operation and related activity during the up to twice-per-day ferry loading or unloading). In terms of magnitude, duration, and extent, this would produce a reference sound level no greater than 70 dBA L_{eq} at a distance of 50 feet over the long-term project operations phase.

Closure—The ferry terminals would likely be used to support closure activities. Because activities at the ferry terminals would continue, the magnitude, duration, extent, and potential for noise impacts would be similar to those discussed under operations. However, it is assumed that after operations and closure activities were completed, the amount of activity at these ferry terminals would decrease. Reclamation activities for areas adjoining the ferry terminal sites would be expected to involve equipment similar to closure, as presented in AECOM 2018c (Table 4); and generate the same predicted potential for noise impact, depending on distance and type of NSR (e.g., unhoused or housed receptor).

4.19.4.3 Amakdedori Port

Alternative 1a includes a caisson dock at Amakdedori port.

Port Noise Sources

Construction—Construction of the port would involve conventional heavy construction equipment, vehicles, and stationary systems (e.g., air compressors, generators) similar to those listed in AECOM 2018c (Table 3), and would be expected to prepare and grade the site and construct the port terminal and facilities, including power generation plant and offshore facilities (dock and causeway). Using FTA general assessment techniques to estimate construction noise, in terms of magnitude and extent of the impacts, it could be assumed that two pieces of equipment, each exhibiting no more than 85 dBA L_{max} (e.g., two simultaneously operating graders on site) at 50 feet and operating at full power, would yield an aggregate average sound level of 88 dBA L_{eq} at 50 feet, and represent the noise from most port construction activities.

Operations—Operation of the port would involve generally persistent stationary noise sources such as on-site power generation and heating and ventilation systems, punctuated by loading/off-loading activity to handle concentrate containers, other cargo, and fuel from vessels.

Closure—As the port would continue to support closure activities, potential noise impacts at the sensitive receptor would be similar to those discussed under the operations above. However, it is assumed that once mine closure is completed, the amount of activity at the port site would decrease from project levels to support port maintenance as needed.

AECOM 2018c (Table 4) lists noise levels emitted by expected mobile and stationary machinery that would be operated at Amakdedori port during construction, operations, and closure. Unless otherwise noted, these lists per project phase represent estimates of maximum operating units at one time.

Port Impact Analysis

The nearest potential NSR to the port would be subsistence hunters and seasonal visitors (recreationists) temporarily inhabiting the Alaska Department of Natural Resources (ADNR) parcel (ID# 24103002). Such NSRs may also dwell on public lands beyond this parcel boundary. Although the equipment and vehicle rosters would be different, the technique for estimating noise exposure at NSRs due to Amakdedori port operation would be similar to that used for estimating aggregate noise emission from mine site operation, and use the same conservative assumptions. The

predicted magnitude and extent of impacts are shown in Table 4.19-5, showing distances where adverse noise effects would be expected for the same two types of NSRs: recreationists and subsistence hunters sleeping outdoors and subject to disturbance; and occupants of structures.

Table 4.19-5: Distances from Amakdedori Port where Noise-Sensitive Receptors in Wilderness (35 dBA L_{dn}) Would Be Impacted

Project Phase or Activity(ies)	Operational Season/ Notes	Distance from Alignment (feet), where 30 dBA L_{eq} Predicted	Distance from Alignment (feet), where > 10 dBA over Existing L_{dn} Predicted
Construction	Summer and Winter	8,550	4,900
Operations	Summer and Winter	9,750	5,800
Closure	Summer and Winter	10,550	6,400

Notes:
> = greater than
dBA = A-weighted decibel
L_{eq} = equivalent sound level (e.g., hourly)
L_{dn} = day-night sound level, expressed as dBA; presumes outdoor ambient noise is 35 dBA L_{dn} (wilderness)

The duration of anticipated noise impacts at potential NSRs in the above-stated distances would be long-term, lasting as long as the project phase occurs.

4.19.4.4 Natural Gas Pipeline Corridor

For purposes of the noise analysis, the pipeline corridor study is organized by type of facility as follows:

- Mainline, which includes the temporary construction and operational ROWs, and temporary work areas outside of the ROW (e.g., shoe-fly roads, construction camps, pipe and equipment storage yards)
- Pipeline aboveground facilities, which would include the new compressor station at the eastern terminus on the Kenai Peninsula (at Anchor Point), the mainline block valve stations, metering stations, and pig launching and receiving facilities

Mainline

The distances of the nearest NSR vary for each subcomponent (surface, water, and air) analyzed; however, the general existing ambient noise level would be estimated at 35 dBA L_{dn} (adapted from Table 3.19-1).

Construction—In terms of duration, noise impacts associated with the mainline would occur mainly during construction. Construction-related noise sources would be generated by helicopter traffic, diesel-powered mobile equipment, pipe installation equipment, equipment operating at material sites, and blasting (in the event it would be necessary). In terms of magnitude and extent, increased noise levels would vary depending on the construction stage and would be localized to the vicinity of the construction equipment, and transitory as construction activity proceeds at various locations along the length of the pipeline. Noise impacts for specific construction activities are described below.

The overall project schedule for construction of infrastructure build-out, pipe installation, and ROW stabilization, rehabilitation, and reclamation work concurrent with and immediately following pipeline installation would take place over a period of 3 to 4 years. The first year would involve ROW civil work and mobilization of material and equipment, including clearing of vegetation (as applicable), preliminary civil construction of access roads, airstrips, barge landings, pipe storage yards, and construction campsites. The pipeline installation would occur for a period of 2 to 3 years.

AECOM 2018c (Table 5) lists equipment used for construction of a typical pipeline section, the corresponding magnitude of noise levels, and season of operation, grouped by construction activities. Because noise impacts and affected sensitive receptors vary with specific construction activities during a certain period of time, as well as the conditions of the affected environment where the activities may be located with respect to potential NSRs, the noise impacts are discussed relative to the pipeline major construction activities, as described below.

The equipment rosters presented in AECOM 2018c (Table 5) show the expected assortment of stationary and mobile equipment per construction phase; this analysis predicts distant NSR noise exposure from only the two loudest units operating at full power—in a manner similar to the FTA "general assessment" technique (FTA 2006). By way of example, in terms of magnitude and extent of impacts for the general activities and utility equipment category, the forklift and carrier are each rated at 85 dBA at 50 feet; therefore, the combined representative reference noise level for this phase would be 88 dBA L_{eq} at 50 feet.

Table 4.19-6 lists the distances from the centerline of the pipeline corridor on land in which the indicated sound levels attributed to construction would be exceeded. As consistently used in the preceding analyses, the 30 dBA L_{eq} metric would be the impact criterion applied to recreationists and subsistence hunters sleeping outdoors during their seasonal activities on lands considered "wilderness ambient," per Table 3.19-2. Correspondingly, the 45 dBA L_{dn} limit (representing a 10 dBA increase over the presumed existing 35 dBA L_{dn} of the pre-project outdoors) applies to such individuals sleeping in structures. These impacts would be expected to occur over the long-term, through the operations phase of the project.

Table 4.19-6: Distances from Construction of the Pipeline where Noise-Sensitive Receptors in Wilderness (35 dBA L_{dn}) Would Be Impacted

Construction Phase or Activity(ies)	Operational Season/Notes	Distance from Alignment (feet), where 30 dBA L_{eq} Predicted	Distance from Alignment (feet), where > 10 dBA over Existing L_{dn} Predicted
General Activities and Utility Equipment (GA&UE)	Summer and Winter	8,550	5,000
GA&UE with helicopter support (40% AUF)	Summer and Winter	19,500	14,000
Civil Construction	Summer and Winter	8,550	5,000
Drilling and Blasting	Summer and Winter	12,600	8,000
Ice Road Construction and Maintenance	Winter	8,550	5,000
Pipe Laying	Summer and Winter	8,550	5,000
River Crossings and Horizontal Directional Drilling (HDD)	Summer	7,800	4,400
Backfilling and Ground Restoration	Summer and Winter	8,550	5,000
Pipe Cleaning, Pressure Testing, and Drying	Summer and Winter	5,100	2,600

Notes:
AUF = acoustic use factor
> = greater than
dBA = A-weighted decibel
HDD = horizontal directional drilling
L_{eq} = equivalent sound level (e.g., hourly)
L_{dn} = day-night sound level, expressed as dBA; presumes outdoor ambient noise is 35 dBA L_{dn} (wilderness)

The magnitude, duration, and extent of anticipated noise effects within the two distances noted in Table 4.19.6 would last only as long as the indicated construction-phase activities occur, and in the vicinity of the receptors. In other words, pipeline construction activity tends to be intensive at a particular area, and moves away from a stationary NSR as construction progresses.

Where the pipeline makes the east Cook Inlet landfall, the existing outdoor ambient sound environment would be anticipated to be higher (50 dBA L_{dn}), due to road traffic on the nearby Sterling Highway and other human development; therefore, in terms of extent of impacts, the distance buffers where pipeline construction noise would potentially cause impacts to neighboring NSRs would be much shorter, as presented in Table 4.19-7. In this sound environment, the magnitude of the outdoor ambient noise is already well above 30 dBA L_{eq}, and would not be expected to have receptors sleeping outdoors. For people sleeping inside their residences in this developed environment, the EPA guidance level of 55 dBA L_{dn} for the NSR exterior serves as the impact threshold for project-attributed noise.

Table 4.19-7: Distances from Construction of the Pipeline where Noise-Sensitive Receptors in Anchor Point (50 dBA L_{dn}) Would Be Impacted

Construction Phase or Activity(ies)	Operational Season/Notes	Distance from Alignment (feet), where 55 dBA L_{dn} Predicted
General Activities and Utility Equipment (GA&UE)	Summer and Winter	2,150
GA&UE with helicopter support (40% AUF)	Summer and Winter	8,300
Civil Construction	Summer and Winter	2,150
Drilling and Blasting	Summer and Winter	4,000
Ice Road Construction and Maintenance	Winter	2,150
Pipe Laying	Summer and Winter	2,150
River Crossings and HDD	Summer	1,850
Backfilling and Ground Restoration	Summer and Winter	2,150
Pipe Cleaning, Pressure Testing, and Drying	Summer and Winter	990

Notes:
AUF = acoustic use factor
dBA = A-weighted decibel
HDD = horizontal directional drilling
L_{dn} = day-night sound level, expressed as dBA; presumes outdoor ambient noise is 50 dBA L_{dn}

The magnitude and extent of impacts, with the exception of helicopter-supported activities and drilling, are provided in Table 4.19-7 for pipeline construction. Construction activities would be expected to cause impactful noise levels within a distance of 2,150 feet from the pipeline alignment. Therefore, it would be possible that up to 43 of the potential NSRs counted as being within 0.5 mile of the compressor station (see Section 3.19, Noise) may experience short-term impacts, lasting only as long as construction. Development of a detailed construction noise mitigation plan, including scheduling of noise-producing activities, the proper design and implementation of practical and site-appropriate noise-reducing measures, and sound level monitoring to check for compliance with the outdoor EPA guidance threshold would help reduce the magnitude of construction noise, and thereby reduce the likelihood, duration, and quantity of impacted NSRs (see Appendix M1.0, Mitigation Assessment).

Construction and installation of the pipeline segments along the bottom of Iliamna Lake and Cook Inlet would be carried out by appropriate equipment and vessels sufficiently distant from NSRs and would not cause noise impacts (see Section 4.23, Wildlife Values, and Section 4.25, Threatened and Endangered Species).

Operations

Pipeline Operations—There would be no major noise-producing sources along the pipeline corridor during pipeline operation. Gas traveling through the pipeline would not emit audible noise at potential NSRs; therefore, there would be no noise impacts associated with pipeline operation.

Periodic Pipeline Maintenance and Inspection—Periodic maintenance and routine inspection would be conducted on the mainline, and noise sources would include pigging. Given the similarity of expected activities, the magnitude and extent of noise level emissions from pigging would be considered comparable to those of the pipeline cleaning, pressure testing, and drying activities, as described in AECOM 2018c (Table 5), with the potential for impact at NSRs, depending on the existing sound environment and the proximity (i.e., in the indicated screening distances), per Table 4.19-5 and Table 4.19-6. The frequency of these impacts would be intermittent throughout the project operations, as defined by permit (if issued) requirements.

Pipeline ROW Maintenance and Safety Inspection—As part of maintenance and safety procedures, the pipeline ROW would be cleared of brush at approximately 10-year intervals, or as required to preserve pipeline integrity and access. AECOM 2018c (Table 6) lists equipment operated for a typical ROW clearing and the corresponding noise levels, and represents an estimate of maximum operating units at one time.

Using the FTA-based general assessment technique of estimating construction noise from the two loudest pieces of equipment operating at full power, the magnitude and extent of the resulting reference noise level for pipeline ROW maintenance would be 88 dBA L_{eq} at 50 feet. The predicted analysis findings are as follows:

- Within a distance of approximately 8,550 feet from the pipeline area being cleared, the magnitude of the estimated noise level would be at least 30 dBA L_{eq}, and therefore risk causing sleep disturbance for recreationists and subsistence hunters sleeping outdoors during their seasonal activities on lands considered “wilderness ambient,” per Table 3.19-1. At Anchor Point, such receptors would not be expected, and therefore would not be impacted.
- Within a distance of approximately 5,000 feet, the magnitude of estimated operations noise level would be at least 45 dBA L_{dn} at a building exterior, and therefore 10 dBA greater than the existing outdoor ambient sound level at a potential NSR (e.g., a temporarily occupied seasonal shelter). For NSRs at Anchor Point, where such ROW maintenance may occur, the screening distance would only be 2,150 feet.

The duration of anticipated noise impacts within the two distances noted above would be intermittent, lasting only as long as the ROW maintenance activity would be occurring, but has the potential to occur throughout the operations phase.

Closure—All disturbed areas (e.g., the ROW, temporary construction camps, pipe storage yards, material sites, airstrips, roads, barge landings other temporary use areas) would be cleaned up, stabilized, prepared for natural revegetation, and reclaimed. Noise estimates are calculated based on the two loudest equipment units listed in AECOM 2018c (Table 5) under the backfilling and ground restoration. In terms of magnitude and extent of impacts, the two loudest equipment units from the table each have a noise level of 85 dBA at 50 feet, and would therefore combine to a source reference level of 88 dBA L_{eq} at 50 feet. Because this is the same reference level for the

pipeline maintenance activity, potential impacts would be anticipated at NSRs within the same distances. The duration anticipated for noise effects would last through closure, and extent would be limited to the immediate vicinity of closure activities at any given time.

Intermittent noise impacts from helicopters used to transport personnel to and from pipeline locations would also be expected. However, because the flight routes and vertical aircraft distances are unknown at this time, the magnitude and extent of resulting noise levels during an NSR fly-over could not be estimated.

Pipeline Aboveground Facilities

Pipeline aboveground facilities consist of a compressor station, metering stations, mainline valves, and pig launcher and receiver stations. Noise impacts for each of these facilities are described below.

Compressor Station

For purposes of this noise analysis, the compressor station is assumed to feature the following:

- 1,000-horsepower natural gas compression machines driven by two gas-fired microturbines (one 100 percent unit and a 100 percent backup)
- Outdoor fin-fan coolers
- Unmanned station, with fully automated equipment operated by a remote-control system
- Pig launcher and a mainline block valve (as an emergency shutdown or blowdown valve) on the site

The nearest NSR to the Kenai compressor station would be residents and seasonal visitors of Anchor Point.

Construction—Noise impacts during the construction of the compressor station would be generated during operations of heavy construction equipment. Noise calculation methodologies and assumptions would be in accordance with the FTA guidance on general assessment for noise impacts (FTA 2006), whereby noise estimates are predicted based on two of the loudest expected equipment units shown under the general activities category of Table 4.19-5 and Table 4.19-6. The predicted magnitude and extent of impacts would be 88 dBA L_{eq} at 50 feet. The predicted analysis finding is as follows:

- Within a distance of approximately 2,150 feet, the magnitude of the estimated noise level would be at least 55 dBA L_{dn} at a building exterior, and therefore potentially greater than the EPA guidance level for the exterior of an NSR in the Anchor Point census-designated place (CDP) boundary (USCB 2018a).

Subsistence hunters and recreationists would not generally be expected to be sleeping outdoors in this developed area of the Kenai Peninsula; therefore, they would not be expected to be potential NSRs with respect to this noise source. The duration and extent of anticipated noise effects within the above-stated distance would be short-term, and limited to the immediate vicinity of where such activities occur during construction of the facilities.

Operations—Noise generated at the compressor station during operations would originate mainly from operation of the compressor machines, one microturbine, fin-fan coolers, blowdown processes, and pipeline pig(s). This analysis assumes the following:

- The compressors and microturbines would be housed inside buildings or provided enclosures to reduce noise emissions.

- External to these buildings or enclosures, air intakes and combustion exhaust ducting for the power units would feature typical sound-attenuating means.
- In aggregate, sound levels attributed to the enclosed compressors and power units operating at full load would be limited to 68 dBA L_{eq} at a distance of 50 feet (based on line source propagation from an exterior wall, where the emitted noise would be 80 dBA L_{eq} at 3.28 feet from the surface).
- Unenclosed fin-fan coolers would emit up to 88 dBA L_{eq} at a distance of 50 feet, and would be the dominant compressor station noise sources.

The predicted analysis finding for compressor station operation noise is as follows:

- Within a distance of approximately 2,150 feet, the magnitude of estimated operations noise level would be at least 55 dBA L_{dn} at a building exterior, and therefore potentially greater than the EPA guidance level for the exterior of an NSR in the community of Anchor Point.

Subsistence hunters and recreationists would not generally be expected to be sleeping outdoors in this developed area of the Kenai Peninsula; therefore, they would not be expected to be potential NSRs with respect to this noise source. The duration of anticipated noise effects within the above-stated distances would be long-term, lasting as long as the compressor station operates during the operations phase.

Pipeline pigging would be needed for maintenance and testing, and most likely would be performed on an annual basis. The noise duration and extent of noise from pipeline pigging would be transient in nature, and would only occur at the pig trap, and at the short, aboveground pipe segment. The potential of noise from a pipeline blowdown event would be rare, because it would only occur during an emergency pressure relief or blowdown due to an incident requiring a major repair on a pipeline segment or compressor station equipment. The magnitude and duration of noise from a pipeline blowdown would be loud and transient, lasting for several minutes, until the pressure is relieved.

Closure—Reclamation activities at the compressor station would occur following construction, and at the beginning of closure. Disturbed ground would be graded and stabilized after construction of facilities. At closure, all equipment at the compressor station would be dismantled and transported away for salvage, recycling, or disposal, as appropriate. Noise estimates are calculated based on the two loudest equipment units from AECOM 2018c (Table 5) under backfilling and ground restoration. In terms of magnitude and extent, the two loudest equipment units from the table each have a noise level of 85 dBA at 50 feet, and would therefore combine to a source reference level of 88 dBA L_{eq} at 50 feet. Because this would be the same reference level for the pipeline maintenance activity, the magnitude and extent of these potential impacts would be anticipated at Anchor Point NSRs within the same distances. The duration of these anticipated noise effects would last only through project closure.

Metering Stations

Metering stations would be at the project pipeline tie-ins with existing natural gas pipeline infrastructure in the vicinity of the compressor station at the eastern pipeline terminus and at Amakdedori port. Each of the metering stations would have a mainline block valve and a pig launcher and receiver. Noise impacts would generally not be anticipated due to construction, operations, and closure of metering facilities, where outdoor noise sources such as the unenclosed fin-fan gas coolers would be expected to dominate the local sound environment.

Mainline Block Valve Stations

Mainline block valves would be placed at no more than 20-mile intervals along the pipeline route. They would be constructed as part of the pipeline installation and operate with aboveground features that would be designed to emit low noise levels due to exterior thermal/acoustic lagging materials or insulated housings or enclosures. No noise impacts would be anticipated at distances beyond the pipeline ROW when the mainline block valves would be conveying gas to the mine site under normal conditions. Maintenance of these facilities would be considered categorized as pipeline maintenance, which has been previously discussed.

4.19.5 Alternative 1

Alternative 1 includes the mine site at Pebble; a transportation corridor with a mine access road in the Upper Talarik Creek watershed to a north ferry terminal; a ferry crossing of Iliamna Lake to a south ferry terminal west of Kokhanok; continuation of the transportation corridor with a port access road to the western side of Cook Inlet; a port at Amakdedori with a solid-fill dock design; and a natural gas pipeline from the Kenai Peninsula to the mine site. Potential noise-related impacts of Alternative 1, including three variants (the Summer-Only Ferry Operations Variant, the Kokhanok East Ferry Terminal Variant, and the Pile-Supported Dock Variant), are analyzed in the following subsections.

4.19.5.1 Mine Site

The magnitude, duration, extent, and likelihood of noise impacts to NSRs with respect to the construction, operations, and closure of the mine site would be the same as those for Alternative 1a.

4.19.5.2 Transportation Corridor

The facilities associated with the transportation corridor under Alternative 1 are discussed below in terms of the subcomponents of surface transportation, air transportation, and water transportation.

Surface Transportation

The primary road segments in Alternative 1 are the mine access road (mine site to the north ferry terminal), Iliamna spur road, port access road, and Kokhanok spur road. Road segments were studied individually and by project phase, as described in the following paragraphs.

Mine Access Road Noise

Noise impact distances for the Alternative 1 mine access road for construction, operations, and closure would be similar to those for the Alternative 1a mine access road.

Iliamna Spur Road

Construction—The Iliamna spur road would connect the mine access road with the existing Portage Road at a T-intersection approximately 2 miles north of Iliamna Airport. Construction of the Iliamna spur road would be expected to involve the same type of equipment shown in AECOM 2018c (Table 5); therefore, the magnitude, duration, and extent of anticipated noise levels during construction would be similar to those predicted for the mine access road, and the distances at which 30 dBA L_{eq} and 45 dBA L_{dn} occur would also be the same (Table 4.19-3).

Operations—The Iliamna spur road would be expected to experience traffic between the mine site and the communities of Iliamna and Newhalen. The type of traffic would probably be limited

to lighter vehicles (e.g., passenger cars, vans) for commuting project workers and approved visitors. The regular flow of truck traffic making deliveries to and from the north ferry terminal would tend to avoid this spur; and as a result, the magnitude and extent of the predicted traffic noise levels along the Iliamna spur road would be lower than that of the mine access road. Using the same FTA-based mathematical expression and input parameters, but without the trucks, the traffic noise estimate in terms of L_{dn}, is as follows:

- At a distance of approximately 20 feet from the spur road, the estimated traffic-attributed noise level would be greater than 45 dBA L_{dn} at a building exterior, and therefore 10 dBA greater than the existing outdoor ambient sound level to a potential NSR (e.g., a temporarily occupied seasonal shelter). This distance would be close to the road, because the day-night project-attributed traffic noise level would be much quieter without the trucks.

With respect to a subsistence hunter or recreationist who may be sleeping outdoors at some distance from this road, the highest level of noise from project traffic possibility would be a concurrent pass-by of two vehicles on the Iliamna spur road—traveling in opposite directions. The sleep disturbance criteria in this context would be the 45 dBA L_{max} value per WHO guidance (WHO 1999); therefore, in terms of extent of the impact, perpendicular distance from the road where an unhoused receptor might be awakened would be 1,000 feet.

In addition to traffic noise from vehicles on the Iliamna spur road, noise from regular maintenance activities would also occur during summer and winter seasons, as studied for the mine access road, with the same magnitude and extent of noise impact potential, depending on distance (Table 4.19-3).

The duration of anticipated noise effects associated with project-attributed traffic and road maintenance would be long-term, continuing through the operations phase.

Closure—Any reclamation activities for areas adjoining the Iliamna spur road would be expected to involve equipment similar to the closure roster presented in AECOM 2018c (Table 4), and generate the same predicted magnitude and extent potential for noise impact, depending on distance and type of NSR (i.e., unhoused or housed receptor). The duration of impacts would be throughout the closure phase.

Port Access Road

Impact for the surface transportation corridor along the port access road would be the same as that described for Alternative 1a.

Kokhanok Spur Road

Impact for the surface transportation corridor along the Kokhanok spur road would be the same as described for Alternative 1a.

Air Transportation

Impacts attributed to air transportation would be the same as those described for Alternative 1a.

Water Transportation—Iliamna Lake Ferry Terminals

Alternative 1 Iliamna Lake ferry terminals would be the north and south ferry terminals.

Noise sources for the north and south ferry terminals would be the same as those described for Alternative 1a. The north ferry terminal is unique to Alternative 1.

For both north and south ferry terminal sites and surrounding lands, the predicted analysis findings would be as shown in Table 4.19-4.

4.19.5.3 Amakdedori Port

Under Alternative 1, impact sheet pile-driving would occur during construction. The magnitude and extent of noise impacts from pile driving would be the generation of noise levels of 95 dBA L_{max} at 50 feet (FHWA 2006). (Sheet piles would be vibratory driven for placement; then impact pile-driving would occur to refusal [PLP 2018-RFI 030]). The duration of noise generated during pile driving would be short-term.

With pile extraction during closure, in terms of magnitude, a subsistence hunter or recreationist who may be sleeping outdoors at some distance from the port may be startled if exposed to 45 dBA L_{max} per WHO guidance (WHO 1999). The extent of the perpendicular distance from the pile-driving activity where this awakening of an unhoused NSR would occur would be 5,100 feet. The duration of the impact would be short-term, lasting only while pile driving would be occurring during the construction phase.

4.19.5.4 Natural Gas Pipeline Corridor

The magnitude, duration, extent, and likelihood of noise impacts to NSRs with respect to the construction, operations, and closure of the natural gas pipeline would be the same as those for Alternative 1a.

4.19.5.5 Alternative 1—Summer-Only Ferry Operations Variant

The magnitude, duration, and extent of noise impacts with implementation of summer-only ferry operations would be the same as those for Alternative 1 during the summer. These impacts would be certain to occur under this variant.

4.19.5.6 Alternative 1—Kokhanok East Ferry Terminal Variant

Aside from a relocation of the south ferry terminal to the east of the community of Kokhanok, the Kokhanok East Ferry Terminal Variant avoids a road crossing the Gibraltar River. Regarding the magnitude, duration, and extent of noise impact, this variant would be identical to Alternative 1. These impacts would be certain to occur under this variant.

4.19.5.7 Alternative 1—Pile-Supported Dock Variant

With regard to noise impacts on human receptors, the Pile-Supported Dock Variant would not produce impacts with a magnitude, duration, and extent beyond those calculated for Alternative 1. These impacts would be certain to occur under this variant. Impacts to wildlife are addressed under Section 4.23, Wildlife; and Section 4.25, Threatened and Endangered Species.

4.19.6 Alternative 2—North Road and Ferry with Downstream Dams

Alternative 2 would reduce the overall length of access roads and use alternative design and construction methods for the bulk tailings storage facility (TSF). Alternative 2 consists of the same mining methods and facilities as Alternative 1a, but uses downstream construction methods for the bulk TSF (see Chapter 2, Alternatives); a transportation corridor with a mine access road to a ferry terminal at Eagle Bay; a south crossing of Newhalen River; and a ferry crossing of Iliamna Lake to a ferry terminal near Pile Bay. Variants under this alternative include a north crossing of the Newhalen River and the same two variants described for Alternative 1: the Summer-Only Ferry Variant and the Pile-Supported Dock Variant.

Alternative 2 would include up to 76 Native Allotments consisting of 6,053 acres within its primary 2-mile analysis distance, compared to 36 Native Allotments and 3,140 acres for Alternative 1a (including all components, but primarily associated with road, port, ferry terminal, and pipeline construction and closure phases). See Section 3.19, Noise, for explanation of using Native Allotments and census-designated areas in the noise impacts analysis for the largely remote (unpopulated) analysis area.

4.19.6.1 Mine Site

The magnitude, duration, extent, and likelihood of noise impacts to NSRs with respect to the construction, operations, and closure of the mine site would be the same as those for Alternative 1a.

4.19.6.2 Transportation Corridor

This section is organized by the subcomponents of the transportation corridor: surface transportation, air transportation, and water transportation.

Surface Transportation

Two road segments apply to Alternative 2: mine access road to Eagle Bay ferry terminal; and the port access road from the Pile Bay ferry terminal to Diamond Point. The mine access road is the same as that for Alternative 1a, and would have the same impact distance for construction, operation, and closure (Table 4.19-3).

Air Transportation

No new permanent airstrips are associated with this alternative.

Water Transportation

Potentially affected NSRs may include the same property parcels, if occupied, identified for Alternative 2 in Section 3.19, Noise. Along the transportation corridor for Alternative 2, distances where impacts would be anticipated at NSRs would be the same as those as previously discussed for Alternative 1a.

4.19.6.3 Diamond Point Port

The facility would be comparable to that of a port at Amakdedori, except there would be no airstrip at the port site. The magnitude, duration, and extent of noise impacts to NSRs with respect to the construction, operations, and closure of the Diamond Point port would be the same as for Alternative 1a. These impacts would be expected to occur under Alternative 2 with construction of the Diamond Point port.

4.19.6.4 Natural Gas Pipeline Corridor

In terms of magnitude, duration, extent, and likelihood, impacts anticipated at NSRs would be the same as those previously presented under Alternative 1a.

4.19.6.5 Alternative 2—Newhalen River North Crossing Variant

This variant considers a north crossing location of the Newhalen River as an alternative to the south crossing location that is evaluated in Alternative 1a. Impacts would be the same as those described for Alternative 1a.

4.19.6.6 Alternative 2—Summer-Only Ferry Operations Variant

Implementation of the summer-only ferry operations under Alternative 2 would have the same magnitude, duration, and extent of noise impacts as Alternative 2 during the summer. The impacts would be expected to occur under this variant.

4.19.6.7 Alternative 2—Pile-Supported Dock Variant

In terms of magnitude, duration, extent, and likelihood of noise impacts on human receptors, the Pile-Supported Dock Variant would not produce impacts beyond those calculated for Alternative 1. Impacts to wildlife are addressed under Section 4.23, Wildlife; and Section 4.2, Threatened and Endangered Species.

4.19.7 Alternative 3—North Road Only

Alternative 3 has a different transportation corridor and natural gas pipeline route, and would eliminate the need for ferry transportation across Iliamna Lake. This alternative includes the mine site; a transportation corridor with a north access road from the mine site to the western side of Cook Inlet (at Diamond Point); a south crossing of Newhalen River; a port north of Diamond Point with a caisson dock design; and a natural gas pipeline that follows the same general route from the Kenai Peninsula to the mine site as Alternative 2. There is one variant under this alternative: Concentrate Pipeline Variant.

Alternative 3 would include all components, but primarily be associated with the road, port, terminal, and pipeline construction and closure phases. This alternative would include up to 71 Native Allotments consisting of 5,702 acres within its primary 2-mile impact screening distance, compared to Alternative 1a with 36 Native Allotments and 3,140 acres. Also, although both alternatives pass through Iliamna and Anchor Point CDPs, Alternative 1a passes through Kokhanok CDP, while Alternative 3 passes through Pedro Bay CDP (Table 3.19-5).

4.19.7.1 Mine Site

The magnitude, duration, extent, and likelihood of potential noise impacts to NSRs with respect to construction, operations, and closure of the mine site would be the same as those for Alternative 1a.

4.19.7.2 Transportation Corridor

Potentially affected NSRs may include those property parcels, if occupied, identified in Section 3.19, Noise. Along the transportation corridor for Alternative 3, distances where impacts would be anticipated at NSRs would be the same as those described for Alternative 1a. The route passes near the community of Pedro Bay; therefore, the existing outdoor ambient sound environment would not be 35 dBA L_{dn}, but in terms of magnitude, would reflect those values shown in Table 3.19-4. This would cause the impact distances to reflect use of the EPA guidance-based noise threshold of 55 dBA L_{dn} for the exteriors of occupied residences or seasonal shelters. In terms of extent of impacts during construction of the mine access road near the Pedro Bay community, this distance would be 2,250 feet.

In terms of magnitude and extent of impacts during the operations phase, expected road traffic would cause noise impact to NSRs at up to 200 feet in an otherwise 35-dBA L_{dn} undeveloped environment; but near Pedro Bay, the distance would shorten to 35 feet. Maintenance of the road would potentially cause noise impacts to NSRs near Pedro Bay at up to 2,150 feet in summer, and 1,800 feet in the winter. During closure and reclamation activities along the road near the

Pedro Bay community, the impact distance would be 3,000 feet. These impacts would be long-term, lasting for the life of the project, and would be expected to occur under Alternative 3.

4.19.7.3 Diamond Point Port

The facility features, construction, and operations would be comparable to those of Amakdedori port (Alternative 1a); therefore, the magnitude, duration, extent, and likelihood of noise impacts to NSRs with respect to the construction, operations, and closure of the Diamond Point port would be the same as those for Alternative 1a.

4.19.7.4 Natural Gas Pipeline Corridor

The magnitude, duration, extent, and likelihood of noise impacts to NSRs with respect to the construction, operations, and closure of the natural gas pipeline corridor would be the same as those for Alternative 1a. The pipeline route passes near the community of Pedro Bay; therefore, the existing outdoor ambient sound environment would not be 35 dBA L_{dn}, but would reflect values shown in Table 3.19-4, and therefore cause the impact distances to reflect use of the EPA guidance-based noise threshold of 55 dBA L_{dn} for the exteriors of occupied residences or seasonal shelters.

4.19.7.5 Alternative 3—Concentrate Pipeline Variant

There would be no difference in impacts under this variant as compared to Alternative 3.

4.19.8 Cumulative Effects

This section addresses cumulative effects of noise on human receptors during all project phases. Potential cumulative noise impacts resulting from the project on other resources are addressed in other sections of the EIS: Section 4.5, Recreation; Section 4.9, Subsistence; Section 4.11, Aesthetics; Section 4.23, Wildlife Values; Section 4.24, Fish Values; and Section 4.25, Threatened and Endangered Species.

The analysis area for cumulative effects on noise includes the footprint of the project, including all alternatives and variants; the Pebble Project expansion footprint (including road, pipeline, and port facilities), and any other reasonably foreseeable future actions (RFFAs) in the vicinity of the project that would result in potential synergistic and interactive noise effects. In this area, a nexus may exist with other past or present activities, as well as RFFAs that could contribute to a cumulative effect on noise.

Section 4.1, Introduction to Environmental Consequences, describes the comprehensive set of past, present, and RFFAs considered for evaluation as applicable. A number of the actions considered would have no potential of contributing to cumulative effects on noise in the analysis area. These include offshore-based developments; activities that may occur in the analysis area, but are unlikely to result in any appreciable impact on noise; or actions outside of the cumulative effects analysis area.

4.19.8.1 Past and Present Actions

Past and present actions that have contributed to noise in the area consist of aircraft traffic associated with mineral exploration and commercial recreation; occasional vessel traffic on Iliamna Lake; and noise sources typical of small Alaskan communities, including airports and regularly scheduled air traffic. Scoping comments have indicated concerns with past helicopter noise associated with mineral exploration activities.

4.19.8.2 Reasonably Foreseeable Future Actions

Most RFFAs listed in Section 4.1, Introduction to Environmental Consequences, are not in the noise cumulative impacts analysis area. The RFFAs that could contribute cumulatively to noise impacts in the cumulative effects analysis area are: Pebble Project expansion scenario; the continued development of the Diamond Point rock quarry; and air traffic associated with communities and commercial recreation.

The potential future actions are similar to the project in how they may generate noise from construction and operations activities. However, if those actions are not concurrent with project activities, such as sequential construction activities, noise emission could not combine to create a cumulative effect. Additionally, if only the project is in proximity to the receptor, and other cumulative projects are sufficiently distant, the acoustic contributions from the other projects would not meaningfully contribute to cumulative noise impacts.

The No Action Alternative would not contribute to cumulative effects on noise.

The contribution of RFFAs to cumulative effects on noise are summarized by alternative in Table 4.19-8.

Table 4.19-8: Cumulative Effects on Noise

Reasonably Foreseeable Future Actions	Alternative 1a	Alternative 1 and Variants	Alternative 2 and Variants	Alternative 3 and Variant
Pebble Project Expansion Scenario	**Mine Site:** The mine site footprint would have a larger open pit and new facilities to store tailings and waste rock, which would contribute to cumulative effects on noise through removal of overburden, waste rock, and ore. Pebble Project expansion would extend the period of operation and closure, and expand the area where noise is generated. **Other Facilities:** A north access road, and concentrate and diesel pipelines, would be constructed along the Alternative 3 road alignment, and extended to a new deepwater port site at Iniskin Bay. The north ferry terminal to the existing Iliamna area road system would already be constructed. The north access road would be extended east from the Eagle Bay ferry terminal to the Pile Bay terminus of the Williamsport Road. This would expand the area affected by construction and operational noise, but avoid generating noise over a second transportation corridor. Construction would have potentially limited impacts on noise in the vicinity of the corridor. An additional compressor station would be added to the Amakdedori port site, which would create additional noise for the period of operations. **Magnitude** The Pebble Project expansion scenario footprint would impact about 3 times the acres as Alternative 1a. The magnitude of impacts to noise would increase. Although sources of noise are similar to the project, they would occur over a larger area of the mine site and transportation corridor, and potentially be audible over a slightly larger area. **Duration/Extent:** Construction, operations, and closure of the Pebble Project expansion scenario would cause increase in duration of noise in the analysis area. An increase in extent of noise in the	**Mine Site:** Same as Alternative 1a**.** **Other Facilities:** Similar to Alternative 1a, except that the portion of the access road from the north ferry terminal to the existing Iliamna area road system would need to be constructed. As in Alternative 1a, the north access road would then be extended east from the Eagle Bay ferry terminal to Iniskin Bay. **Magnitude:** The Pebble Project expansion scenario footprint would impact more than 3 times the acres as Alternative 1. This is more than Alternative 1a because the north access road would require more new construction. As for Alternative 1a, the magnitude of impacts to noise would increase; they would occur over a larger area of the mine site and transportation corridor. **Duration/Extent:** The duration and extent of cumulative impacts to noise would be similar to Alternative 1a, although	**Mine Site:** Same as Alternative 1a**.** **Other Facilities:** Similar to Alternative 1a, the north access road would be extended east from the Eagle Bay ferry terminal to Iniskin Bay. **Magnitude:** Overall, Pebble Project expansion would affect less acreage than Alternative 1a, as well as generation of noise, given that a portion of the north access road and all of the gas pipeline would already be constructed. **Duration/Extent:** The duration and extent of cumulative impacts to noise would be similar to duration and extent of Alternative 1a. **Contribution:** The contribution to cumulative impacts would be similar to but slightly less than Alternative 1a.	**Mine Site:** Same as Alternative 1a**.** **Other Facilities:** Overall expansion would use the existing north access road; concentrate and diesel pipelines would be constructed along the existing road alignment, and extended to a new deepwater port site at Iniskin Bay. **Magnitude:** Overall expansion would affect less acreage and generate less noise than Alternative 1a, Alternative 1, and Alternative 2, given that the entire north access road and gas pipeline would already be constructed. Noise impacts from the Pebble Project expansion would be less than Alternative 1a. **Duration/Extent:** The duration and extent of cumulative impacts to noise would be similar to duration and extent of Alternative 1a, although affecting a smaller amount of acreage, and within one transportation corridor.

Table 4.19-8: Cumulative Effects on Noise

Reasonably Foreseeable Future Actions	Alternative 1a	Alternative 1 and Variants	Alternative 2 and Variants	Alternative 3 and Variant
	mine site may occur because of the increase in areas of activity that would generate noise, but impacts to noise-sensitive receptors would not be expected to increase in the mine site analysis area. Noise would be generated over a larger area, given the Pebble Project expansion and the construction of a second road and pipeline corridor. **Contribution:** The magnitude of impacts to noise would not be expected to increase because sources of noise are similar to the Alternative 1a direct and indirect impacts. However, the duration would be longer, and they would be potentially audible over a slightly larger area.	affecting a larger amount of acreage over two transportation corridors. **Contribution:** The contribution to cumulative effects under Alternative 1 would be slightly more than under Alternative 1a.		**Contribution:** The contribution to cumulative impacts would be slightly less than Alternative 1a.
Other Mineral Exploration Projects	**Magnitude:** Mining exploration activities, including additional borehole drilling, road and pad construction, helicopter support, and development of temporary camp facilities, would generate noise noticeable to people in their vicinity, causing noise disturbance at discrete locations. **Duration/Extent:** Exploration activities typically occur at a discrete location for one season, although a multi-year program could expand the geographic area affected in a specific mineral prospect. Table 4.1-1 in Section 4.1, Introduction to Environmental Consequences, identifies seven mineral prospects in the analysis area where exploratory drilling is anticipated (four of which are in relatively close proximity to the Pebble Project). **Contribution:** This contributes to cumulative effects of noise disturbance (by adding areas of activity), although the areal extent of disturbance is a relatively small portion of the Kvichak/Nushagak watersheds.	Impacts would be similar to Alternative 1a.	Impacts would be similar to Alternative 1a.	Impacts would be similar to Alternative 1a.

Table 4.19-8: Cumulative Effects on Noise

Reasonably Foreseeable Future Actions	Alternative 1a	Alternative 1 and Variants	Alternative 2 and Variants	Alternative 3 and Variant
Oil and Gas Exploration and Development	**Magnitude:** Onshore oil and gas exploration activities could involve seismic and other forms of geophysical exploration; and in limited cases, exploratory drilling. Seismic exploration would involve temporary overland activities and potential helicopter support, creating temporary noise disturbances. Should it occur, exploratory drilling would involve the construction of temporary pads and support facilities, and helicopter support, with permit conditions to minimize noise disturbance. **Duration/Extent:** Seismic exploration and exploratory drilling are typically single-season temporary activities. The 2013 BBAP amended plan shows 13 oil and gas wells drilled on the western Alaska Peninsula, and a cluster of three wells near Iniskin Bay. It is possible that additional seismic testing and exploratory drilling could occur in the analysis area; but based on historic activity, this is not expected to be intensive. **Contribution:** Onshore oil and gas exploration activities would contribute cumulatively to noise disturbances, and would occur in the analysis area, but distant from the project. The project would have minimal contribution to cumulative effects.	Similar to Alternative 1a.	Similar to Alternative 1a.	Similar to Alternative 1a.
Road Improvement and Community Development Projects	**Magnitude:** Road improvement projects would take place in the vicinity of communities and have noise impacts through construction and operation. The Diamond Point rock quarry has potential to increase noise disturbance in the analysis area through the excavation of rock, which would require removal of soil overburden materials and rock using heavy equipment and blasting. If activity is concurrent, there is a possibility of this RFFA contributing cumulatively to noise impacts locally around the Diamond Point area. The estimated	Similar to Alternative 1a.	The footprint of the Diamond Point rock quarry in Alternative 1a coincides with the Diamond Point port footprint in Alternative 2. Cumulative impacts would likely be less under Alternative 2 as compared to Alternative 1a due to commonly shared project	The footprint of the Diamond Point rock quarry in Alternative 1a coincides with the Diamond Point port footprint in Alternative 3. Cumulative impacts would likely be similar to Alternative 2, and less as compared to Alternative 1a.

Table 4.19-8: Cumulative Effects on Noise

Reasonably Foreseeable Future Actions	Alternative 1a	Alternative 1 and Variants	Alternative 2 and Variants	Alternative 3 and Variant
	area that would be affected is approximately 140 acres (ADNR 2014a). **Duration/Extent:** Noise would be most noticeable during construction, which usually lasts for a single season. Communities in the immediate vicinity of project facilities, such as Iliamna, Newhalen, and Kokhanok, would notice the greatest contribution to cumulative noise effects. Noise from continued operation of Diamond Point may also be noticeable. Some limited road upgrades could also occur in the vicinity of the natural gas pipeline starting point near Stariski Creek, in the Anchor Point census-designated area, or in support of mineral exploration previously discussed. **Contribution**: Road construction would occur in the analysis area, but removed from the project. The project would have minimal contribution to cumulative effects. Quarrying at Diamond Point would contribute additional noise to that generated by the proposed project.		footprints with the quarry site.	
Summary of Project contribution to Cumulative Effects	Overall, the contribution of Alternative 1a to cumulative effects to noise, when taking other past, present, and RFFAs into account, would be minor in terms of magnitude, duration, and extent, given the limited human population residing near the mine site.	Similar to Alternative 1a, although slightly more acreage would be affected by the Pebble Project expansion over two transportation corridors.	Similar to Alternative 1a, although slightly less acreage would be affected by the Pebble Project expansion over one transportation corridor.	Similar to Alternative 1a, although less acreage would be affected by the Pebble Project expansion than any of the alternatives over one transportation corridor.

Notes:
BBAP = Bristol Bay Area Plan
RFFA = reasonably foreseeable future action