K4.20 AIR QUALITY

This appendix supports discussion and explanation of an analysis of project emissions and impacts to air quality presented in Section 4.20, Air Quality, of the Environmental Impact Statement (EIS). This appendix presents the approach and results of the calculation of emissions and assessment of impacts from project components (mine site, transportation corridor, Amakdedori port, and pipeline corridor) and phases (construction, operations, and closure), for which direct impacts were predicted using modeling. The analysis presented in this appendix is not intended to be applied directly to any specific alternative, but is meant instead to be representative of several action alternatives (referred to a representative project). Components and phases selected for emissions quantification and modeling were those anticipated to produce impacts with the highest magnitude, largest geographic extent, and longest duration from among those included in Alternative 1a and Alternative 1. Impacts from other components and phases are smaller than those modeled and are assessed by proxy. Because the action alternatives would have similar emission sources and locations of stationary emissions (except for the location of the port and transportation corridor), emissions estimates and air dispersion modeling for the analyzed representative project provide a proxy for all action alternatives. Differences among alternatives in road and pipeline length and location would result in different road-related emissions. These differences among alternatives, as well as differences in locations of the port, were not separately modeled, but instead were evaluated qualitatively.

In addition to the emissions and model impacts for the project, a cumulative impact assessment was completed for the combined impacts of the project and Reasonably Foreseeable Future Actions (RFFAs). The cumulative impact assessment is based on the analysis of the direct impacts that were predicted using modeling of the project components and phases.

K4.20.1 Emission Inventory and Project Emissions Summary

The following sections present an overview of assumptions and methods used to calculate the emissions inventory, as well as the emissions for representative project components and select project phases. Additional information and details of the emission inventory calculations are provided in PLP 2018-RFI 007 and PLP 2019-RFI 007b.

K4.20.1.1 Emission Inventory Development Methodology

Total potential criteria pollutant and hazardous pollutant emissions are calculated using vendor data, US Environmental Protection Agency (EPA) AP-42 emission factors, Motor Vehicle Emission Simulator (MOVES) model, mass balances equations, EPA Current Methodologies in Preparing Mobile Source Port-Related Emission Inventories, and New Source Performance Standards (NSPS). The methods for estimating greenhouse gas (GHG) emissions for fuel combustion sources are applied in accordance with the guidance provided in Subpart C of the Mandatory Reporting of Greenhouse Gases Rule (40 CFR Part 98) for Tier 1 units, and EPA Current Methodologies in Preparing Mobile Source Port-Related Emission Inventories for marine vessel emissions. The carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (N_2O) emission estimates are calculated for all stationary and mobile equipment on an individual basis using Equation C-1 from 40 CFR Part 98. In addition, to estimate emissions for the air quality impact analyses for modeled project components, several applicant agreed upon avoidance and control measures prior to the impact analysis were considered, such as Ultra Low Sulfur Diesel (ULSD) combustion in sources as outlined in PLP 2018-RFI 007 and PLP 2019-RFI 007b.

K4.20.1.2 Calculated Emission Inventory for Direct Impacts

The calculated emissions for the representative project are addressed for each project component by project phase in the following sections.

Mine Site

For the mine site, the analysis area for the direct impacts and emissions encompasses the area where the mine site activities would occur. The direct emissions from the construction, operations, and closure phases are presented.

Construction

Direct emissions during construction would be related to quarry crushing operations, concrete batch plant operation, incineration, and power generation.

The total emissions were calculated based on a worst-case mine site construction year. Emissions were calculated assuming that each emission unit would be operated continuously 24 hours a day, 7 days a week, for a total of 8,760 hours per year, with the appropriate load factors, with the exception of those emission units, such as fire water pump engines, that would be subject to operating restrictions under an air quality permit, if issued. The potential emissions for restricted emission units were calculated with the assumption that those emission units would operate a limited number of hours per year. For the fire water pump engines, it was estimated that an expected upper limit would be 500 hours per year. The construction emission inventory for the mine site is summarized in Table K4.20-1 for a worst-case construction year.

Table K4.20-1: Mine Site Construction Emission Summary

Air Pollutant	Stationary Emission Units (tons/year)	Mobile and Non-Road Emission Units (tons/year)	Fugitive and Blasting Emission Units (tons/year)	Total Emissions (tons/year)
NO_x	110	624	9	743
CO	589	72	54	715
PM_{10}	17	14	1,030	1,061
$PM_{2.5}$	16	14	124	154
VOCs	34	20	N/A	54
SO_2	1.0	1.9	N/A	2.9
Pb	0.0	negligible	N/A	0.0
Total HAPs	5.5	6.5	N/A	12.0
CO_2	99,302	312,446	N/A	411,748
CH_4	4.6	1.7	N/A	6.3
N_2O	0.9	0.1	N/A	1.0
CO_2e	99,696	312,530	N/A	412,226

Notes:

CH_4 = methane
CO = carbon monoxide
CO_2 = carbon dioxide
CO_2e = CO_2 equivalent
HAPs = total hazardous air pollutants
N/A = not applicable
negligible = values less than 0.001 ton per year
N_2O = nitrous oxide
NO_x = oxides of nitrogen
Pb = lead
PM_{10} = particulate matter with an aerodynamic diameter less than or equal to 10 microns
$PM_{2.5}$ = particulate matter with an aerodynamic diameter less than or equal to 2.5 microns
SO_2 = sulfur dioxide
VOCs = volatile organic compounds

Source: PLP 2018-RFI 007; PLP 2019-RFI 007b

Operations

Direct emissions during mine site operations would be related to mining activities, ore-processing activities, incineration, and power generation. The mine site stationary emission unit inventory would include a combined-cycle combustion turbine 270-megawatt power plant, fire water pump natural gas engines, a back-up diesel generator, boilers, fuel storage tanks, and a small waste incinerator. The mobile equipment inventory used for various mining activities would include haul trucks, bulldozers, graders, shovels, light-duty vehicles, and loaders. Fugitive emissions would result from blasting and drilling in the pit and quarries, vehicle traffic on unpaved roads, and material handling. The fuel-burning mobile and stationary emission units are sources of combustion-related air pollutant emissions. Table K4.20-2 is a summary of the emissions during operations at the mine site for a representative operations year.

Table K4.20-2: Mine Site Operations Emission Summary

Air Pollutant	Stationary Emission Units (tons/year)	Mobile Emission Units (tons/year)	Fugitive and Blasting Units (tons/year)	Total Emissions (tons/year)
NO_x	83	1,296	31	1,410
CO	133	105	179	417
PM_{10}	159	26	2,686	2,871
$PM_{2.5}$	159	26	322	507
VOC	32	37	N/A	69
SO_2	14.2	4.1	N/A	18.3
Pb	0.0	negligible	negligible	0.0
Total HAPs	9.1	16.6	negligible	25.7
CO_2	640,226	600,251	N/A	1,240,477
CH_4	12.7	2.7	N/A	15.4
N_2O	1.3	0.0	N/A	1.3
CO_2e	640,940	600,320	N/A	1,241,260

Notes:
CH_4 = methane
CO = carbon monoxide
CO_2 = carbon dioxide
CO_2e = CO_2 equivalent
HAPs = total hazardous air pollutants
N/A = not applicable
negligible = values less than 0.001 ton per year
N_2O = nitrous oxide
NO_x = oxides of nitrogen
Pb = lead
PM_{10} = particulate matter with an aerodynamic diameter less than or equal to 10 microns
$PM_{2.5}$ = particulate matter with an aerodynamic diameter less than or equal to 2.5 microns
SO_2 = sulfur dioxide
VOCs = volatile organic compounds
Source: PLP 2018-RFI 007; PLP 2019-RFI 007b

Closure

During closure, facilities would support operation of the camp and power generation. The reclamation emissions inventory would include internal combustion engines, a gas turbine, boilers, and an incinerator. The mobile equipment would include haul trucks, shovels, bulldozers, compactors, graders, and service and light-duty vehicles. Fugitive dust emissions would result from stockpiled overburden handling, bulldozing, grading, vehicle traffic on unpaved roads, and wind erosion of road surfaces and active reclamation areas. The duration of the closure phase at the mine site is expected to be approximately 20 years. The maximum closure and construction activities and emissions in a given year would be similar to each other. Table K4.20-3 presents a summary of the mine site closure emissions for a representative closure year.

Table K4.20-3: Mine Site Closure Emission Summary

Air Pollutant	Stationary Emission Units (tons/year)	Mobile Emission Units (tons/year)	Fugitive Emission Units (tons/year)	Total Emissions (tons/year)
NO_x	30	969	N/A	999
CO	77	53	N/A	130
PM_{10}	28	16	978	1,022
$PM_{2.5}$	28	16	139	183
VOC	11	22	N/A	33
SO_2	1.7	3.2	N/A	4.9
Pb	0.005	negligible	N/A	0.005
Total HAPs	4.7	5.4	negligible	10.1
CO_2	140,134	524,619	N/A	664,753
CH_4	3.3	1.8	N/A	5.1
N_2O	0.4	0.3	N/A	0.7
CO_2e	140,331	524,750	N/A	665,081

Notes:

CH_4 = methane
CO = carbon monoxide
CO_2 = carbon dioxide
CO_2e = CO_2 equivalent
HAPs = total hazardous air pollutants
N/A = not applicable
negligible = values less than 0.001 ton per year
N_2O = nitrous oxide
NO_x = oxides of nitrogen
Pb = lead
PM_{10} = particulate matter with an aerodynamic diameter less than or equal to 10 microns
$PM_{2.5}$ = particulate matter with an aerodynamic diameter less than or equal to 2.5 microns
SO_2 = sulfur dioxide
VOCs = volatile organic compounds

Source: PLP 2018-RFI 007; PLP 2019-RFI 007b

Transportation Corridor

This section addresses the direct emissions from the construction and operations phases of the transportation corridor facilities. For the analysis of direct impacts to air quality, the analysis area of the transportation corridor includes gravel roads, ferry terminals on Iliamna Lake, port, and spur roads. The road and onshore pipeline would be constructed in the same right-of-way (ROW) at the same time (except for the pipeline-only segment from Newhalen to the mine access road under Alternative 1a, and the pipeline-only segment between Ursus Cove and Cottonwood Bay under Alternative 2 and Alternative 3), so the emissions from the construction of both the road and onshore pipeline are calculated together.

Construction

During construction, the main direct emission sources would be heavy-duty, non-road, and mobile construction vehicles, as well as fugitive dust generated by vehicles on unpaved roads, and wind erosion. Additional fugitive emissions would result from blasting, drilling, rock crushing, and material handling. Stationary emissions sources would include engines and vapor vented from fuel storage tanks. Emissions from material mining and crushing operations required for fill material, principally for an earthen access causeway at the port (under Alternative 1 and Alternative 2) are also included in this assessment. The representative emissions were calculated based on the total construction duration of the transportation corridor and estimated equipment operation. The duration of construction for the road corridor and onshore pipeline facilities is expected to be approximately 1 year. Table K4.20-4 presents a summary of the construction emissions for the transportation corridor.

Table K4.20-4: Transportation Corridor Construction Emission Summary

Air Pollutant	Stationary Emission Units (tons/year)	Mobile and Non Road Emission Units (tons/ year)	Fugitive Emission Units (tons/year)	Total Emissions (tons/year)
NO_x	13	200	4	217
CO	80	92	23	195
PM_{10}	2	14	1,838	1,854
$PM_{2.5}$	2	14	229	245
VOC	7	18	N/A	25
SO_2	0.14	0.71	N/A	0.85
Pb	0.01	negligible	N/A	0.01
Total HAPs	7.25	8.4	N/A	15.7
CO_2	18,401	108,422	N/A	126,823
CH_4	1.4	1.4	N/A	2.8
N_2O	0.2	0.0	N/A	0.2
CO_2e	18,506	108,466	N/A	126,972

Notes:
CH_4 = methane
CO = carbon monoxide
CO_2 = carbon dioxide
CO_2e = CO_2 equivalent
HAPs = total hazardous air pollutants
N/A = not applicable
negligible = values less than 0.001 ton per year
N_2O = nitrous oxide
NO_x = oxides of nitrogen
Pb = lead
PM_{10} = particulate matter with an aerodynamic diameter less than or equal to 10 microns
$PM_{2.5}$ = particulate matter with an aerodynamic diameter less than or equal to 2.5 microns
SO_2 = sulfur dioxide
VOCs = volatile organic compounds

Source: PLP 2018-RFI 007; PLP 2019-RFI 007b

Operations

Direct emissions during the transportation corridor operations would come from power generators at the ferry terminals, shipping across the waterways, vapor vented from fuel storage tanks, and other fuel-burning engines such as ferry engines, light-duty vehicles, truck/trailer vehicles, container-handing forklifts, graders, and aircraft. Additionally, fugitive dust emissions would result from vehicle traffic on unpaved roads. Table K4.20-5 presents a summary of the operations emissions in the transportation corridor.

Table K4.20-5: Transportation Corridor Operations Emission Summary

Air Pollutant	Stationary Emission Units (tons/year)	Mobile and Non-road Emission Units (tons/year)	Fugitive Emission Units (tons/year)	Total Emissions (tons/year)
NO_x	25.9	30	N/A	56
CO	84.2	42	N/A	126
PM_{10}	1.6	2	398.5	403
$PM_{2.5}$	1.6	2	38.4	42
VOC	18.1	5	N/A	23
SO_2	0.2	0.6	N/A	0.8
Pb	0.0	negligible	N/A	0.0
Total HAPs	2.6	0.07	N/A	2.7
CO_2	13,111	17,015	N/A	30,126
CH_4	0.6	0.5	N/A	1.1
N_2O	0.1	0.1	N/A	0.2
CO_2e	13,156	17,046	N/A	30,202

Notes:

CH_4 = methane
CO = carbon monoxide
CO_2 = carbon dioxide
CO_2e = CO_2 equivalent
HAPs = total hazardous air pollutants
N/A = not applicable
negligible = values less than 0.001 ton per year
N_2O = nitrous oxide
NO_x = oxides of nitrogen
Pb = lead
PM_{10} = particulate matter with an aerodynamic diameter less than or equal to 10 microns
$PM_{2.5}$ = particulate matter with an aerodynamic diameter less than or equal to 2.5 microns
SO_2 = sulfur dioxide
VOCs = volatile organic compounds

Source: PLP 2018-RFI 007; PLP 2019-RFI 007b

Amakdedori Port

This section presents the emissions from the construction, operations, and closure phases of the Amakdedori port. Additionally, the underwater pipeline portions in the Cook Inlet and Iliamna Lake are included in the analysis of the port construction phase.

Construction

The construction of the port and offshore pipeline uses similar equipment and methods. Therefore, the emissions are calculated together; however, the construction would not occur at the same time. The construction of the offshore pipeline would occur after the port construction. The construction emissions are calculated based on the estimated construction time, regardless of which activity would occur first.

The port site construction activity would include construction of port facilities to support later phases of construction and mine operations. Emissions from material mining and crushing operations required for fill material are captured in the road construction emissions provided for the transportation corridor. Emissions associated with operation of the port facilities, including trucking or offshore pipeline construction, are assumed to be similar to emissions during mine operation, and are represented by the annual transportation emissions estimate for mine operations.

The construction activity associated with the port and offshore pipeline would include engines, an asphalt plant, boilers, fuel storage tanks, and a small incinerator. The mobile equipment inventory would include bulldozers, excavators, loaders, and cranes in the port construction, and tugs, long-reach excavators, and welders in the pipeline construction. Fugitive emissions would result from site grade preparation and mobile equipment traffic. The construction of the port and offshore pipeline is expected to take approximately 1 year. Table K4.20-6 presents an emission summary for construction of the port and associated offshore pipeline.

Table K4.20-6: Amakdedori Port Construction Emission Summary

Air Pollutant	Stationary Emission Units (tons/year)	Mobile and Non Road Emission Units (tons/year)	Fugitive Emission Units (tons/year)	Total Emissions (tons/year)
NO_x	6.2	343	N/A	349
CO	13.5	144	N/A	158
PM_{10}	17.5	16	1.3	35
$PM_{2.5}$	17.5	16	0.2	34
VOC	2.5	16	N/A	19
SO_2	0.4	4.4	N/A	4.8
Pb	0.007	negligible	N/A	0
Total HAPs	3.6	0.2	N/A	3.8
CO_2	5,890	32,443	N/A	38,333
CH_4	0.6	0.2	N/A	0.8
N_2O	0.1	1.2	N/A	1.3
CO_2e	5,937	32,816	N/A	38,753

Notes:

CH_4 = methane
CO = carbon monoxide
CO_2 = carbon dioxide
CO_2e = CO_2 equivalent
HAPs = total hazardous air pollutants
N/A = not applicable
negligible = values less than 0.001 ton per year
N_2O = nitrous oxide
NO_x = oxides of nitrogen
Pb = lead
PM_{10} = particulate matter with an aerodynamic diameter less than or equal to 10 microns
$PM_{2.5}$ = particulate matter with an aerodynamic diameter less than or equal to 2.5 microns
SO_2 = sulfur dioxide
VOCs = volatile organic compounds

Source: PLP 2018-RFI 007; PLP 2019-RFI 007b

Operations

The Amakdedori port emission unit inventory would include power generator engines, heaters, vapor vented from fuel storage tanks, and a small incinerator. Mobile equipment would include light-duty vehicles, skidsteers, forklifts, and container-handing forklifts. Marine vessels would include barges, tugs, and bulk carriers at the lightering locations. Table K4.20-7 presents a summary of the operations emissions at the port for a representative year of operations activity.

Table K4.20-7: Amakdedori Port Operations Emission Summary

Air Pollutant	Stationary Emission Units (tons/year)	Mobile and Non Road Emission Units (tons/year)	Fugitive Emission Units (tons/year)	Total Emissions (tons/year)
NO_x	53.8	265	N/A	319
CO	169	28	N/A	197
PM_{10}	4	15	1.00E-03	19
$PM_{2.5}$	4	14	1.00E-03	18
VOC	38.2	11	N/A	49
SO_2	0.4	2.0	N/A	2.4
Pb	0	negligible	N/A	0
Total HAPs	8.9	0.05	N/A	9.0
CO_2	30,246	16,432	N/A	46,678
CH_4	1.5	0.5	N/A	2.0
N_2O	0.3	0.6	N/A	0.9
CO_2e	30,370	16,627	N/A	46,997

Notes:

CH_4 = methane
CO = carbon monoxide
CO_2 = carbon dioxide
CO_2e = CO_2 equivalent
HAPs = total hazardous air pollutants
N/A = not applicable
negligible = values less than 0.001 ton per year
N_2O = nitrous oxide
NO_x = oxides of nitrogen
Pb = lead
PM_{10} = particulate matter with an aerodynamic diameter less than or equal to 10 microns
$PM_{2.5}$ = particulate matter with an aerodynamic diameter less than or equal to 2.5 microns
SO_2 = sulfur dioxide
VOCs = volatile organic compounds

Source: PLP 2018-RFI 007; PLP 2019-RFI 007b

Natural Gas Pipeline Corridor

This section only addresses emissions and air quality impacts from the construction of the Kenai compressor station on the eastern Cook Inlet landfall of the natural gas pipeline corridor. The emissions from the construction of the onshore portion of the pipeline are addressed above under the transportation corridor, while the construction air quality impacts of the offshore portion of the pipeline are addressed above under Amakdedori port.

Construction

Construction of the compressor station would involve site grading and mobile equipment use for assembly of the compressor station from pre-constructed modules. The compressor station emissions inventory would include engines and mobile equipment, as well as bulldozers, loaders, excavators, cranes, and light-duty vehicles. The fuel-burning equipment would be sources of combustion-related air pollutant emissions. Fugitive dust emissions would result from site grade preparation and mobile equipment traffic. Table K4.20-8 presents a summary of the emissions from the compressor station construction.

Table K4.20-8: Compressor Station Construction Emission Summary

Air Pollutant	Stationary Emission Units (tons/year)	Mobile and Non Road Emission Units (tons/year)	Fugitive Emission Units (tons/year)	Total Emissions (tons/year)
NO_x	N/A	1.56	N/A	1.6
CO	N/A	0.64	N/A	0.6
PM_{10}	N/A	0.11	0.53	0.64
$PM_{2.5}$	N/A	0.11	0.08	0.19
VOC	N/A	0.13	N/A	0.13
SO_2	N/A	0.01	N/A	0.01
Pb	N/A	negligible	N/A	negligible
Total HAPs	N/A	0.06	N/A	0.06
CO_2	N/A	1,332	N/A	1,332
CH_4	N/A	0.01	N/A	0.01
N_2O	N/A	0.00	N/A	0.00
CO_2e	N/A	1,332	N/A	1,332

Notes:

CH_4 = methane
CO = carbon monoxide
CO_2 = carbon dioxide
CO_2e = CO_2 equivalent
HAPs = total hazardous air pollutants
N/A = not applicable
negligible = values less than 0.001 ton per year
N_2O = nitrous oxide
NO_x = oxides of nitrogen
Pb = lead
PM_{10} = particulate matter with an aerodynamic diameter less than or equal to 10 microns
$PM_{2.5}$ = particulate matter with an aerodynamic diameter less than or equal to 2.5 microns
SO_2 = sulfur dioxide
VOCs = volatile organic compounds

Source: PLP 2018-RFI 007; PLP 2019-RFI 007b

Operations

During the operations of the pipeline corridor, the direct emissions from the onshore and offshore pipelines would be minimal. The Kenai compressor station, which would be the single compressor station for the natural gas pipeline, would have emissions. The Kenai compressor station inventory would include natural-gas-fired simple-cycle combustion turbines. Table K4.20-9 presents a summary of the operations emissions at the compressor station.

Table K4.20-9: Kenai Compressor Station Operations Emission Summary

Air Pollutant	Total Emissions (tons/year)
NO_x	69.3
CO	17.8
PM_{10}	1.4
$PM_{2.5}$	1.4
VOC	0.5
SO_2	0.30
Pb	negligible
Total HAPs	0.2
CO_2	25,344
CH_4	0.47
N_2O	0.04
CO_2e	25,370

Notes:

CH_4 = methane
CO = carbon monoxide
CO_2 = carbon dioxide
CO_2e = CO_2 equivalent
HAPs = hazardous air pollutants
negligible = values less than 0.001 ton per year
N_2O = nitrous oxide
NO_x = oxides of nitrogen
Pb = lead
PM_{10} = particulate matter with an aerodynamic diameter less than or equal to 10 microns
$PM_{2.5}$ = particulate matter with an aerodynamic diameter less than or equal to 2.5 microns
SO_2 = sulfur dioxide
VOCs = volatile organic compounds

Source: PLP 2018-RFI 007

K4.20.2 Model-Predicted Direct Impacts

The assessment of representative project model-predicted air quality impacts is addressed for select project components and phases in the following sections. As described in PLP 2018-RFI 009, near-field ambient air quality impacts were predicted using the EPA AERMOD (American Meteorological Society/EPA Regulatory Model) dispersion modeling system. The AERMOD system is preferred and required by the EPA for applications similar to what is needed for this analysis has undergone the necessary peer scientific reviews and model performance evaluation exercises that include statistical measures of model performance in comparison with measured air quality data as described in Section 3.1, Introduction to Affected Environment, and 40 Code of Federal Regulations (CFR) Section 2.1.1, Appendix W to Part 51, Guideline on Air Quality Models.

K4.20.2.1 Comparison of Model-Predicted Direct Impacts to Applicable Thresholds

Project direct impacts are compared to applicable thresholds using near-field dispersion models for Class II areas and far-field modeling assessments tools for federal Class I areas. Federal Class I area status is assigned to federally protected wilderness areas and allows the lowest amount of permissible deterioration. All other areas are Class II, allowing for a moderate amount of air quality deterioration.

Near-Field Class II Area Impact Assessments

The Clean Air Act (CAA) of 1970 (42 United States Code [USC] 7401 et seq.), as amended in 1977 and 1990, is the primary federal statute that regulates air pollution. The CAA provides states with the authority to regulate air quality within state boundaries. The State of Alaska has enacted the Alaska Ambient Air Quality Standards (AAAQS). The AAAQS establishes maximum acceptable concentrations for criteria pollutants, including nitrogen dioxide (NO_2), carbon monoxide (CO), sulfur dioxide (SO_2), particulate matter with an aerodynamic diameter of 10 microns or less (PM_{10}), particulate matter with an aerodynamic diameter of 2.5 microns or less ($PM_{2.5}$), ozone, ammonia, and lead. The AAAQS represent the maximum allowable atmospheric concentrations that may occur to protect public health and welfare and include a reasonable margin of safety to protect the more sensitive individuals in the population. Table K4.20-10 lists the AAAQS criteria used to evaluate both project and background impacts, based on the results of dispersion modeling. Note that lead and ammonia emissions are either minimal or not emitted at all from project components; therefore, they were not addressed as part of the impact analysis.

In addition to the AAAQS, New Source Review Prevention of Significant Deterioration (PSD) regulations are a CAA provision that is relevant to the project's impact assessment. PSD regulations under New Source Review require an analysis of potential increases in air pollutant concentration due to proposed major stationary sources (or major modification of any existing major stationary source) in areas where the baseline dates have been set (40 CFR Part 51). According to PLP 2018-RFI 012, the mine site would be the only portion of the project potentially considered a major source under PSD rules and may require this assessment.

To perform an increment analysis, modeled project-only impacts are compared to allowed maximum incremental increases in air pollutant concentrations, referred to as "PSD increments." The PSD increments for criteria pollutants are based on the PSD classification of the area. Class I areas allow the lowest amount of air quality increment consumption, while Class II designations allow higher increment consumption. The project is in a Class II area, and the project-only impacts based on near-field modeling are assessed using the PSD Class II increments as listed in Table K4.20-10. An evaluation of PSD Class I increments is qualitatively based on predicted Class II increment impacts even though screening analyses conducted in PLP 2018-RFI 012 show that the closest Federal Class I areas are too far from the project to be impacted by the project. PSD Class I increments are listed in Table K4.20-10. The comparison of impacts using PSD Class II and Class I increments has been provided for informational purposes only and does not represent a regulatory PSD increment consumption analysis. PSD increment consumption would be assessed as part of a formal increment consumption analysis during the permitting process, if required.

Also, for the purpose of this assessment, not all ambient standards and increments are addressed. The modeled project and project-only impacts are compared only to ambient standards and increments applicable to the project based on likely air quality permits requirements once the project is operational.

Table K4.20-10: Prevention of Significant Deterioration Increments and Alaska Ambient Air Quality Standards

Pollutant	Averaging Period	PSD Increment Value (µg/m³)			AAAQS	
		Class II	Class I	Form	Value (µg/m³)	Form
CO	8-hour	N/A	N/A	N/A	10,000	Not to be exceeded more than once per year
	1-hour	N/A	N/A	N/A	40,000	Not to be exceeded more than once per year
NO_2	Annual	25	2.5	Annual mean	100	Annual mean
	1-hour	N/A	N/A	N/A	188	98th percentile of annual distribution of the maximum daily 1-hour concentrations averaged over 3 years
$PM_{2.5}$	Annual	4	1	Annual mean	12	Annual mean, averaged over 3 years
	24-hour	9	2	Not to be exceeded more than once per year	35	98th percentile, averaged over 3 years
PM_{10}	Annual	17	4	Annual mean	N/A	Annual mean
	24-hour	30	8	Not to be exceeded more than once per year	150	Not to be exceeded more than once per year on average over 3 years
SO_2	Annual	20	2	Annual mean	80	Never to be exceeded
	24-hour	91	5	Not to be exceeded more than once per year	365	Not to be exceeded more than once per year
	3-hour	512	25	Not to be exceeded more than once per year	1,300	Not to be exceeded more than once per year
	1-hour	N/A	N/A	N/A	196	99th percentile of the annual distribution of the maximum daily 1-hour concentrations averaged over 3 years
Lead	Rolling 3-month average	N/A	N/A	N/A	0.15	Not to be exceeded
Ammonia	8-hour	N/A	N/A	N/A	2.1 mg/m³	Not to be exceeded more than once per year

Notes:

AAAQS = Alaska Ambient Air Quality Standards
CO = carbon monoxide
µg/m³ = micrograms per cubic meter
mg/m³ = milligrams per cubic meter
N/A = not applicable
NO_2 = nitrogen dioxide
$PM_{2.5}$ and PM_{10} = particulate matter with an aerodynamic diameter less than or equal to 2.5 and 10 micrometers, respectively
PSD = prevention of significant deterioration
SO_2 = sulfur dioxide

Source: Alaska Administrative Code Title 18, Section 50.010

Because of the lack of large nearby sources, modeling was conducted only to predict project-only concentrations. Therefore, project total ambient impact concentrations were developed by summing the project-only concentrations with a representative background concentration. The background concentrations include the contributions from non-modeled sources, which include nearby emission sources, natural sources, other unidentified sources in the vicinity of the project, and regional transport contributions from more distant sources. Project-only impacts can be inferred from the modeling results tables presented in the following sections by eliminating the background concentrations.

The background concentrations for all components were obtained from Alaska Department of Environmental Conservation (ADEC) (ADEC 2019b). As ambient air background often varies by location, the background concentrations used for each project component differ. The background concentrations for the mine site and port were calculated using data collected at the PLP Iliamna Air Quality Monitor from April 1, 2012 through March 31, 2013. Because of the monitor's close proximity to the mine site (approximately 30 miles), these background concentrations (presented in the modeling results tables) are representative of the ambient environment. The background concentrations used for the Kenai compressor station were calculated from the data collected at Chevron Swanson River Monitor from 2008 through 2009 because of the proximity of that monitor to the compressor station location. Additionally, because there are no RFFA within 31 miles of project area that would overlap in time with the project's construction and operations, the background values added to the project total are representative of the cumulative project impact.

Far-Field Class I Area Impact Assessments

As previously discussed, according to PLP 2018-RFI 012, the mine site would be the only portion of the project potentially considered a major source under PSD rules and may require this assessment. Given that there is a large distance (greater than 90 miles) between the mine and Class I areas and that project near-field criteria pollutant impacts are minimal, it is anticipated that the far-field ambient air quality impacts at Class I areas would be even smaller and below the AAAQS. Although a quantitative PSD Class I increment assessment was not performed at nearby Class I areas, the increment impacts are implicit in the PSD Class II increment analysis presented below. That analysis shows that all modeled pollutant impacts are below Class I PSD increments at the mine site safety zone boundary, except for 24-hour $PM_{2.5}$ and 24-hour PM_{10}. Although they exceed the Class I PSD increment thresholds, they are still relatively low and it is important to note that the highest 24-hour $PM_{2.5}$ and 24-hour PM_{10} impacts from the modeling assessment occurred less than a kilometer away from the mine site, near or on the mine site safety zone boundary (see Figure 1.4 of PLP 2018-RFI 009). Furthermore, the analyses presented show that impacts would rapidly decrease from that point outward. Therefore, it is highly unlikely that mine site modeled impacts at the nearest Class I area, Tuxedni Wilderness, which is separated by extremely high terrain and a distance of greater than 150 kilometers, would exceed 24-hour $PM_{2.5}$ and 24-hour PM_{10} PSD Class I increments. This is consistent with the screening analyses presented in PLP 2018-RFI 012, which implies that impacts at Class I areas would be insignificant and not cause or contribute to an increment violation. For this reason, a project-only quantitative PSD Class I increment analysis was not performed. Furthermore, because project impacts are not expected to contribute to a violation, a quantitative cumulative PSD Class I increment analysis was not performed.

In addition to an analysis of ambient air quality and increment impacts, a far-field impact assessment also includes describing impacts to air quality-related values (AQRVs). The US Forest Service, National Park Service, and US Fish and Wildlife Service (USFWS), collectively the Federal Land Managers (FLM), define an AQRV as "a resource, as identified by the FLM for one or more federal areas that may be adversely affected by a change in air quality. The resource may include visibility, or a specific scenic, cultural, physical, biological, ecological or recreational resource identified by the FLM for a particular area" (Federal Land Managers' Air

Quality Related Values Workgroup [FLAG] 2010). The AQRV analysis is typically limited to either a plume blight or regional haze analysis depending on impact magnitude and an acidic deposition analysis. The FLAG 2010 document provides guidance on methods used to assess the potential AQRV impacts.

For similar projects that have relatively low emissions and are far from the Federal Class I areas, FLAG 2010 offers a Q/D[1] screening approach to potentially avoid the need to quantify impacts for direct comparison to AQRVs. The Q/D value is calculated by dividing the sum of potential oxides of nitrogen (NO_x), total suspended particulate matter (PM), and SO_2 emissions by the distance to the closest boundary of a Class I area. A Q/D value of greater than or equal to 10 would indicate possible AQRV impacts to the Federal Class I from the project; below 10, and the project is considered to have minimal impacts to AQRVs in the Class I area.

Critical load values for federal Class I areas are used to assess acidic deposition, if such analysis is needed. To assess the magnitude of acidic nitrogen deposition, the National Park Service has developed nitrogen deposition critical load values for federal Class I areas based on the amount of deposition that could lead to harmful changes in an ecosystem. As presented in Section 3.20, Air Quality, the nitrogen deposition critical loads for Denali National Park, Tuxedni National Wildlife Refuge, and other nearby federal Class I areas are between 1.2 and 17 kilograms per hectare per year (kg/ha/yr). Cumulative project impacts below this threshold are acceptable.

K4.20.2.2 Discussion of Model-Predicted Criteria Pollutant Impacts for the Representative Project Components

The approach and results of the assessment of emissions and impacts of the representative project are addressed for select project components (mine site, transportation corridor, Amakdedori port, and natural gas pipeline corridor) and phases (construction, operations, and closure) for which direct impacts were predicted using modeling. Components and phases selected for modeling were those anticipated to produce impacts with the highest magnitude, largest geographic extent, and longest duration. Impacts from all other phases would be less impactful and were assessed by proxy to the phases modeled.

The federal action consists of the discharge of fill material into waters and wetlands, and authorization to work in and place structures in wetlands and other waters. For the project, the federal action that could cause an air impact includes the construction and operations of the Amakdedori port, construction and operations of the ferry terminals at Iliamna Lake, and construction and operations of the offshore pipeline across Iliamna Lake and Cook Inlet. Discussion of the assessed magnitude, duration, extent, and probability for each of these components is provided in the sections below. Based on the modeling assessments described in the sections below, for those project activities directly related to the federal action, impacts would be minimal and localized, and are likely to occur while the components are being constructed and/or operated. Once the construction and operations phases are complete, all emissions and impacts associated with construction and operations would cease and would no longer contribute to cumulative impacts.

<u>Mine Site</u>

Potential direct impacts from the mine site were developed by completing a project impacts assessment using dispersion modeling. For the dispersion modeling of the mine site, a safety zone was established around the mine site. This safety zone provided a buffer between the mine

[1] **Q/D** is the sum of certain pollutant emissions (tons per year) divided by distance (kilometer) from Class I area.

site and public access areas to ensure that the public would not be exposed to work site safety risks. Therefore, model receptors were placed only along and outside of the safety zone boundary to capture public access areas. The assessment was conducted based on a modeling analysis of the emissions presented under "Emissions Inventory," in Section 4.20, Air Quality. The analysis of modeling needs was based on likely air quality permits required once the mine is operational, which resulted in only select pollutants being modeled. The full permit applicability analysis is provided in PLP 2018-RFI 007.

Construction

The concentration of PM attributed to the increase in emissions from construction activities of a new permitted source lasting less than 24 months is excluded from PSD increment consumption analysis under 18 Alaska Administrative Code (AAC) 50.306(b)(2). Therefore, PM_{10} and $PM_{2.5}$ PSD increments were not part of the dispersion modeling assessment. However, in accordance with the requirements for potential future air permit authorizing the construction and operations of a stationary source, dispersion modeling was conducted to demonstrate compliance with the NO_2, PM_{10}, and $PM_{2.5}$ AAAQS. Although ADEC has not approved or reviewed modeling performed, the modeling is consistent with ADEC minor air quality dispersion modeling permitting requirements. In addition, modeling was performed to demonstrate that the level of project-related air quality deterioration is lower than the applicable NO_2 PSD Class II increment. Table K4.20-11 and Table K4.20-12 present the modeling results relative to the AAAQS and the PSD Class II increment, respectively. The maximum modeled near-field impacts are shown in Figure K4.20-1 and the modeled PSD Class II increments are shown in Figure K4.20-2. The star points in the figures represent the locations of the maximum modeled impact, which all occur along the mine site safety zone boundary. Additional details regarding the near-field modeling configuration, emissions, and assessments are provided in PLP 2018-RFI 009. Minimal and localized impacts would only occur during the construction of the mine site. Impacts would dissipate once the construction was complete. Far-field modeling was not conducted or warranted because the impacts would be temporary, and only occur when the construction activities are ongoing. Furthermore, because the construction impacts are temporary, the potential impacts would be lower than those during the operations phase, for which far-field impacts are analyzed in the following section.

Table K4.20-11: Mine Site Construction Maximum Modeled Project Impacts Compared to the AAAQS

Pollutant	Averaging Period	Maximum Project-only Predicted Concentration ($\mu g/m^3$)	Background Concentration ($\mu g/m^3$)	Maximum Concentration ($\mu g/m^3$)	AAAQS ($\mu g/m^3$)	Percent of the AAAQS
NO_2	1-Hour	77.9	2.3	80.2	188	43%
	Annual	0.3	0	0.3	100	0.3%
PM_{10}	24-Hour	23.2	12.4	35.6	150	24%
$PM_{2.5}$	24-Hour	2.2	4.1	6.3	35	18%
	Annual	0.3	0.9	1.2	12	10%

Notes:

AAAQS = Alaska Ambient Air Quality Standards
$\mu g/m^3$ = micrograms per cubic meter
NO_2 = nitrogen dioxide
$PM_{2.5}$ and PM_{10} = Particulate matter with an aerodynamic diameter less than or equal to 2.5 and 10 micrometers, respectively

Source: PLP 2018-RFI 009

Table K4.20-12: Mine Site Construction Maximum Modeled Project-Only Impacts Compared to Class II PSD Increment Limit

Pollutant	Averaging Period	Maximum Project-only Predicted Concentration (μg/m³)	Class II PSD Increment (μg/m³)	Percent of the Class II PSD Increment
NO_2	Annual	0.3	25	1.2%

Notes:

μg/m³ = micrograms per cubic meter
NO_2 = nitrogen dioxide
PSD = prevention of significant deterioration

Source: PLP 2018-RFI 009

Figure K4.20-1: Mine Site Construction Maximum Modeled Project Impacts (AAAQS)

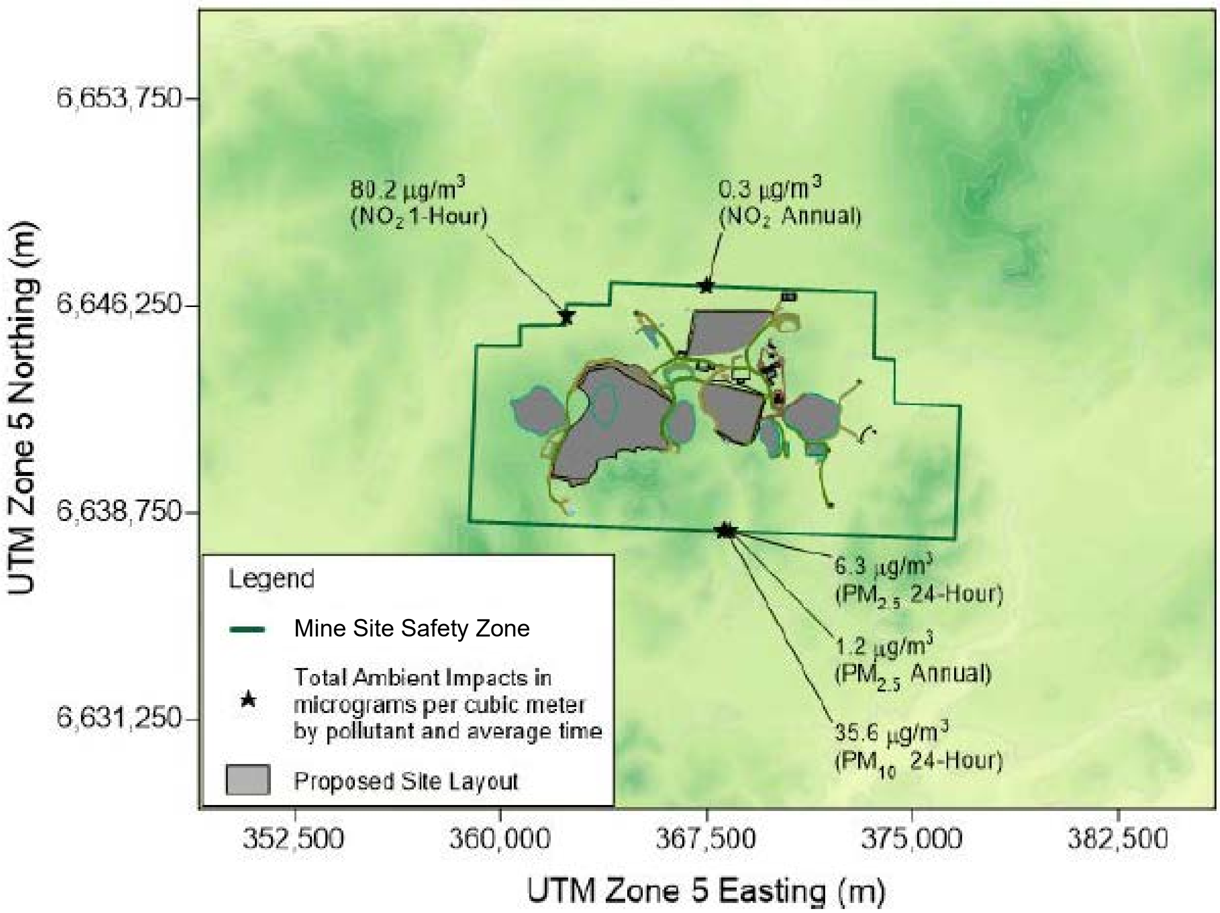
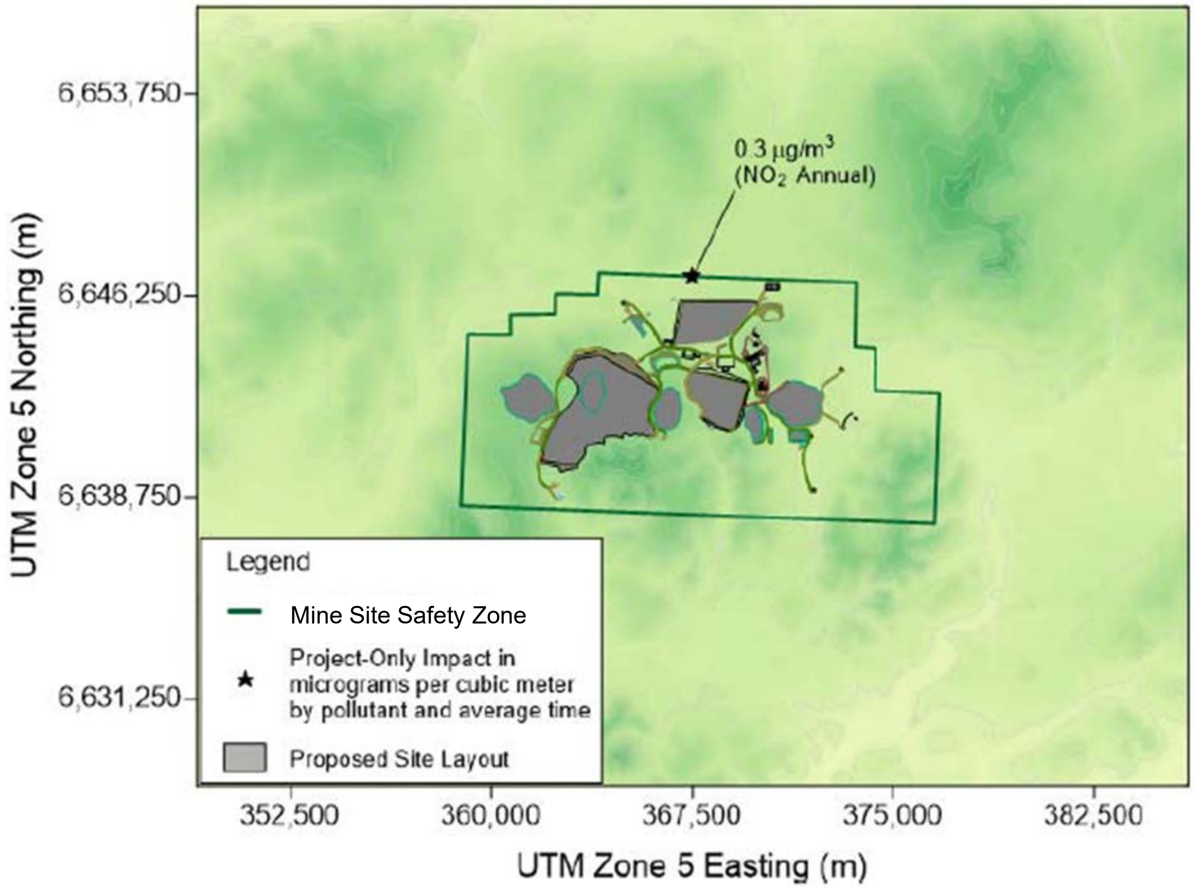


Figure K4.20-2: Mine Site Construction Maximum Modeled Project-Only Impacts (PSD)



Operations

A near-field modeling assessment was completed for mine site operations. Although ADEC has not approved or reviewed the modeling performed, the modeling is consistent with ADEC air quality permitting requirements, which require a permit to construct and operate a stationary source. The modeling assessment was prepared to address the potential air quality impacts related to the operation of the mine site. Table K4.20-13 and Table K4.20-14 summarize the modeling results relative to the AAAQS and the PSD Class II increments, respectively, that are likely to be required for an air quality permit. The maximum modeled impacts are shown for modeled pollutants compared to AAAQS in Figure K4.20-3; and the modeled pollutants compared to the PSD Class II increments are shown in Figure K4.20-4. The star points in the figures represent the locations of the maximum modeled impact, which both occur along the mine site safety zone, that would preclude public access. Additional details regarding the near-field modeling configuration, emissions, and assessments are provided in PLP 2018-RFI 009. Through modeling, compliance with applicable AAAQS has been demonstrated. In addition, modeling has demonstrated that the level of project-related air quality deterioration is lower than the applicable PSD increment. Minimal and localized impacts would occur only during operations at the mine site. Once the operations phase is complete, all emissions and impacts associated with operations would cease and would no longer contribute to cumulative impacts.

Table K4.20-13: Mine Site Operations Maximum Modeled Project Impacts Compared to the AAAQS

Pollutant	Averaging Period	Maximum Project-Only Predicted Concentration (µg/m^3)	Background Concentration (µg/m^3)	Maximum Concentration (µg/m^3)	AAAQS (µg/m^3)	Percent of the AAAQS
NO_2	1-Hour	99.1	2.3	101.4	188	54%
	Annual	0.1	0	0.1	100	0.1%
PM_{10}	24-Hour	26.3	12.4	38.7	150	26%
$PM_{2.5}$	24-Hour	3.2	4.1	7.3	35	21%
	Annual	0.5	0.9	1.4	12	12%

Notes:

AAAQS = Alaska Ambient Air Quality Standards
µg/m^3 = micrograms per cubic meter
NO_2 = nitrogen dioxide
$PM_{2.5}$ and PM_{10} = Particulate matter with an aerodynamic diameter less than or equal to 2.5 and 10 micrometers, respectively

Source: PLP 2018-RFI 009

Table K4.20-14: Mine Site Operations Maximum Modeled Project-Only Impacts Compared to Class II PSD Increment Limit

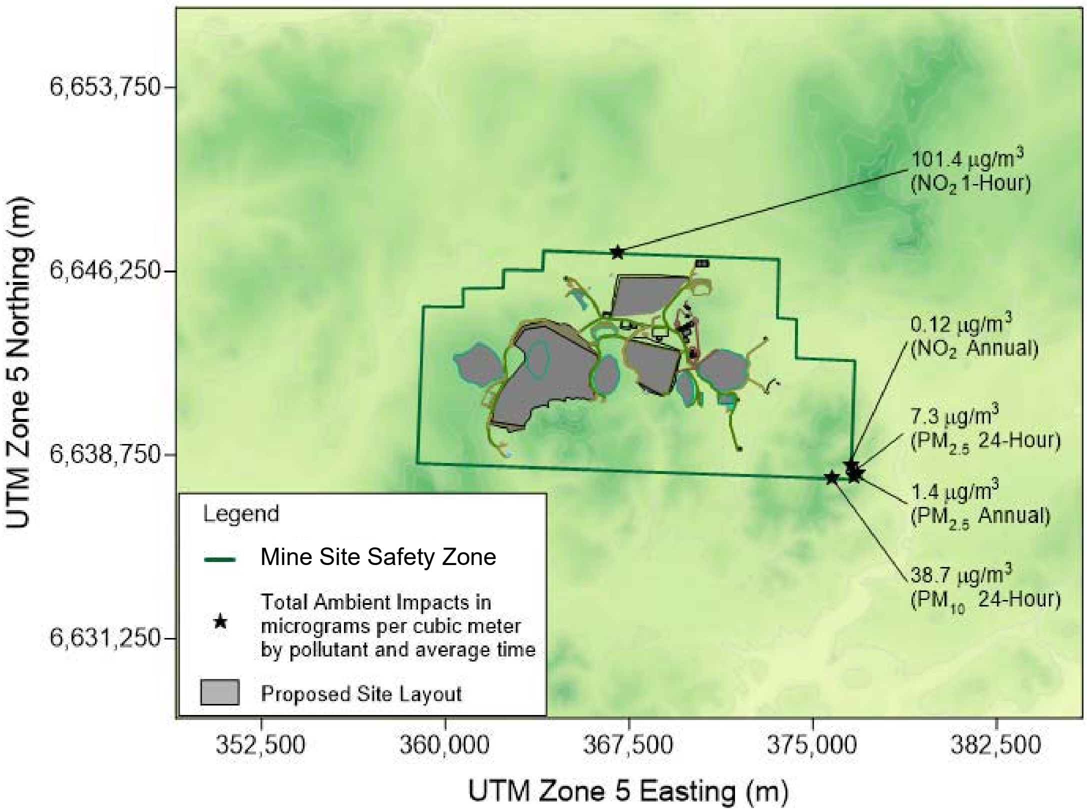
Pollutant	Averaging Period	Maximum Project-only Predicted Concentration (µg/m^3)	Class II PSD Increment (µg/m^3)	Percent of the Class II PSD Increment
NO_2	Annual	0.1	25	0.4%
PM_{10}	24-Hour	26.3	30	88%
	Annual	1.6	17	9.4%
$PM_{2.5}$	24-Hour	8.0	9	89%
	Annual	0.5	4	13%

Notes:

µg/m^3 = micrograms per cubic meter
NO_2 = nitrogen dioxide
PSD = prevention of significant deterioration
$PM_{2.5}$ and PM_{10} = Particulate matter with an aerodynamic diameter less than or equal to 2.5 and 10 micrometers, respectively

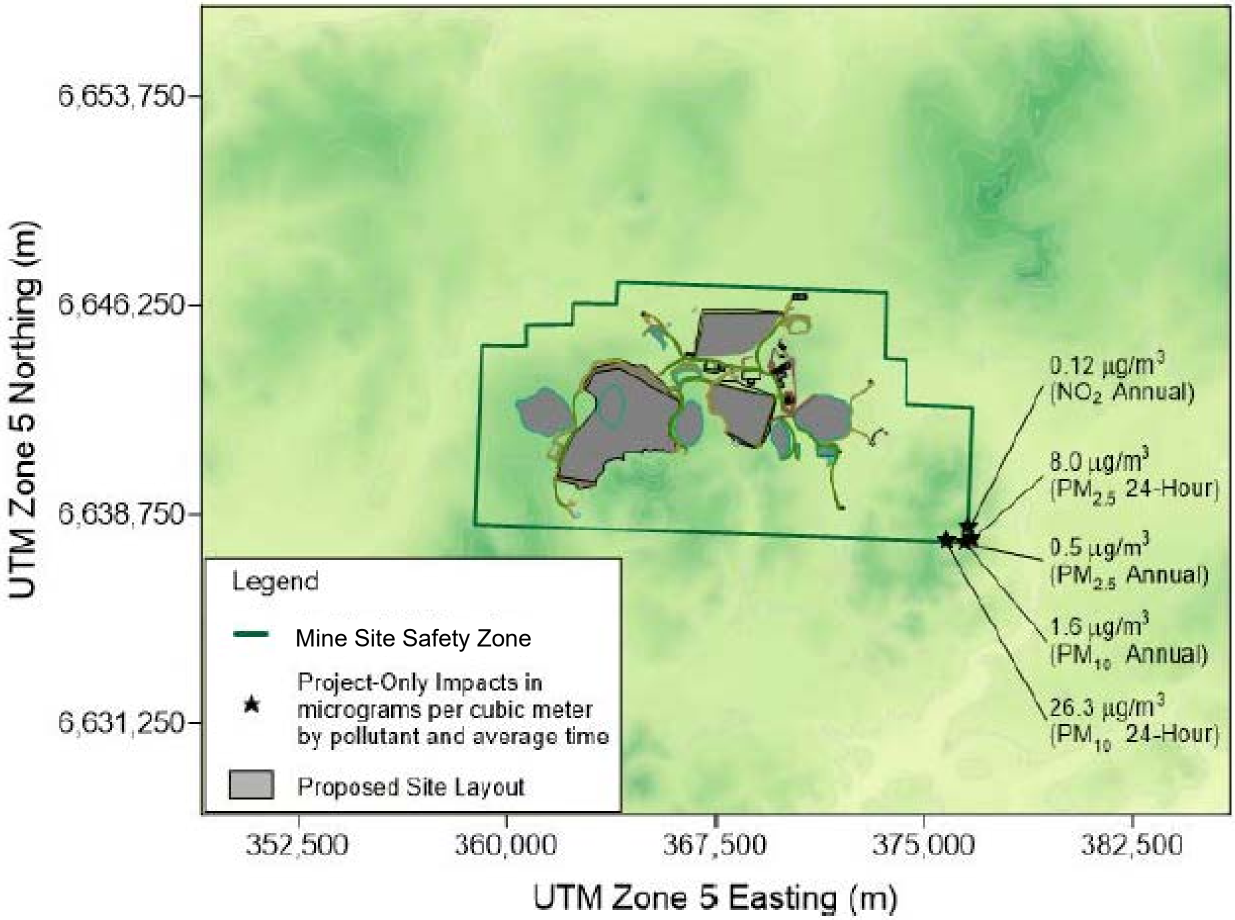
Source: PLP 2018-RFI 009

Figure K4.20-3: Mine Site Operations Maximum Modeled Project Impacts (AAAQS)



Source: PLP 2018-RFI 009

Figure K4.20-4: Mine Site Operations Maximum Modeled Project-Only Impacts (PSD Increment)



Source: PLP 2018-RFI 009

To assess the far-field AQRV impacts, the Plume Visual Impact Screening Model (VISCREEN) was used to determine whether air pollutant emissions from the mine site would cause visibility impacts at Federal Class I areas in the general vicinity of the mine site. Like AERMOD, VISCREEN is recommended by the EPA for visual impact screening applications similar to the current analysis and has undergone the necessary peer scientific reviews and model performance evaluation exercises that include statistical measures of model performance. A discussion of model applicability is described in 40 CFR Section 6.2.1.1, Appendix W to Part 51.

Based on the combination of inputs, distances modeled, and conservative model assumptions, the model-predicted impacts show that the visibility screening criteria established for federal Class I areas would not be exceeded at any federal Class I area, obviating the need for a cumulative impact analysis to demonstrate that this project would not adversely contribute to regional haze. Further details of this assessment are provided in PLP 2018-RFI 012.

Although far-field deposition impacts from the mine site operations were not evaluated in PLP 2018-RFI 012, conservative estimates of potential far-field deposition impacts can be inferred from predicted near-field annual NO_x and SO_2 impacts using a screening technique detailed in the Level I Analysis of Long Range Transport and Depositional Impacts (EPA 1993), and conservatively assuming total conversion of NO_x and SO_2 emissions to depositional nitrogen and sulfur. NO_x and SO_2 contribute to deposition when these compounds are converted into other compounds that are readily removed from the atmosphere and deposited to soils, vegetation, and waterbodies. SO_2 emissions from the mine site operations are below the modeling requirement, based on likely permitting needs. Therefore, the SO_2 impacts were not modeled for the mine site, and it is unlikely that the SO_2 emissions from the mine site operations would be large enough to contribute to sulfur deposition impacts. Unlike SO_2, annual NO_2 concentrations were predicted, as shown in Table K4.20-13, and were used to estimate acidic nitrogen deposition. Using the maximum project-only concentration at the mine site safety zone as input to the screening approach discussed above yields a conservatively high nitrogen deposition impact of 0.5 kg/ha/yr. Deposition impacts at the Class I areas that are more than 62 miles from the safety zone would be smaller.

As discussed in Section 3.20, Air Quality, the nitrogen deposition critical loads for Denali National Park and Preserve, Tuxedni Wilderness in Alaska Maritime National Wildlife Refuge, and other nearby federal Class I areas range from 1.2 kilograms of nitrogen per hectare per year (kgN/ha/yr) for lichens and bryophytes, to 17.0 kgN/ha/yr for forests and nitrate leaching (NPS 2018e). The critical loads are for total (wet plus dry) deposition, while the project nitrogen deposition impact is representative of dry deposition for the project only. Representative measured wet and dry deposition values can be added to the project-only nitrogen deposition impact to provide an estimated total deposition, which can be compared to criteria loads to assess the mine site operation's deposition impact. Measured wet and dry deposition values representative of nearby Class I areas (Tuxedni and Denali) were measured at Denali National Park and Preserve. As presented in Table 3-20-4, for 2015, the measured nitrogen dry deposition value at the park was 0.3 kg/ha/yr, while the wet deposition was 0.4 kg/ha/yr (1.5 micro-equivalent per liter). When added to the project-only deposition, the total deposition is 1.2 kg/ha/yr. This estimated total deposition is equal to the lowest critical load for lichens and bryophytes, which is an ecosystem found in Denali National Park and Preserve, Tuxedni Wilderness in Alaska Maritime National Wildlife Refuge, and other nearby Federal Class I areas. Although the calculated total nitrogen deposition value is a conservatively high estimate, the analysis still shows impacts equal to the lowest critical load value, and below the other criteria loads at a distance of 1 kilometer from the source. Therefore, because Denali National Park and Preserve, Tuxedni Wilderness in Alaska Maritime National Wildlife Refuge, and other nearby Federal Class I areas are more than 62 miles from the source, minimal impacts are expected.

Closure

The closure phase of the mine site was not explicitly modeled, because the impacts are expected to be similar to those of the construction phase. The duration of the closure phase at the mine site is expected to be approximately 20 years, compared to fewer than 5 years of construction. However, the closure and construction activities and emissions in a given year would be similar. Assuming impacts would be similar to those from the construction phase, near-field impacts may be possible, but far-field impacts are unlikely to occur. Impacts are limited to the duration of mine site closure. Impacts would return to the baseline conditions at the end of the closure.

Transportation Corridor

For analysis of impacts to air quality, the transportation corridor includes all-season gravel roads, ferry terminals on Iliamna Lake, port, and spur roads, and the onshore pipeline segment at the port, because the pipeline and road would be constructed jointly. The transportation corridor would be operational through the life of the project.

The emissions are presented previously in the "Emissions Inventory and Project Emissions Summary" subsection above. Due to lower levels of activity and emissions at the transportation corridor relative to the mine site, it is anticipated that the construction, operations, and closure of the transportation corridor would have lower near-field and far-field impacts than those predicted for the mine site. Therefore, modeling was not conducted for this project component phase, and impacts are assessed by proxy to those predicted for the mine site.

Amakdedori Port

Potential direct impacts from the port were developed by completing a project impacts assessment using dispersion modeling. The assessment was conducted based on the emissions previously presented above and an analysis of modeling needs based on likely air quality permits required once the port is operational. The permit applicability analysis is provided in PLP 2018-RFI 007. In the future, development of the port would be required to undergo complete permitting analysis.

Construction

Because of the lower level of construction activity and emissions at the port relative to the mine site, it is anticipated that the construction of the Amakdedori port would have lower near-field and far-field impacts than those predicted for the mine site; therefore, modeling was not conducted for this project component phase, and applicable impacts are assessed by proxy to those predicted for the mine.

Operations

Based on the air quality permitting assessment, a minor source permit to construct and operate a stationary source could be required for NO_x emissions, and not the other pollutants. A near-field modeling assessment was completed to determine the annual NO_2 impact of the NO_x that would occur from the Amakdedori port. Although ADEC has neither reviewed nor approved the modeling performed, the modeling is consistent with ADEC minor air quality permitting dispersion modeling requirements. Table K4.20-15 presents the modeling results relative to the pollutant modeled in the form of the AAAQS. Figure K4.20-5 presents the maximum modeled impacts for NO_2 in the form of the annual NO_2 AAAQS. The star point in the figure represents the location of the maximum modeled impact, which is along the port boundary. Additional details regarding the near-field modeling configuration, emissions, and assessments are provided in PLP 2018-RFI 009. Results of this modeling show that AAAQS would not be exceeded under the port operations, and operations would result in minimal impacts, which would be localized, and remain only while the port is operational.

Table K4.20-15: Amakdedori Port Operations—Maximum Modeled Project Impacts Compared to the AAAQS

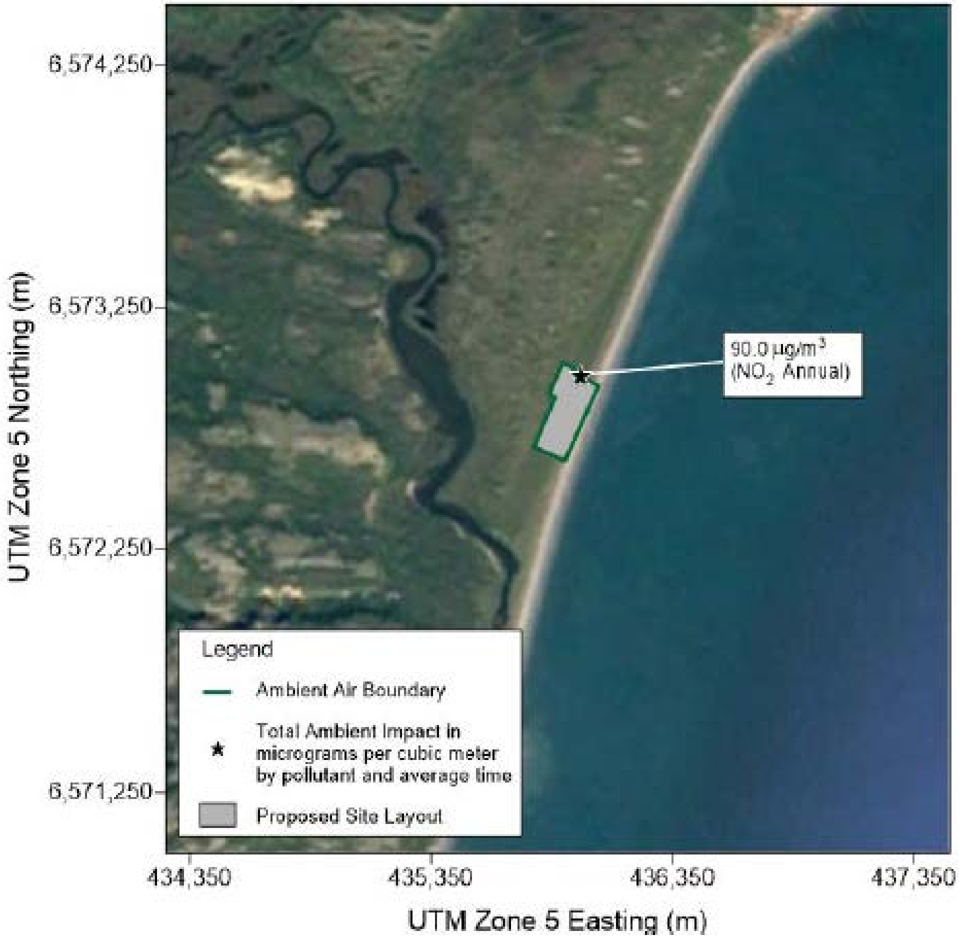
Pollutant	Averaging Period	Maximum Project-Only Predicted Concentration (µg/m³)	Background Concentration (µg/m³)	Maximum Concentration (µg/m³)	AAAQS (µg/m³)	Percent of AAAQS
NO_2	Annual	89.98	0	90	100	90%

Notes:

µg/m³ = micrograms per cubic meter
AAAQS = Alaska Ambient Air Quality Standards
NO_2 = nitrogen dioxide

Source: PLP 2018-RFI 009

Figure K4.20-5: Amakdedori Port Operations Maximum Modeled Project Impacts



Source: PLP 2018-RFI 009

To assess the far-field impacts, per the FLAG 2010 guidance, a Q/D screening assessment was conducted to determine if the emissions from the port would affect the AQRVs in the nearest federal Class I area. The Q/D value for the port is less than 1. As a result, AQRVs would not likely be affected at any of the federal Class I areas as a result of the port operations.

Closure

Although near-field and far-field air quality impacts from port closure were not explicitly modeled, the impacts are expected to be similar to those outlined for the port construction, because the activities that would occur in a given year are similar. Near-field impacts may be possible, but far-field impacts are unlikely to occur. If the near-field impacts occur, they would be localized, minimal, and only occur during port closure activities.

Natural Gas Pipeline Corridor

Potential direct impacts from the pipeline corridor were developed by completing a project impacts assessment using dispersion modeling. The assessment was conducted based on the emissions presented above and an analysis of modeling needs based on likely air quality permits that would be required once the pipeline is operational. The full permit applicability analysis is provided in PLP 2018-RFI 007. In the future, emissions sources associated with the pipeline would be required to undergo a complete permitting analysis.

Construction

It is anticipated that the construction associated with the pipeline corridor and compressor station would have lower near-field and far-field impacts than those predicted for the mine site, because the construction of the pipeline and compressor station would have fewer activities and lower emissions than the mine site. Therefore, modeling was not conducted for this project component phase, and impacts are assessed by proxy to those predicted for the mine.

Operations

During the operations of the pipeline, the emissions and associated impacts from the onshore and offshore pipeline segments would be minimal. The Kenai compressor station would have emissions and possible air impacts. Therefore, for the operations phase, only the potential emissions from the compressor station were modeled.

A near-field modeling assessment for the operation of the compressor station was completed to address possible air quality impacts. Because a requirement to obtain a minor air quality permit might be triggered, a dispersion modeling assessment was completed. Although ADEC has neither reviewed nor approved of the modeling performed, the modeling is consistent with ADEC minor air quality dispersion modeling permitting requirements. Based on the estimated emissions, only NO_X emissions would require modeling. Per permit requirements, dispersion modeling was used to determine the annual NO_2 impact of the NO_X emissions that would occur from the Kenai compressor station. Table K4.20-16 presents the modeling results relative to the AAAQS. Figure K4.20-6 presents the maximum modeled impacts for NO_2 in the form of the annual NO_2 AAAQS. The star point in the figure represents the locations of the maximum modeled impact, which occur along the ambient air boundary of the compressor station. Additional details regarding the near-field modeling configuration, emissions, and assessments are provided in PLP 2018-RFI 009. This modeling shows that AAAQS would not be exceeded under compressor station operations. If near-field impacts occur from the compressor station, those impacts would be minimal, localized, and would only occur when the compressor station would be operating.

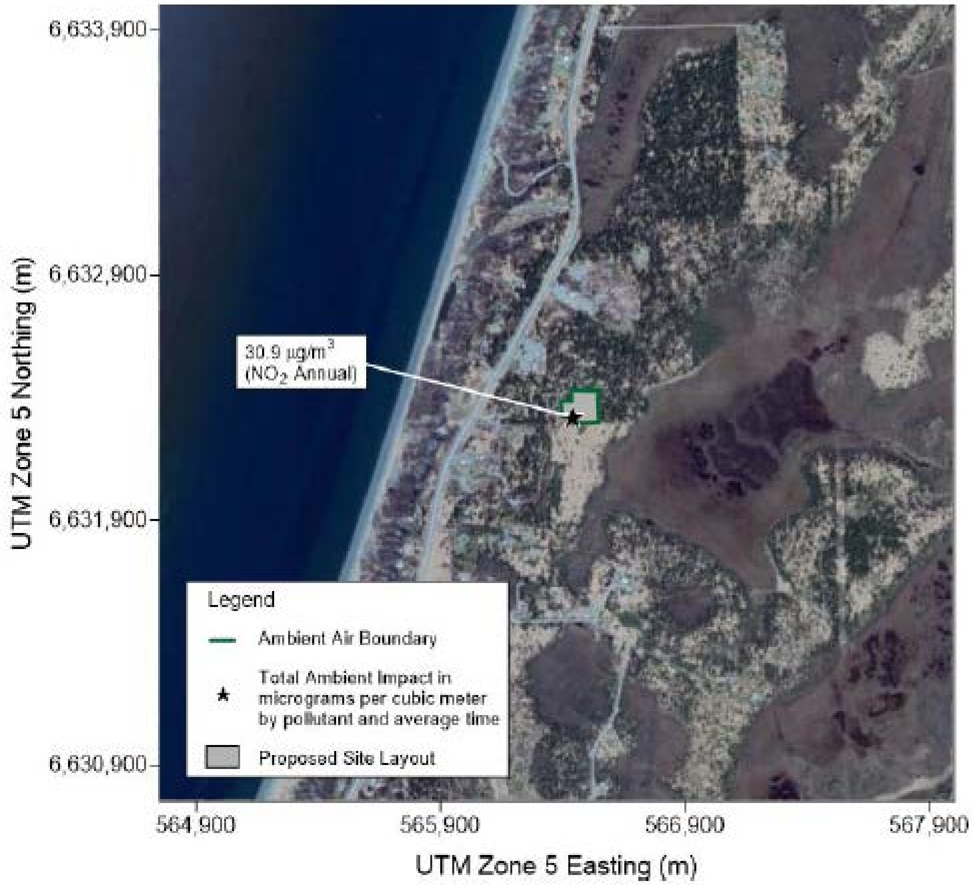
Table K4.20-16: Kenai Compressor Station Operations—Maximum Modeled Project Impacts Compared to the AAAQS

Pollutant	Averaging Period	Maximum Project-only Concentration ($\mu g/m^3$)[1]	Background Concentration ($\mu g/m^3$)	Maximum Concentration ($\mu g/m^3$)	AAAQS ($\mu g/m^3$)	Percent of AAAQS
NO_2	Annual	17.7	13.2	30.9	100	30%

Notes:

AAAQS = Alaska Ambient Air Quality Standards
$\mu g/m^3$ = micrograms per cubic meter
NO_2 = nitrogen dioxide

Figure K4.20-6: Compressor Station Operations Maximum Modeled Project Impacts



To assess the far-field impacts, per the FLAG 2010 guidance, a screening assessment was conducted to determine if the emissions from the compressor station would affect the AQRVs in the nearest Federal Class I area. The Q/D value for the compressor station is less than 2. As a result, AQRVs would not likely be impacted at any of the Federal Class I areas as a result of the compressor station operations.

Closure

Although the air quality near-field and far-field impacts from the closure activities were not explicitly modeled, the applicable impacts are anticipated to be similar to those presented for the construction phase, because the activities are similar in a given year. Near-field impacts may be possible, but far-field impacts are unlikely to occur. If the near-field impacts occur, they would be localized, minimal, and only occur during closure.

K4.20.3 Discussion of Cumulative Impact Analysis for the Representative Project

Past, present, and RFFAs in the cumulative impact study area have the potential to contribute cumulatively to impacts on air quality. Section 4.1, Introduction to Environmental Consequences, details the past, present, and RFFAs that may impact air quality. The potential future actions are similar to the proposed project in how they impact air quality by emitting combustion-related air pollutant emissions from fuel-burning equipment and generating fugitive emissions from blasting, drilling, vehicle traffic on unpaved roads, and material handling.

There is no indication that development of the nearby RFFAs within roughly 30 miles of the Pebble Project (e.g., Pebble South/PED, Big Chunk South, Groundhog) would occur in the operations phase of the proposed Pebble Project. It is likely that some exploration activities from the nearby RFFAs would occur during the project operations, which could cause a small increase of emissions in the area. The exploration activities could likely result in a slight increase of emissions in and near the Pebble Project's transportation corridor, because the corridor could be used as a transportation corridor for other projects, as well. Beyond a slight increase of traffic through the transportation corridor, it is unlikely that the exploration activities would generate enough emissions to result in a change the Pebble Project's near-field impact, as presented above. Therefore, the near-field impacts assessed for the Pebble Project would be representative of the near-field cumulative impacts.

There are several RFFAs (e.g., Shotgun, Donlin Gold Mine, Alaska Liquefied Natural Gas [LNG]) that could be undergoing development and operations during the operations timeframe of the proposed Pebble Project. However, all these RFFAs are beyond 30 miles from the Pebble Project and would not influence the near-field impacts. The proposed Donlin Gold Mine would be situated roughly 174 miles northwest of the proposed Pebble mine site, and the proposed Alaska LNG facility would be roughly 137 miles east of the proposed Pebble mine site. These RFFAs would have their own impact on Federal Class I areas that could overlap with Pebble mine site operations. However, given the distance from the Pebble Project and the prevailing wind direction, it is unlikely these RFFAs would contribute to a far-field cumulative impact resulting from project emissions. Additionally, the low Q/D value for the Pebble Project components indicates that its emissions are too small and too far away from federal Class I areas to contribute to an adverse cumulative impact. Therefore, it is concluded that the magnitude of cumulative impacts associated with project emissions would be minimal.

As discussed in Section 4.1, Introduction to Environmental Consequences, the Pebble project expansion scenario, if approved, would begin at the end of the operations phase of the proposed project. Therefore, overlapping activities between the proposed project and the expansion that would add to cumulative impacts would be largely limited to a small number of years when there are still emissions associated with the closure of the proposed project and the expansion construction phase. During these limited years of overlap, the proposed project is ramping down and project emissions are decreasing. At the same time, activities associated with the expansion scenario would begin to increase over a period of years along with expanded emissions. It is reasonable to assume that decreases would approximately balance the increases leading to no meaningful change during the period of overlapping operations between the proposed and expansion activities. This is even the case for the power plant, which would increase in size, and the processing facilities, which would have increased throughput. Consider for these sources that the modifications required to increase capacity would not happen right away, and once modified, these sources would not achieve full operating capacity immediately. Therefore, in the few years of overlap between the proposed and expansion activities, these modified sources would not likely achieve full capacity and the emissions increases compared to those from the proposed project would not be as large as the potential change in throughput would suggest. Considering this example and the preceding discussion, it is reasonable to assert that cumulative emissions would not be meaningfully different from those analyzed for Alternative 1a. Therefore, the expansion scenario and the project would likely result in impacts of similar magnitude, duration, and geographic extent to those air quality impacts described under Alternative 1a for a given year.

K4.20.3.1 Pebble Project Ambient Ozone

The entire project and all of its components are in an ozone unclassified area, with measurement showing no evidence of attainment issues. Additionally, there are minimal nearby anthropogenic sources of NO_x and volatile organic compounds (VOCs), which are ozone precursors. The area surrounding the mine site has naturally occurring VOCs. As demonstrated in Section 3.20, Air Quality, the ambient NO_x concentrations surrounding the mine site are low. This results in a NO_x-limited ozone environment, meaning that ozone formation is capped, because the reactions that result in ozone are limited by the amount of available NO_x. Because the project NO_x sources are dispersed over a large area and the potential to emit NO_x from the project components would be low and are unlikely to accumulate to any large degree under stagnant atmospheric conditions, project air pollutant emissions would result in minimal ozone formation, if any formation would occur as a result of the project. Therefore, project impacts to ambient ozone concentrations would be minimal.