

APPENDIX B

Air Quality Analysis

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1 Introduction

This air quality analysis was prepared in support of the Environmental Assessment, focusing on construction-related emissions generated by the Proposed Action.¹ The U.S. Environmental Protection Agency (USEPA) sets National Ambient Air Quality Standards (NAAQS) to protect the public health and the environment. The USEPA has identified the following seven criteria air pollutants for which NAAQS are applicable: carbon monoxide (CO), lead (Pb), nitrogen dioxide (NO₂), ozone (O₃), particulate matter (PM₁₀ and PM_{2.5}), and sulfur dioxide (SO₂). The USEPA calls these pollutants "criteria" air pollutants because it regulates them by developing human health-based and/or environmentally based criteria (science-based guidelines) for setting permissible levels.²

Geographic areas found to be in violation of one or more NAAQS are classified as "nonattainment" areas. Nonattainment designations are generally based on the degree of nonattainment (e.g., serious, severe, moderate, marginal), which dictates the deadline (i.e., the attainment year) by which the area must be brought back into attainment with a NAAQS. States with nonattainment areas must develop a State Implementation Plan (SIP) demonstrating how the area will be brought back into attainment with the NAAQS within designated timeframes. Areas where concentrations of the criteria pollutants are below (i.e., within) the NAAQS are classified as "attainment" areas. Lastly, areas with prior nonattainment status that have since transitioned to attainment are known as "maintenance" areas.

The Airport is in entirely in Snohomish County (the County), which is in attainment for all NAAQS.³

The Proposed Action is a federal action due to the Airport Sponsor's request to the FAA for unconditional approval of the Proposed Action on the Airport Layout Plan (ALP), as well as the use of federal funds. Because the project is in an area designated by USEPA as attainment for all pollutants, a Clean Air Act (CAA) General Conformity Analysis and FAA General Conformity Determination does not apply. However, because the Proposed Action is large in nature, for transparency, a CEI is being conducted for construction emissions only. Construction emissions are analyzed for each construction emission source; non-road sources, on-road sources, and fugitive dust sources. The analysis addresses all criteria pollutants for NEPA purposes to determine if the Proposed Action would significantly affect air quality.

1.1 Construction Emissions Inventory Approach

Construction requirements for the Proposed Action include a variety of construction emissions sources; off-road, on-road, and fugitive dust. These emissions sources are most associated with

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- 1 The Proposed Action would not increase operations at the Airport beyond what is forecasted or change the fleet mix operating at the Airport so there would be no significant effect from operational emissions, therefore there is no operational emissions analysis.
 - 2 USEPA. (2021, August 16). Criteria Air Pollutants. Accessed May 2023, from USEPA: <https://www.epa.gov/criteria-air-pollutants>.
 - 3 DOE. (2023). Plans for Maintaining Air Quality. Retrieved December 2023, from DOE: <https://ecology.wa.gov/Regulations-Permits/Plans-policies/State-implementation-plans/Maintenance-SIPs>.

the following types of activities; earthwork, grading and leveling, and storage and movement of construction equipment.

Construction for the Proposed Action would occur over two years. Construction emissions are estimated based on these factors: construction schedule; the number of construction vehicles and/or equipment; the types of construction vehicles and/or equipment; types of fuel used to power the equipment and vehicles; vehicle and equipment hourly activity/vehicle miles travelled; construction materials used and their quantities; and the duration of construction.

1.1.1 Non-road Emission Sources

Non-road sources associated with construction of the Proposed Action include exhaust from heavy construction equipment (e.g., graders, excavators, rollers, dump trucks) and fugitive dust emissions. The construction emissions inventory (CEI) was based on the factors noted in the above paragraph.

1.1.1.1 On-road Emission Sources

On-road emission sources associated with construction of the Proposed Action often include material deliver vehicles (e.g., dump trucks, 18-wheelers carrying asphalt) and passenger vehicles transporting construction personnel to and from the job site. Material delivery vehicles are assumed to travel up to 40 miles roundtrip per scheduled workday, while passenger vehicles are assumed to travel 30 miles roundtrip per scheduled workday.

1.1.1.2 Fugitive Emissions

Paving or dust emission sources associated with construction of the Proposed Action include asphalt storage, material movement on both paved and unpaved roads, soil handling, and un-stabilized land and wind erosion. Paving or dust emissions were based on the number of months for construction.

The CEI was quantified using the USEPA's Motor Vehicle Emission Simulator (MOVES3). Estimates for the equipment hours and horsepower for non-road vehicles, and vehicle miles traveled (VMT) for on-road vehicles were coordinated with a design engineer. The estimates were used in MOVES3, which uses updated emissions factors to calculate emissions for construction of the Proposed Action. MOVES3 does not calculate fugitive emissions, which are instead calculated in ACEIT and added to the non-road and on-road emissions calculated in MOVES3.

Table B-1 shows the CEI for the Proposed Action. Snohomish County is classified as in maintenance for CO in the Seattle-Tacoma area only and in attainment for all other NAAQS.

Table B-1
Construction Emissions (Tons) for the Proposed Action

Criteria Pollutant	CO (tons)	VOC (tons)	NO ₂ (tons)	SO ₂ (tons)	PM ₁₀ (tons)	PM _{2.5} (tons)
Construction Year 1 (2026)						
Non-road Emissions	0.17	0.04	0.47	0.03	0.03	0.00
On-road Emissions	0.67	0.01	0.12	0.00	0.00	0.00
Fugitive Emissions	0.44	6.69	0.03	0.15	0.00	0.01
Total Emissions Construction Year 1	1.28	6.75	0.61	0.19	0.04	0.01
<i>De minimis</i>	100	100	100	100	100	100
Exceeds <i>de minimis</i> ?	No	No	No	No	No	No
Construction Year 2 (2027)	(tons)	(tons)	(tons)	(tons)	(tons)	(tons)
Non-road Emissions	0.14	0.04	0.42	0.03	0.03	0.00
On-road Emissions	1.49	0.02	0.19	0.01	0.01	0.00
Fugitive Emissions	0.31	4.80	0.02	0.23	0.00	0.00
Total Emissions Construction Year 2	1.94	4.86	0.62	0.27	0.03	0.01
<i>De minimis</i>	100	100	100	100	100	100
Exceeds <i>de minimis</i> ?	No	No	No	No	No	No

Note: Values may not add up due to rounding.

Source: FAA, 2015; RS&H, 2023.

1.1.2 Construction Emissions Inventory Results

As shown in **Table B-1**, construction-related emission levels are below the *de minimis* thresholds. In addition, the Proposed Action would not significantly affect air quality since no criteria pollutant would exceed its respective *de minimis* threshold.

Construction emissions modeling outputs can be seen on the following pages in **Section 1.2**.

1.2 Construction Emissions Inventory Modeling Outputs

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							MOVES3 Emission Factors (g-hp-hr)													
							2	3	31	87	90	100	110	2	87	3	100	110	31	90
Inputs														Emissions (Tons per Year)						
Year	Equipment Type	MOVES3 Equipment Type	Fuel Type	Average Horsepower	Load Factor	Operating Hours	CO	NOx	SO2	VOC	CO2	PM10	PM2.5	CO	VOC	NOx	PM10	PM2.5	SO2	CO2
2026	Asphalt Paver	Pavers	Diesel	175.00	0.59	24.98	0.09	0.23	0.00	0.01	536.79	0.02	0.02	0.00	0.00	0.00	0.00	0.00	0.00	1.53
2026	Chain Saw	Other Construction Equipment	Diesel	11.00	0.59	62.40	2.47	4.18	0.00	0.84	593.75	0.24	0.23	0.00	0.00	0.00	0.00	0.00	0.00	0.27
2026	Chipper/Stump Grinder	Other Construction Equipment	Diesel	100.00	0.59	62.40	0.45	1.26	0.00	0.06	595.99	0.06	0.06	0.00	0.00	0.01	0.00	0.00	0.00	2.42
2026	Concrete Truck	Off-Highway Trucks	Diesel	600.00	0.59	121.07	0.03	0.14	0.00	0.01	536.80	0.01	0.01	0.00	0.00	0.01	0.00	0.00	0.00	25.36
2026	Dozer	Crawler Tractor/Dozers	Diesel	175.00	0.59	492.62	0.09	0.25	0.00	0.01	536.79	0.02	0.02	0.00	0.00	0.01	0.00	0.00	0.00	30.10
2026	Dump Truck	Off-Highway Trucks	Diesel	600.00	0.59	1240.14	0.03	0.14	0.00	0.01	536.80	0.01	0.01	0.02	0.01	0.07	0.00	0.00	0.00	259.77
2026	Excavator	Excavator	Diesel	175.00	0.59	210.92	0.07	0.23	0.00	0.01	536.80	0.02	0.02	0.00	0.00	0.01	0.00	0.00	0.00	12.89
2026	Flat Bed or Dump Trucks	Off-Highway Trucks	Diesel	600.00	0.59	417.83	0.03	0.14	0.00	0.01	536.80	0.01	0.01	0.01	0.00	0.02	0.00	0.00	0.00	87.52
2026	Grader	Graders	Diesel	300.00	0.59	25.03	0.04	0.15	0.00	0.01	536.79	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	2.62
2026	Hydroseeder	Other Construction Equipment	Diesel	600.00	0.59	22.55	0.80	1.87	0.00	0.11	536.51	0.12	0.11	0.01	0.00	0.02	0.00	0.00	0.00	4.72
2026	Loader	Tractors/Loaders/Backhoes	Diesel	175.00	0.21	344.50	1.32	2.32	0.00	0.39	625.41	0.28	0.27	0.02	0.01	0.03	0.00	0.00	0.00	8.73
2026	Off-Road Truck	Off-Highway Trucks	Diesel	600.00	0.59	22.55	0.03	0.14	0.00	0.01	536.80	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	4.72
2026	Other General Equipment	Other Construction Equipment	Diesel	175.00	0.59	833.08	0.19	0.55	0.00	0.04	536.70	0.04	0.04	0.02	0.00	0.05	0.00	0.00	0.00	50.89
2026	Pickup Truck	Off-Highway Trucks	Diesel	600.00	0.59	1308.46	0.03	0.14	0.00	0.01	536.80	0.01	0.01	0.02	0.01	0.07	0.00	0.00	0.00	274.08
2026	Pumps	Other Construction Equipment	Diesel	11.00	0.59	20.80	2.47	4.18	0.00	0.84	593.75	0.24	0.23	0.00	0.00	0.00	0.00	0.00	0.00	0.09
2026	Roller	Rollers	Diesel	100.00	0.59	353.14	0.20	0.99	0.00	0.02	596.11	0.03	0.03	0.00	0.00	0.02	0.00	0.00	0.00	13.69
2026	Scraper	Scraper	Diesel	600.00	0.59	83.25	0.17	0.47	0.00	0.03	536.75	0.03	0.03	0.01	0.00	0.02	0.00	0.00	0.00	17.44
2026	Skid Steer Loader	Skid Steer Loaders	Diesel	75.00	0.21	144.98	6.82	5.84	0.00	1.26	692.30	0.94	0.91	0.02	0.00	0.01	0.00	0.00	0.00	1.74
2026	Surfacing Equipment (Grooving)	Other Construction Equipment	Diesel	25.00	0.59	31.97	1.49	3.76	0.00	0.35	595.15	0.17	0.17	0.00	0.00	0.00	0.00	0.00	0.00	0.31
2026	Tractors/Loader/Backhoe	Tractors/Loaders/Backhoes	Diesel	100.00	0.21	348.45	3.16	3.06	0.00	0.55	694.39	0.43	0.42	0.03	0.00	0.02	0.00	0.00	0.00	5.60
2026	Vibratory Compactor	Plate Compactors	Diesel	6.00	0.43	121.07	2.58	4.22	0.00	0.83	587.99	0.26	0.26	0.00	0.00	0.00	0.00	0.00	0.00	0.20
2026	Water Truck	Off-Highway Trucks	Diesel	600.00	0.59	1440.00	0.03	0.14	0.00	0.01	536.80	0.01	0.01	0.02	0.01	0.08	0.01	0.00	0.00	301.64
Total							0.17	0.04	0.47	0.03	0.03	0.00	1106.32							

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							MOVES3 Emission Factors (g-hp-hr)													
							2	3	31	87	90	100	110	2	87	3	100	110	31	90
Inputs														Emissions (Tons per Year)						
Year	Equipment Type	MOVES3 Equipment Type	Fuel Type	Average Horsepower	Load Factor	Operating Hours	CO	NOx	SO2	VOC	CO2	PM10	PM2.5	CO	VOC	NOx	PM10	PM2.5	SO2	CO2
2027	Air Compressor	Other Construction Equipment	Diesel	100.00	0.59	32.00	0.35	1.16	0.00	0.04	596.03	0.05	0.05	0.00	0.00	0.00	0.00	0.00	0.00	1.24
2027	Aerial Lift	Other Construction Equipment	Diesel	75.00	0.59	31.17	0.57	2.77	0.00	0.10	595.87	0.06	0.06	0.00	0.00	0.00	0.00	0.00	0.00	0.91
2027	Asphalt Paver	Pavers	Diesel	175.00	0.59	17.90	0.08	0.21	0.00	0.01	536.80	0.02	0.02	0.00	0.00	0.00	0.00	0.00	0.00	1.09
2027	Chain Saw	Other Construction Equipment	Diesel	11.00	0.59	79.17	2.46	4.18	0.00	0.84	593.75	0.24	0.23	0.00	0.00	0.00	0.00	0.00	0.00	0.34
2027	Chipper/Stump Grinder	Other Construction Equipment	Diesel	100.00	0.59	79.17	0.35	1.16	0.00	0.04	596.03	0.05	0.05	0.00	0.00	0.01	0.00	0.00	0.00	3.07
2027	Concrete Truck	Off-Highway Trucks	Diesel	600.00	0.59	40.00	0.03	0.13	0.00	0.01	536.80	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	8.38
2027	Dozer	Crawler Tractor/Dozers	Diesel	175.00	0.59	462.81	0.08	0.23	0.00	0.01	536.79	0.02	0.02	0.00	0.00	0.01	0.00	0.00	0.00	28.28
2027	Dump Truck	Off-Highway Trucks	Diesel	600.00	0.59	982.94	0.03	0.13	0.00	0.01	536.80	0.01	0.01	0.01	0.00	0.05	0.00	0.00	0.00	205.90
2027	Excavator	Excavators	Diesel	175.00	0.59	249.43	0.06	0.20	0.00	0.01	536.80	0.01	0.01	0.00	0.00	0.01	0.00	0.00	0.00	15.24
2027	Flat Bed or Dump Trucks	Off-Highway Trucks	Diesel	600.00	0.59	294.86	0.03	0.13	0.00	0.01	536.80	0.01	0.01	0.00	0.00	0.01	0.00	0.00	0.00	61.76
2027	Grader	Graders	Diesel	300.00	0.59	19.43	0.03	0.14	0.00	0.01	536.79	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	2.03
2027	Hydroseeder	Other Construction Equipment	Diesel	600.00	0.59	17.51	0.63	1.53	0.00	0.09	536.57	0.09	0.09	0.00	0.00	0.01	0.00	0.00	0.00	3.67
2027	Loader	Tractors/Loaders/Backhoes	Diesel	175.00	0.21	172.46	1.05	1.90	0.00	0.32	625.62	0.22	0.21	0.01	0.00	0.01	0.00	0.00	0.00	4.37
2027	Off-Road Truck	Off-Highway Trucks	Diesel	600.00	0.59	17.51	0.03	0.13	0.00	0.01	536.80	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	3.67
2027	Other General Equipment	Other Construction Equipment	Diesel	175.00	0.59	742.29	0.16	0.46	0.00	0.04	536.73	0.03	0.03	0.01	0.00	0.04	0.00	0.00	0.00	45.34
2027	Pickup Truck	Off-Highway Trucks	Diesel	600.00	0.59	1234.33	0.03	0.13	0.00	0.01	536.80	0.01	0.01	0.01	0.01	0.06	0.00	0.00	0.00	258.55
2027	Pumps	Other Construction Equipment	Diesel	11.00	0.59	16.00	2.46	4.18	0.00	0.84	593.75	0.24	0.23	0.00	0.00	0.00	0.00	0.00	0.00	0.07
2027	Roller	Rollers	Diesel	100.00	0.59	244.84	0.11	0.91	0.00	0.01	596.13	0.02	0.02	0.00	0.00	0.01	0.00	0.00	0.00	9.49
2027	Scraper	Scrapers	Diesel	600.00	0.59	59.66	0.13	0.38	0.00	0.02	536.76	0.02	0.02	0.00	0.00	0.01	0.00	0.00	0.00	12.50
2027	Skid Steer Loader	Skid Steer Loaders	Diesel	75.00	0.21	246.97	6.41	5.62	0.00	1.18	692.55	0.88	0.85	0.03	0.01	0.02	0.00	0.00	0.00	2.97
2027	Surfacing Equipment (Grooving)	Other Construction Equipment	Diesel	25.00	0.59	22.91	1.49	3.76	0.00	0.35	595.15	0.17	0.17	0.00	0.00	0.00	0.00	0.00	0.00	0.22
2027	Tractors/Loader/Backhoe	Tractors/Loaders/Backhoes	Diesel	100.00	0.21	293.42	2.50	2.60	0.00	0.44	694.71	0.35	0.34	0.02	0.00	0.02	0.00	0.00	0.00	4.72
2027	Water Truck	Off-Highway Trucks	Diesel	600.00	0.59	2400.00	0.03	0.13	0.00	0.01	536.80	0.01	0.01	0.03	0.01	0.12	0.01	0.01	0.00	502.73
Total							0.14	0.04	0.42	0.03	0.03	0.00	1176.53							

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					On-road																																																						
					2					3					5					6					31					87					90					100					110														
Inputs																									MOVES3 Emission Factors (g/miles)										Emissions (Tons per Year)																								
Year	Equipment Type		MOVES3 Equipment Type		On-Road Activity		Fuel Type		Vehicle Miles Traveled		CO	NOx	CH4	N2O	SO2	VOC	CO2	PM10	PM2.5	CO	VOC	NOx	PM10	PM2.5	SO2	CO2	CH4	N2O																															
2026	Asphalt 18 Wheeler		Combination Short-haul Truck		Urban Unrestricted Access		Diesel		2612		2.13	5.17	0.02	0.00	0.01	0.21	1547.85	0.16	0.14	0.01	0.00	0.01	0.00	0.00	0.00	0.00	4.46	0.00	0.00																														
2026	Dump Truck - Asphalt		Combination Short-haul Truck		Urban Unrestricted Access		Diesel		3700		2.13	5.17	0.02	0.00	0.01	0.21	1547.85	0.16	0.14	0.01	0.00	0.02	0.00	0.00	0.00	0.00	6.31	0.00	0.00																														
2026	Dump Truck Subbase Material		Single Unit Short-haul Truck		Urban Unrestricted Access		Diesel		22200		1.30	2.44	0.01	0.00	0.00	0.20	876.43	0.10	0.09	0.03	0.00	0.06	0.00	0.00	0.00	0.00	21.45	0.00	0.00																														
2026	Passenger Car		Passenger Car		Urban Unrestricted Access		Gasoline		263160		2.15	0.08	0.01	0.00	0.00	0.02	243.21	0.00	0.00	0.62	0.01	0.02	0.00	0.00	0.00	0.00	70.55	0.00	0.00																														
Total																									0.67	0.01	0.12	0.00	0.00	0.00	102.77	0.00	0.00																										

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		On-road																								
						2	3	5	6	31	87	90	100	110												
Inputs						MOVES3 Emission Factors (g/miles)									Emissions (Tons per Year)											
Year	Equipment Type	MOVES3 Equipment Type	On-Road Activity	Fuel Type	Vehicle Miles Traveled	CO	NOx	CH4	N2O	SO2	VOC	CO2	PM10	PM2.5	CO	VOC	NOx	PM10	PM2.5	SO2	CO2	CH4	N2O			
2027	Asphalt 18 Wheeler	Combination Short-haul Truck	Urban Unrestricted Access	Diesel	1872	2.04	4.75	0.02	0.00	0.01	0.19	#####	0.14	0.12	0.00	0.00	0.01	0.00	0.00	0.00	3.15	0.00	0.00			
2027	Cement Mixer	Single Unit Short-haul Truck	Urban Unrestricted Access	Diesel	8325	1.23	2.22	0.01	0.00	0.00	0.18	862.62	0.09	0.08	0.01	0.00	0.02	0.00	0.00	0.00	7.92	0.00	0.00			
2027	Dump Truck	Single Unit Short-haul Truck	Urban Unrestricted Access	Diesel	24000	1.23	2.22	0.01	0.00	0.00	0.18	862.62	0.09	0.08	0.03	0.00	0.06	0.00	0.00	0.00	22.82	0.00	0.00			
2027	Dump Truck - Asphalt	Single Unit Short-haul Truck	Urban Unrestricted Access	Diesel	2652	1.23	2.22	0.01	0.00	0.00	0.18	862.62	0.09	0.08	0.00	0.00	0.01	0.00	0.00	0.00	2.52	0.00	0.00			
2027	Dump Truck Subbase Material	Single Unit Short-haul Truck	Urban Unrestricted Access	Diesel	15910	1.23	2.22	0.01	0.00	0.00	0.18	862.62	0.09	0.08	0.02	0.00	0.04	0.00	0.00	0.00	15.13	0.00	0.00			
2027	Passenger Car	Passenger Car	Urban Unrestricted Access	Gasoline	626708	2.05	0.08	0.01	0.00	0.00	0.02	237.60	0.00	0.00	1.42	0.01	0.05	0.00	0.00	0.00	164.14	0.00	0.00			

		Fugitive								
Year	Emission Source	Pollutants								
		CO	NOx	SO2	PM10	PM2.5	VOC	CO2	CH4	N2O
2026	Fugitive	0.44	0.03	0.01	0.15	--	6.69	--	--	--
2027	Fugitive	0.31	0.02	0.00	0.23	--	4.80	--	--	--
Total		0.75	0.05	0.01	0.38	0.00	11.49	0.00	0.00	0.00