FINAL

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AIR DISPERSION MODELING REPORT

SEGALE PROPERTIES LLC, CUMBERLAND MINE

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1.0 INTRODUCTION

Ramboll US Consulting Inc. (Ramboll) is submitting this air dispersion modeling report to King County on behalf of Segale Properties LLC (Segale). Segale (the applicant) proposes to commence development of an aggregate processing and mining operation on its 990-acre ownership located north of Cumberland in King County, Washington (the Site).

Before Puget Sound Clean Air Agency (PSCAA) can issue an Order of Approval, the project must obtain a State Environmental Protection Act (SEPA) determination from the appropriate lead agency. King County Department of Local Services (DLS) will serve as lead agency for the SEPA environmental review. Ramboll is supplementing the required SEPA documents. This dispersion modeling analysis is to aid in the Environmental Impact Statement (EIS) for the SEPA analysis and to show compliance with the National Ambient Air Quality Standards (NAAQS) for criteria pollutants and Acceptable Source Impact Levels (ASIL) for applicable Toxic Air Pollutants (TAPs)[1].

2.0 PROJECT OVERVIEW

2.1 Project Location

The Segale Cumberland property consists of 15 parcels making up 990 acres of land owned by Segale. As shown in **Figure 1**, the Segale property surrounds a 600-acre parcel controlled by the King County Department of Natural Resources (DNR) and a privately held 41-acre parcel. The proposed project is located along the Cumberland Kanasket Road SE. **Figure 1** presents the Segale Cumberland property boundary and general location of the proposed project.

2.2 Project Description

Segale proposes to develop a surface mining (aggregate) and asphalt plant in King County. The project would replace an existing operation in southeast Auburn (ICON Materials) that is ending its service life of aggregate production and would relocate both surface mining and the existing asphalt plant to this location. The project development will consist of a general office area, maintenance shop, aggregate processing and product stockpiles, process water treatment and recycling facility, and an asphalt plant and yard. The aggregate processing facility is proposed to have a maximum capacity of processing 1,500 tons per hour of aggregate and will consist of a one (1) jaw crusher, two (2) secondary cone crushers, and two (2) tertiary cone crushers. Stockpiles at the facility will total up to eight (8) acres. Front end loaders will be used to load finished material from the stockpiles near the crushing and wash plants into highway trucks.

Aggregate, recycled asphalt pavement (RAP), and asphalt cement will be combined in a counter-flow combination aggregate dryer and rotary drum mixer to produce hot mix asphalt (HMA). The combination dryer and drum mixer will include a 128 million British thermal units per hour (MMBtu/hr) burner, which will combust propane as a primary fuel. The HMA produced by the dryer will be sent to HMA storage silos. The three asphalt cement storage tanks (30,000-gallon capacity each) and the two HMA storage silos (200-ton capacity each) will be heated electrically to maintain reduced viscosity.

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[1] Department of Ecology. State of Washington. 2015. Guidance Document. First, Second and Third Tier Review of Toxic Air Pollution Sources. Available online: [Guidance Document: First, Second, and Third Tier Review of Toxic Air Pollution Sources (wa.gov)]

3.0 REGULATORY OVERVIEW

3.1 Ambient Air Quality Standards and Attainment Status

Air quality is generally assessed in terms of whether ambient concentrations of emitted air pollutants are higher or lower than ambient air quality standards set to protect human health and welfare. The NAAQS are set by the U.S. Environmental Protection Agency (USEPA) for "criteria" pollutants (i.e., CO, $PM_{2.5}$, PM_{10}, NO_2, and SO_2). Three agencies have jurisdiction over the management of ambient air quality at the Site: the EPA, the Washington State Department of Ecology (Ecology), and PSCAA. The applicable federal ambient air quality standards are displayed in **Summary Table A**. These standards have been set at levels that EPA have determined will protect human health with a margin of safety, including the health of sensitive individuals such as the elderly, the chronically ill, and the very young. The modeling analysis discussed herein was used to demonstrate that the Project will be in compliance with the applicable NAAQS.

Summary Table A. Ambient Air Quality Standards for Criteria Pollutants

Pollutant	Averaging Period	NAAQS (µg/m³)	Form of the NAAQS
Particulate Matter less than 2.5 microns ($PM_{2.5}$)	Annual	12	Annual mean, averaged over 3 years
	24-Hour	35	98th percentile, averaged over 3 years
Particulate Matter less than 10 microns (PM_{10})	24-Hour	150	Not to be exceeded more than once per year on average over 3 years
Nitrogen Dioxide (NO_2)	Annual	100	Annual mean
	1-Hour	188	98th percentile of 1-hour daily maximum concentrations, averaged over 3 years
Carbon Monoxide (CO)	8-Hour	10,000	Not to be exceeded more than once per year
	1-Hour	40,000	Not to be exceeded more than once per year
Sulfur Dioxide (SO_2)	1-Hour	196	99th percentile of 1-hour daily maximum concentrations, averaged over 3 years

King County is currently classified as in attainment or unclassifiable for all NAAQS, except for CO, ozone, and PM_{10} in which it is classified as maintenance.[2]

[2] https://www3.epa.gov/airquality/greenbook/anayo_wa.html

3.2 Toxic Air Pollutant Acceptable Source Impact Levels

In addition to the criteria air pollutants for which health-protective air quality standards have been set, fuel combustion sources emit a number of known or suspected toxic air pollutants. Although there are not any specific health-related air quality standards for such pollutants, Ecology and PSCAA have established screening levels for a variety of TAPs that can be used to assess predicted concentrations.

The first screening level is the "De Minimis" threshold. Project's whose TAP emissions are below the *de minimis* threshold are found to have trivial levels of emissions that do not pose a threat to human health or the environment. If a TAP is found to be above the *de minimis* threshold for the project, it is then compared to the "Small Quantity Emissions Rate" (SQER) threshold. Project's whose TAP emissions are below the SQER are considered to have emissions below which dispersion modeling is not required to demonstrate compliance with ASILs.

A common method of assessing potential risk related to exposure to TAPs is to estimate the likelihood of increases in cancer due to a lifetime of exposure (usually assumed to be 70 years) to a given contaminant. Some screening levels for assessing such potential risk are based on an increased risk of one additional cancer among one million people. Ecology and PSCAA apply ASILs during air quality permitting of proposed new or modified stationary emission sources. ASILs are applied based on the incremental changes in pollutant concentrations expected to occur due to proposed projects. ASILs also screen for both chronic and acute impacts from TAPs by defining screening level thresholds for a variety of averaging periods, including 1-hour, 24-hour, and annual averaging periods.

Based on the calculated emissions, an air quality impacts assessment was performed for the following pollutants and averaging times:

- CO – 1-hr and 8-hr
- $PM_{2.5}$ – 24-hr and Annual
- PM_{10} – 24-hr
- NO_2 – 1-hr and Annual
- SO_2 – 1-hr
- Benzene – Annual
- Naphthalene – Annual
- Formaldehyde – Annual

4.0 EMISSIONS INVENTORY

Ramboll estimated emissions from the operation of the Project, which includes asphalt plant, silo, and loadout operations, crushing plant and recycled asphalt crusher operations, storage tank and stockpile operations, and both on-road truck and off-road equipment operations. The pollutants considered are criteria air pollutants, toxic air pollutants, and greenhouse gases (GHGs): Volatile Organic Compounds (VOC), oxides of nitrogen (NO_X), PM_{10}, $PM_{2.5}$, CO, SO_2, carbon dioxide equivalents (CO_2e), and TAPs as defined by Washington Administrative Code (WAC) 173-460-150[3]. The methodologies used by Ramboll are summarized below.

4.1 Asphalt Plant, Silo, and Loadout Emissions

Particulate matter emissions from the asphalt plant were calculated using emissions rates from the baghouse filter specification sheets, provided by ICON Materials. NO_X, SO_2, CO, and VOC emissions from the asphalt plant were calculated using emissions rates from the propane burner manufacturer specification sheet, provided by Gencor. GHG emissions from the asphalt plant were calculated using

[3] Table of ASIL, AQER and de minimis emission values, available at: https://app.leg.wa.gov/WAC/default.aspx?cite=173-460-150

the most conservative emission factors from the EPA Compilation of Air Pollutant Emissions Factors (AP-42), selected from either Section 1.5 Liquefied Petroleum Gas Combustion or Section 11.1 Hot Mix Asphalt Plants. TAP emissions for the asphalt plant were calculated using emission factors for organic pollutant emissions from drum mix hot mix asphalt plants controlled by fabric filters, as reported by AP-42. Drum mix asphalt plant emissions are summarized in **Table 1**.

Asphalt silo and loadout criteria air pollutants (CAP) and GHG emissions were calculated using emission factors from AP-42 Section 11.1 Hot Mix Asphalt Plants. TAP emissions for the asphalt silo and loadout were calculated using the Total Organic Compound (TOC) speciation reported in Tables 11.1-15 and 11.1-16 in AP-42. Where applicable, a 500,000 ton per year, 6,000 ton per day, or 500 ton per hour maximum throughput rate was used to calculate emissions for the asphalt plant, silo, and loadout. Asphalt silo and loadout emissions are summarized in **Table 2** and **Table 3**, respectively.

The asphalt plant, silo, and loadout will be abated by a Blue Smoke Control system which has an expected VOC control efficiency of 60% and a $PM_{2.5}$/PM_{10} control efficiency of 95%. Abated emissions are calculated assuming these control efficiencies.

4.2 Crushing Plant and Recycled Asphalt Crusher Emissions

PM_{10} and $PM_{2.5}$ emissions from the crushing plant and recycled asphalt crusher (RAC) were calculated using emission factors from AP-42 Section 11.19.2 Crushed Stone Processing and Pulverized Mineral Processing. Crushing plant throughput is estimated at 1,500 tons per hour and is abated by watering. RAC throughput is estimated at 300 tons per hour and is abated by wet suppression on conveyors. Crushing Plant and RAC emissions are summarized in **Table 4** and **Table 5**, respectively.

4.3 Stockpile and Storage Tank Emissions

Stockpile emissions are calculated using emission factors from AP-42 Section 11.9 Western Surface Coal Mining. Stockpile emissions are summarized in **Table 6**.

Storage Tank VOC and CO emissions are calculated using methodology consistent with AP-42 Section 11.1 Hot Mix Asphalt Plants. TAP emissions from the storage tank were calculated using the TOC speciation reported in Tables 11.1-15 and 11.1-16 in AP-42. The storage tanks will be abated by a Blue Smoke Control system which has an expected VOC control efficiency of 60%. Abated emissions are calculated assuming these control efficiencies. Storage tank emissions are summarized in **Table 7**.

4.4 Off-Road Equipment Emissions

Diesel fueled off-road equipment is expected to operate at the active mine excavation locations, crushing plant, asphalt plant, recycle crushing area, and to support general operations of the mine. CAP and GHG emissions from off-road equipment were calculated using the US EPA's Motor Vehicle Emission Simulator (MOVES) version 3.0.0. No TAP emissions are expected from off-road equipment. Off-road equipment emissions are summarized in **Table 8**.

4.5 On-Road Vehicle Emissions

Exhaust emissions from on-road trucks are calculated using the USEPA MOVES tool and annual vehicle miles traveled (VMT) as provided by the Project Applicant. Sweeper trucks and service trucks are expected to operate consistently throughout the year. Emissions from these trucks are summarized in **Table 9**. Heavy-duty haul trucks and light/medium duty trucks are expected to have seasonal variation in their operation, with higher VMT expected in April through October and lower VMT expected in November through March. Emissions from these seasonal trucks are summarized in **Table 10**.

Fugitive dust from on-road truck operations vary based on whether the trucks are traveling over paved or unpaved roads. At the proposed project site, the sweeper and service trucks are expected to travel only on paved roads while the heavy-duty haul trucks and light/medium duty trucks are expected to travel on both paved and unpaved roads. Paved road fugitive dust emission factors are calculated using parameters from AP-42 Section 13.2.1 Paved Roads, which are summarized in **Table 11**. Fugitive dust emissions from the sweeper trucks and service trucks traveling over paved roads are calculated in **Table 12**. Fugitive dust emissions from seasonal trucks traveling over paved roads are calculated in **Table 13**. Unpaved fugitive dust emission factors are calculated using parameters from AP-42 Section 13.2.2 Unpaved Roads, which are summarized in **Table 14**. Fugitive dust emissions from seasonal trucks traveling over unpaved roads are calculated in **Table 15**.

4.6 Summary of Project Operational Emissions

Controlled CAP and TAP emissions are summarized in **Table 16** and **Table 17**, respectively. Uncontrolled CAP and TAP emissions are summarized in **Table 18** and **Table 19**, respectively. GHG Emissions are summarized in **Table 20**.

5.0 MODEL OVERVIEW

The following sections summarize the model settings and inputs that were used in the model setup for the proposed project air impact analysis.

5.1 Model Selection and Settings

Dispersion modeling was conducted using the latest version of the AERMOD modeling system (version 22112). Model settings and inputs were consistent with the Washington Department of Ecology's modeling guidance[4] (Ecology Guideline). The coordinate system used in the modeling analysis was North American Datum of 1983 (NAD83) of the Universal Transverse Mercator (UTM) Zone 10 North Coordinate System.

5.2 Source Parameters

Source parameters were determined for the modeled sources using equipment specifications, existing modeling guidance, and professional judgement. Details on the source parameter selection can be found in **Table 21**. **Figure 2** presents the site layout with the property boundary and modeled source locations.

5.3 Operational Limits and Schedules

The emissions sources at the proposed project have varied operational schedules. The asphalt plant, silo, and loadout sources will limit operation from 8am-4pm (8 hours per day, 6 days a week) from November to March (rainy season) and from 7am-4pm and 7pm-4am (18 hours per day, 6 days a week) from April through October (busy season), equal to 4,340 hours annual hours of operation. The on-road sources, including fugitive dust, are assumed to follow the same schedule as the asphalt plant. Crushing plant operations are expected to limit operations from 7am-6pm (11 hours a day, 6 days a week) year-round. Off-road equipment is expected to operate between 7am-4pm (9 hours a day, 6 days a week). Sources that emit regardless of operational schedules, such as stockpile areas and tanks, were modeled at 24-hours per day. Proposed operational schedules of emissions sources at the proposed project are summarized in **Summary Table B** below.

[4] Guidance on First, Second, and Third Tier Review of Air Toxics, 2015, State of Washington Department of Ecology

Summary Table B. Operational Schedules of Emissions Sources

Source	Daily Operation November 1st to March 31st	Daily Operation April 1st to October 31st
Crushing Plant	7am-6pm, Weekdays, Saturdays	
Recycled Asphalt Crushing	7am-6pm, Weekdays, Saturdays	
Asphalt Plant Sources	8am-4pm, Weekdays, Saturdays	7am-4pm and 7pm-4am, Weekdays, Saturdays
On-Road Sources, Fugitive Road Dust	8am-4pm, Weekdays, Saturdays	7am-4pm and 7pm-4am, Weekdays, Saturdays
Off-road Sources, Off-road Fugitive Dust	7am-4pm, Weekdays, Saturdays	
Storage Tanks, Stockpile Area	24 Hours per day	

The operating hours for each source were incorporated into the model using the variable emissions rate factor (EMISFACT) option in AERMOD. The EMISFACTs for each source category used in the model are summarized in **Table 22**. Due to the seasonal nature of the on-road (exhaust and fugitive emissions) sources, the EMISFACT for the 1-hr and 24-hr averaging periods vary based on the season and are adjusted to account for the selected emission rate. The EMISFACTs used for the 1-hr and 24-hr averaging period for the on-road sources are summarized in **Table 23**.

5.4 Source Emission Rates

Each source was modeled using the maximum allowable emission rate by pollutant and averaging period. The total emissions for each averaging period is based on the operating schedule discussed above and implemented using the EMISFACT temporal scalars. Modeling emissions rates are summarized in **Table 24**.

5.5 Receptor Grid

Receptors were placed along and beyond the boundary of the proposed project. Receptors were represented in the model using variable density, discrete Cartesian grid following the Ecology Guideline. **Summary Table C** outlines the receptor spacing requirements from the Ecology Guideline and was used in the air quality analysis - the nested receptor grids resulted in 32,621 receptors within the modeling domain. **Figure 3** shows the modeled receptor grid.

Summary Table C. Receptor Grid Spacing

Distance from Fence Line	Receptor Spacing
Along fence line out to 150 meters	12.5 meters
150 – 400 meters	25 meters
400 – 900 meters	50 meters
900 – 2,000 meters	100 meters
2,000 – 4,500 meters	300 meters
4,500 – 6,000 meters	600 meters

5.6 Terrain Data and Land Use

In accordance with USEPA guidance, terrain elevations will be incorporated into the model using the most recent version (18081) of AERMAP, AERMOD's terrain preprocessor. Terrain elevation data for the entire modeling domain was extracted from 1/3 arc second National Elevation Data (NED) files with a resolution of approximately 10 meters. The NED files will be obtained from the United States Geological Survey (USGS) Multi-Resolution Land Characteristics Consortium (MRLC)[5]. Based on review of the surrounding landuse, the urban modeling option will not be invoked.

5.7 Meteorological Data

A representative meteorological data set for the five-year period between January 2016 and December 2021 (year 2018 was excluded because of missing data) was developed for this analysis using a combination of meteorological data collected by the Washington State Department of Ecology's Mud Mountain air quality station (AQS Site ID 53-033-0023), National Weather Service (NWS) surface observations from the Tacoma-McChord Air Force Base (KTCM), and upper air observations from the NWS Quillayute, Washington (KUIL) station.

Ecology's Mud Mountain monitoring station is located approximately 17.2 kilometers south of the project site. The Mud Mountain station was used for wind speed, wind direction, and temperature. The Mud Mountain station is the closest meteorological station for which data are available. Available National Weather Service stations in King and Pierce Counties, including Puyallup, Tacoma, Renton, and SeaTac, are all further from the project site than the Mud Mountain station. Additionally, the land use surrounding the Mud Mountain station and the proposed project site are similar. Both Mud Mountain and the proposed project site are in rural, forested areas. The available NWS stations noted above are in areas of suburban or urban development. Thus land use parameters developed based off the Mud Mountain location will also be more representative of the proposed project site than parameters developed off of one of the NWS stations. The shorter distance from the proposed project site to the Mud Mountain station and similar land use surrounding the two sites make the Mud Mountain station the most representative meteorological data record available.

For surface meteorological parameters not recorded at the Mud Mountain station (notably cloud cover), KTCM data were used. KTCM is located approximately 44.6 km west-southwest of the Facility. Upper-air data were obtained from KUIL, which is located approximately 212 km west-northwest of the Facility.

The data was processed using the ADJ_U* option since measured turbulence data was unavailable.

AERSURFACE (version 20060) was run with USGS 2016 National Land Cover, Canopy, and Impervious data sets for the area around the Mud Mountain station. AERSURFACE was run for a monthly temporal resolution and 12, 30-degree sectors. The precipitation analysis to determine wet, dry, and average soil moisture was based on precipitation data from SeaTac airport.

Figure 4 presents the windrose for the processed Mud Mountain meteorological dataset.

5.8 Background Concentrations

Background concentration data for criteria pollutants were obtained from the NW-AIRQUEST background design value tool[6] for grid cells surrounding the proposed project site, from 2014 through 2017. The six surrounding modeled grid cells to the project site were considered and the highest background concentration for each pollutant and averaging period was selected. The background concentrations extracted from the NW-AIRQUEST tool are summarized in **Table 25**.

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[5] http://www.mrlc.gov

[6] http://lar.wsu.edu/nw-airquest/

6.0 MODEL RESULTS

Modeling was conducted for comparison with the NAAQS for each criteria pollutant. The results of these analyses include the model-predicted concentrations and background concentrations to demonstrate that there are no predicted violations of the NAAQS as shown in **Table 26** and summarized below in **Summary Table D**. With AERMOD containing a degree of conservativeness (e.g., includes worst-case meteorological conditions) and NW-AIRQUEST background concentrations being interpolated, which tends to be conservative, there is a level of confidence that the total impact levels of pollutants are under the NAAQS threshold.

Summary Table D. NAAQS Compliance Demonstration

Pollutant	Averaging Period	Modeled Impact (µg/m³)	Background (µg/m³)	Total (µg/m³)	NAAQS Threshold (µg/m³)	Above NAAQS?
NO_2	1-Hour	128.3	58.4	186.7	188	No
	Annual	5.4	11	16	100	No
SO_2	1-Hour	13	13	26	196	No
PM_{10}	24-Hour	65	41	106	150	No
$PM_{2.5}$	24-Hour	6.7	14	21	35	No
	Annual	1.6	5.0	6.6	12	No
CO	1-Hour	1,018	1,236	2,254	40,000	No
	8-Hour	236	813	1,049	10,000	No

Modeling was also conducted for comparison with the ASILs. Results of the TAPS analysis is presented in **Table 26** and summarized in **Summary Table E** below and demonstrate that impacts will not exceed the ASIL for any of the TAPs above the SQER threshold.

Summary Table E. ASIL Compliance Demonstration

Pollutant	Averaging Period	Modeled Impact (µg/m³)	ASIL (µg/m³)	Above ASIL?
Benzene	Annual	0.0034	0.13	No
Formaldehyde	Annual	0.026	0.17	No
Naphthalene	Annual	0.017	0.029	No

All the modeling files will be provided upon request by an FTP-like platform.

TABLES

Table 1
Drum Mix Asphalt Plant Emissions
Segale-Cumberland Mine
King County, Washington

Asphalt Plant Operational Parameters

Daily Operation Hours April 1st-October 31st	18	hours/day
Weekly Operation Days April 1st-October 31st	6	days/week
Daily Operation Hours November 1st-March 31st	8	hours/day
Weekly Operation Days November 1st-March 31st	6	days/week
Annual Hours of Operation	4,340	hours/year
Annual Production Rate	500,000	ton/year
Maximum Daily Production Rate	6,000	ton/day
Maximum Hourly Production Rate	500	ton/hour
Blue Smoke VOC Control[3]	60	%
Blue Smoke PM_{10}/$PM_{2.5}$ Control[3]	95	%

Emissions Calculations

Pollutant Category	**Pollutant**	**Emission Factor[1]**	**Emission Factor Unit**	**Production Rate (PR)**			**Emission Rate (ER) - Baghouse Only[2]**			**ER - Abated with Blue Smoke Control[3]**		
				(ton/yr)	**(ton/day)**	**(ton/hr)**	**(ton/yr)**	**(ton/day)**	**(lb/hr)**	**(ton/yr)**	**(ton/day)**	**(lb/hr)**
CAPs[4]	PM_{10}	--	--	500,000	6,000	500	11.26	0.05	5.19	0.56	2.34E-03	0.26
	$PM_{2.5}$	--	--	500,000	6,000	500	8.75	0.04	4.03	0.44	1.81E-03	0.20
	SO_X	--	--	500,000	6,000	500	3.69	0.02	1.70	--	--	--
	NO_X	--	--	500,000	6,000	500	14.11	0.06	6.50	--	--	--
	CO	--	--	500,000	6,000	500	83.55	0.35	38.50	--	--	--
	VOC	--	--	500,000	6,000	500	17.36	0.07	8.00	6.94	2.88E-02	3.20
GHG	CO_2	12500	lb/1000 gals	500,000	6,000	500	37877	157	17455	--	--	--
	N_2O	0.90	lb/1000 gals	500,000	6,000	500	2.73	0.01	1.26	--	--	--
	CH_4	0.016	lb/ton	500,000	6,000	500	4.00	0.05	8.00	--	--	--
Non-PAH HAP's[5]	Benzene	3.90E-04	lb/ton	500,000	6,000	500	9.75E-02	1.17E-03	0.20	3.90E-02	4.68E-04	0.078
	Ethylbenzene	2.40E-04	lb/ton	500,000	6,000	500	6.00E-02	7.20E-04	0.12	2.40E-02	2.88E-04	0.048
	Formaldehyde	3.10E-03	lb/ton	500,000	6,000	500	7.75E-01	9.30E-03	1.55	3.10E-01	3.72E-03	0.62
	Hexane	9.20E-04	lb/ton	500,000	6,000	500	2.30E-01	2.76E-03	0.46	9.20E-02	1.10E-03	0.18
	Isooctane (2,2,4-trimethylpentane)	4.00E-05	lb/ton	500,000	6,000	500	1.00E-02	1.20E-04	0.02	4.00E-03	4.80E-05	8.0E-03
	Methyl chloroform	4.80E-05	lb/ton	500,000	6,000	500	1.20E-02	1.44E-04	0.02	4.80E-03	5.76E-05	0.010
	Toluene	1.50E-04	lb/ton	500,000	6,000	500	3.75E-02	4.50E-04	0.08	1.50E-02	1.80E-04	0.030
	Xylene	2.00E-04	lb/ton	500,000	6,000	500	5.00E-02	6.00E-04	0.10	2.00E-02	2.40E-04	0.040
PAH HAP's[5]	2-Methylnaphthalene	7.40E-05	lb/ton	500,000	6,000	500	1.85E-02	2.22E-04	0.04	7.40E-03	8.88E-05	0.015
	Acenaphthene	1.40E-06	lb/ton	500,000	6,000	500	3.50E-04	4.20E-06	7.00E-04	1.40E-04	1.68E-06	2.80E-04
	Acenaphthylene	8.60E-06	lb/ton	500,000	6,000	500	2.15E-03	2.58E-05	4.30E-03	8.60E-04	1.03E-05	1.72E-03
	Anthracene	2.20E-07	lb/ton	500,000	6,000	500	5.50E-05	6.60E-07	1.10E-04	2.20E-05	2.64E-07	4.40E-05
	Benzo(a)anthracene	2.10E-07	lb/ton	500,000	6,000	500	5.25E-05	6.30E-07	1.05E-04	2.10E-05	2.52E-07	4.20E-05
	Benzo(a)pyrene	9.80E-09	lb/ton	500,000	6,000	500	2.45E-06	2.94E-08	4.90E-06	9.80E-07	1.18E-08	1.96E-06
	Benzo(b)fluoranthene	1.00E-07	lb/ton	500,000	6,000	500	2.50E-05	3.00E-07	5.00E-05	1.00E-05	1.20E-07	2.00E-05
	Benzo(e)pyrene	1.10E-07	lb/ton	500,000	6,000	500	2.75E-05	3.30E-07	5.50E-05	1.10E-05	1.32E-07	2.20E-05
	Benzo(g,h,i)perylene	4.00E-08	lb/ton	500,000	6,000	500	1.00E-05	1.20E-07	2.00E-05	4.00E-06	4.80E-08	8.00E-06
	Benzo(k)fluoranthene	4.10E-08	lb/ton	500,000	6,000	500	1.03E-05	1.23E-07	2.05E-05	4.10E-06	4.92E-08	8.20E-06
	Chrysene	1.80E-07	lb/ton	500,000	6,000	500	4.50E-05	5.40E-07	9.00E-05	1.80E-05	2.16E-07	3.60E-05
	Fluoranthene	6.10E-07	lb/ton	500,000	6,000	500	1.53E-04	1.83E-06	3.05E-04	6.10E-05	7.32E-07	1.22E-04
	Fluorene	3.80E-06	lb/ton	500,000	6,000	500	9.50E-04	1.14E-05	1.90E-03	3.80E-04	4.56E-06	7.60E-04
	Indeno(1,2,3-cd)pyrene	7.00E-09	lb/ton	500,000	6,000	500	1.75E-06	2.10E-08	3.50E-06	7.00E-07	8.40E-09	1.40E-06
	Naphthalene	9.00E-05	lb/ton	500,000	6,000	500	2.25E-02	2.70E-04	4.50E-02	9.00E-03	1.08E-04	1.80E-02
	Perylene	8.80E-09	lb/ton	500,000	6,000	500	2.20E-06	2.64E-08	4.40E-06	8.80E-07	1.06E-08	1.76E-06
	Phenanthrene	7.60E-06	lb/ton	500,000	6,000	500	1.90E-03	2.28E-05	3.80E-03	7.60E-04	9.12E-06	1.52E-03
	Pyrene	5.40E-07	lb/ton	500,000	6,000	500	1.35E-04	1.62E-06	2.70E-04	5.40E-05	6.48E-07	1.08E-04

Table 1 (cont.)
Drum Mix Asphalt Plant Emissions
Segale-Cumberland Mine
King County, Washington

Non-HAP organic compounds	Butane	6.70E-04	lb/ton	500,000	6,000	500	1.68E-01	2.01E-03	0.34	6.70E-02	8.04E-04	0.13
	Ethylene	7.00E-03	lb/ton	500,000	6,000	500	1.75E+00	2.10E-02	3.50	7.00E-01	8.40E-03	1.40
	Heptane	9.40E-03	lb/ton	500,000	6,000	500	2.35E+00	2.82E-02	4.70	9.40E-01	1.13E-02	1.88
	2-Methyl-1-pentene	4.00E-03	lb/ton	500,000	6,000	500	1.00E+00	1.20E-02	2.00	4.00E-01	4.80E-03	0.80
	2-Methyl-2-butene	5.80E-04	lb/ton	500,000	6,000	500	1.45E-01	1.74E-03	0.29	5.80E-02	6.96E-04	0.12
	3-Methylpentane	1.90E-04	lb/ton	500,000	6,000	500	4.75E-02	5.70E-04	0.10	1.90E-02	2.28E-04	0.04
	1-Pentene	2.20E-03	lb/ton	500,000	6,000	500	5.50E-01	6.60E-03	1.10	2.20E-01	2.64E-03	0.44
	n-Pentane	2.10E-04	lb/ton	500,000	6,000	500	5.25E-02	6.30E-04	0.11	2.10E-02	2.52E-04	0.04

Notes

1. AP-42, Fifth Edition, Section 11.1, 3/04. Hot Mix Asphalt Plants. Tables 11.1-3, 11.1-4, 11.1-7, 11.1-8, 11.1-10 and 11.1-12
2. For pollutants with emission factors from AP42, emission rates were calculated as follow:

$$\left(EF\,\frac{lb}{ton}\right)\left(PR\,\frac{ton}{yr}\right)\left(\frac{1\ ton}{2{,}000\ lb}\right)=ER\left(\frac{ton}{yr}\right)$$
$$\left(EF\,\frac{lb}{ton}\right)\left(PR\,\frac{ton}{yr}\right)=ER\left(\frac{lb}{yr}\right)$$
$$\left(EF\,\frac{lb}{ton}\right)\left(PR\,\frac{ton}{hr}\right)=ER\left(\frac{lb}{hr}\right)$$
$$\left(ER\,\frac{lb}{hr}\right)\left(453.59\,\frac{g}{lb}\right)\left(\frac{1\ hr}{3{,}600\ sec}\right)=ER\left(\frac{g}{sec}\right)$$

3. Assuming end of drum will be abated by Blue Smoke Control. Blue Smoke Control directly abates PM and indirectly abates VOC. We used reduction factors as specified by Blue Smoke Control's sales engineer. Since the drum outlet-to-conveyor transfer point and the conveyors themselves will be enclosed and vented to control, wind speed would not be a factor in emissions at those two locations. Thus, emissions from those two locations will be de minimis.
4. Emissions rates for $PM_{2.5}$ and PM_{10} are from baghouse filter specification sheets. Emissions rates for NO_X, SO_X, CO, and VOC are from Gencor specification sheets. Emissions rates for CO_2 and N_2O are from AP-42 section 1.5.
5. Per AP-42 Section 11.1, organic HAP emission factors are based on asphalt plants controlled with fabric filters.

Abbreviations:

CAP - criteria air pollutant
CO - carbon monoxide
CO2 - carbon dioxide
CH4 - methane
GHG - greenhouse gas
HAP - hazardous air pollutant
N2O - nitrous oxide
NOx - nitrogen oxides
PAH - polycylic aromatic hydrocarbons
PM2.5 - PM of less than 2.5 microns in diameter
PM10 - PM of less than 10 microns in diameter
SO2 - sulfur dioxide
VOC - volatile organic compounds

References:

USEPA. AP-42, Fifth Edition, Vol. 1: Section 11.1 Hot Mix Asphalt Plants. Available at: https://www.epa.gov/sites/default/files/2020-10/documents/c11s01.pdf
USEPA. AP-42, Fifth Edition, Vol. 1: Section 1.5 Liquefied Petroleum Gas Combustion. Available at: https://www.epa.gov/sites/default/files/2020-09/documents/1.5_liquefied_petroleum_gas_combustion.pdf

Table 2
Hot Mix Asphalt Plant Silo Loading Emissions
Segale-Cumberland Mine
King County, Washington

Emission Factors[1]

EF (Total PM)=	0.000332 + 0.00105 (-v)E^(((0.0251)(T+460)-20.43)
EF (Organic PM)=	0.00105 (-V)e^(((0.0251)(T+460)-20.43)
EF (TOC) =	0.0504 (-V)e^(((0.0251)(T+460)-20.43)
EF (CO)=	0.00488(-V)e^(((0.0251)(T+460)-20.43)
Blue Smoke VOC Control[2]	60
Blue Smoke PM_{10}/$PM_{2.5}$ Control[2] (%)	95

Emissions Calculations

Pollutant Category	**Pollutant**	**Emission Factor**	**Production Rate (PR)**			**Emission Rate (ER) - Unabated**			**ER - Abated with Blue Smoke Control[2]**		
		(lb/ton)	**(ton/yr)**	**(ton/day)**	**(ton/hr)**	**(ton/yr)**	**(ton/day)**	**(lb/hr)**	**(ton/yr)**	**(ton/day)**	**(lb/hr)**
CAPs	PM_{10}	0.00057	500,000	6,000	500	0.14	0.0017	0.29	0.0072	8.61E-05	0.014
	Total PM ($PM_{2.5}$)	0.00057	500,000	6,000	500	0.14	0.0017	0.29	0.0072	8.61E-05	0.014
	TOC	0.01219	500,000	6,000	500	3.05	0.0366	6.09	1.22	1.46E-02	2.44
	CO	0.00118	500,000	6,000	500	0.29	0.0035	0.59	0.29	3.54E-03	0.59
	VOC	0.01219	500,000	6,000	500	3.05	0.0366	6.09	1.22	1.46E-02	2.44
GHGs	CH_4	3.2E-05	500,000	6,000	500	0.0079	0.00010	0.016	0.0079	9.51E-05	0.016
Volatile Organic HAPS	Benzene	3.9E-06	500,000	6,000	500	0.0010	0.0000	0.0019	3.9E-04	4.68E-06	7.8E-04
	Bromomethane	6.0E-07	500,000	6,000	500	1.5E-04	1.8E-06	3.0E-04	6.0E-05	7.17E-07	1.2E-04
	2-Butanone	4.8E-06	500,000	6,000	500	0.0012	1.4E-05	0.0024	4.8E-04	5.70E-06	9.5E-04
	Carbon Disulfide	1.9E-06	500,000	6,000	500	4.9E-04	5.8E-06	0.0010	1.9E-04	2.34E-06	3.9E-04
	Chloroethane	4.9E-07	500,000	6,000	500	1.2E-04	1.5E-06	2.4E-04	4.9E-05	5.85E-07	9.7E-05
	Chloromethane	2.8E-06	500,000	6,000	500	7.0E-04	8.4E-06	0.0014	2.8E-04	3.36E-06	5.6E-04
	Ethylbenzene	4.6E-06	500,000	6,000	500	1.2E-03	1.4E-05	2.3E-03	4.6E-04	5.56E-06	9.3E-04
	Formaldehyde	8.4E-05	500,000	6,000	500	2.1E-02	2.5E-04	4.2E-02	8.4E-03	1.01E-04	1.7E-02
	n-Hexane	1.2E-05	500,000	6,000	500	3.0E-03	3.7E-05	6.1E-03	1.2E-03	1.46E-05	2.4E-03
	Isooctane	3.8E-08	500,000	6,000	500	9.4E-06	1.1E-07	1.9E-05	3.8E-06	4.53E-08	7.6E-06
	Methylene Chloride	3.3E-08	500,000	6,000	500	8.2E-06	9.9E-08	1.6E-05	3.3E-06	3.95E-08	6.6E-06
	Styrene	6.6E-07	500,000	6,000	500	1.6E-04	2.0E-06	3.3E-04	6.6E-05	7.90E-07	1.3E-04
	Toluene	7.6E-06	500,000	6,000	500	1.9E-03	2.3E-05	3.8E-03	7.6E-04	9.07E-06	1.5E-03
	m-/p-Xylene	2.4E-05	500,000	6,000	500	6.1E-03	7.3E-05	1.2E-02	2.4E-03	2.92E-05	4.9E-03
	o-Xylene	6.9E-06	500,000	6,000	500	1.7E-03	2.1E-05	3.5E-03	6.9E-04	8.34E-06	1.4E-03
PAH HAPS[3]	Acenaphthene	1.2E-06	500,000	6,000	500	3.0E-04	3.6E-06	6.0E-04	1.2E-04	1.43E-06	2.4E-04
	Acenaphthylene	3.6E-08	500,000	6,000	500	8.9E-06	1.1E-07	1.8E-05	3.6E-06	4.27E-08	7.1E-06
	Anthracene	3.3E-07	500,000	6,000	500	8.3E-05	9.9E-07	1.7E-04	3.3E-05	3.96E-07	6.6E-05
	Benzo(a)anthracene	1.4E-07	500,000	6,000	500	3.6E-05	4.3E-07	7.1E-05	1.4E-05	1.71E-07	2.8E-05
	Benzo(e)pyrene	2.4E-08	500,000	6,000	500	6.0E-06	7.2E-08	1.2E-05	2.4E-06	2.89E-08	4.8E-06
	Chrysene	5.3E-07	500,000	6,000	500	1.3E-04	1.6E-06	2.7E-04	5.3E-05	6.40E-07	1.1E-04
	Fluoranthene	3.8E-07	500,000	6,000	500	9.5E-05	1.1E-06	1.9E-04	3.8E-05	4.57E-07	7.6E-05
	Fluorene	2.6E-06	500,000	6,000	500	6.4E-04	7.7E-06	1.3E-03	2.6E-04	3.08E-06	5.1E-04
	2-Methylnaphthalene	1.3E-05	500,000	6,000	500	3.3E-03	4.0E-05	6.7E-03	1.3E-03	1.61E-05	2.7E-03
	Naphthalene	4.6E-06	500,000	6,000	500	1.2E-03	1.4E-05	2.3E-03	4.6E-04	5.54E-06	9.2E-04
	Perylene	7.6E-08	500,000	6,000	500	1.9E-05	2.3E-07	3.8E-05	7.6E-06	9.14E-08	1.5E-05
	Phenanthrene	4.6E-06	500,000	6,000	500	1.1E-03	1.4E-05	2.3E-03	4.6E-04	5.48E-06	9.1E-04
	Pyrene	1.1E-06	500,000	6,000	500	2.8E-04	3.4E-06	5.6E-04	1.1E-04	1.34E-06	2.2E-04

Table 2 (cont.)
Hot Mix Asphalt Plant Silo Loading Emissions
Segale-Cumberland Mine
King County, Washington

Notes:

1. AP-42, Section 11.1 Hot Mix Asphalt Plants
2. Abated by Blue Smoke Control. Blue Smoke Control directly abates PM and indirectly abates VOC. We used reduction factors as specified by Blue Smoke Control's sales engineer. Assumed VOC control = HAP control.
3. Per AP-42, these PAH HAPs are organic particulate-based compounds, and thus the organic PM EF was used.
4. Asphalt silos have a rated capacity of 200 tons.
5. Two 200-ton standard haven silos.

Abbreviations:

CAP - criteria air pollutant
CO - carbon monoxide
CO2 - carbon dioxide
CH4 - methane
GHG - greenhouse gas
HAP - hazardous air pollutant
N2O - nitrous oxide
NOx - nitrogen oxides
PAH - polycylic aromatic hydrocarbons
PM2.5 - PM of less than 2.5 microns in diameter
PM10 - PM of less than 10 microns in diameter
SO2 - sulfur dioxide
TOC - total organic compounds
VOC - volatile organic compounds

References:

USEPA. AP-42, Fifth Edition, Vol. 1: Section 11.1 Hot Mix Asphalt Plants. Available at: https://www.epa.gov/sites/default/files/2020-10/documents/c11s01.pdf

Table 3
Hot Mix Asphalt Plant Loadout Emissions
Segale-Cumberland Mine
King County, Washington

Emission Factors[1]

EF (Total PM)=	0.000181 + 0.00141 (-v)E^(((0.0251)(T+460)-20.43)
EF (Organic PM)=	0.00141 (-V)e^(((0.0251)(T+460)-20.43)
EF (TOC) =	0.0172 (-V)e^(((0.0251)(T+460)-20.43)
EF (CO)=	0.00558(-V)e^(((0.0251)(T+460)-20.43)
Blue Smoke VOC Control[3] (%)	60
Blue Smoke PM_{10}/$PM_{2.5}$ Control[3] (%)	95

Emissions Calculations

Pollutant Category	**Pollutant**	**Emission Factor[1,2]**	**Production Rate (PR)**			**Emission Rate (ER) - Unabated**			**ER - Abated with Blue Smoke Control[3]**		
		(lb/ton)	**(ton/yr)**	**(ton/day)**	**(lb/hr)**	**(ton/yr)**	**(ton/day)**	**(lb/hr)**	**(ton/yr)**	**(ton/day)**	**(lb/hr)**
CAPs	PM_{10}	0.00052	500,000	6,000	500	0.13	0.0016	0.26	0.0065	7.83E-05	0.013
	Total PM ($PM_{2.5}$)	0.00052	500,000	6,000	500	0.13	0.0016	0.26	0.0065	7.83E-05	0.013
	TOC	0.00416	500,000	6,000	500	1.04	0.0125	2.08	0.42	0.0050	0.83
	CO	0.00135	500,000	6,000	500	0.34	0.0040	0.67	0.34	0.0040	0.67
	VOC	0.00391	500,000	6,000	500	0.98	0.012	1.95	0.39	0.0047	0.78
GHGs	CH_4	2.70E-04	500,000	6,000	500	6.76E-02	8.11E-04	1.35E-01	6.76E-02	8.11E-04	1.35E-01
Volatile Organic HAPS	Benzene	2.16E-06	500,000	6,000	500	5.41E-04	6.49E-06	1.08E-03	2.16E-04	2.60E-06	4.33E-04
	Bromomethane	3.99E-07	500,000	6,000	500	1.0E-04	1.2E-06	2.00E-04	3.99E-05	4.79E-07	7.99E-05
	2-Butanone	2.04E-06	500,000	6,000	500	5.09E-04	6.11E-06	1.02E-03	2.04E-04	2.45E-06	4.08E-04
	Carbon Disulfide	5.41E-07	500,000	6,000	500	1.35E-04	1.62E-06	2.70E-04	5.41E-05	6.49E-07	1.08E-04
	Chloroethane	8.73E-09	500,000	6,000	500	2.18E-06	2.62E-08	4.37E-06	8.73E-07	1.05E-08	1.75E-06
	Chloromethane	6.24E-07	500,000	6,000	500	1.56E-04	1.87E-06	3.12E-04	6.24E-05	7.49E-07	1.25E-04
	Cumene	4.57E-06	500,000	6,000	500	1.14E-03	1.37E-05	2.29E-03	4.57E-04	5.49E-06	9.15E-04
	Ethylbenzene	1.16E-05	500,000	6,000	500	2.91E-03	3.49E-05	5.82E-03	1.16E-03	1.40E-05	2.33E-03
	Formaldehyde	3.66E-06	500,000	6,000	500	9.15E-04	1.10E-05	1.83E-03	3.66E-04	4.39E-06	7.32E-04
	n-Hexane	6.24E-06	500,000	6,000	500	1.56E-03	1.87E-05	3.12E-03	6.24E-04	7.49E-06	1.25E-03
	Isooctane	7.49E-08	500,000	6,000	500	1.87E-05	2.25E-07	3.74E-05	7.49E-06	8.98E-08	1.50E-05
	Styrene	3.04E-07	500,000	6,000	500	7.59E-05	9.11E-07	1.52E-04	3.04E-05	3.64E-07	6.07E-05
	Tetrachloroethene	3.20E-07	500,000	6,000	500	8.01E-05	9.61E-07	1.60E-04	3.20E-05	3.84E-07	6.40E-05
	Toluene	8.73E-06	500,000	6,000	500	2.18E-03	2.62E-05	4.37E-03	8.73E-04	1.05E-05	1.75E-03
	Trichlorofluoromethane	5.41E-08	500,000	6,000	500	1.35E-05	1.62E-07	2.70E-05	5.41E-06	6.49E-08	1.08E-05
	m-/p-Xylene	1.71E-05	500,000	6,000	500	4.26E-03	5.12E-05	8.53E-03	1.71E-03	2.05E-05	3.41E-03
	o-Xylene	3.33E-06	500,000	6,000	500	8.32E-04	9.98E-06	1.66E-03	3.33E-04	3.99E-06	6.65E-04
PAH HAPS[4]	Acenaphthene	8.86E-07	500,000	6,000	500	2.22E-04	2.66E-06	4.43E-04	8.86E-05	1.06E-06	1.77E-04
	Acenaphthylene	9.55E-08	500,000	6,000	500	2.39E-05	2.86E-07	4.77E-05	9.55E-06	1.15E-07	1.91E-05
	Anthracene	2.39E-07	500,000	6,000	500	5.97E-05	7.16E-07	1.19E-04	2.39E-05	2.86E-07	4.77E-05
	Benzo(a)anthracene	6.48E-08	500,000	6,000	500	1.62E-05	1.94E-07	3.24E-05	6.48E-06	7.77E-08	1.30E-05
	Benzo(b)fluoranthene	2.59E-08	500,000	6,000	500	6.48E-06	7.77E-08	1.30E-05	2.59E-06	3.11E-08	5.18E-06
	Benzo(k)fluoranthene	7.50E-09	500,000	6,000	500	1.88E-06	2.25E-08	3.75E-06	7.50E-07	9.00E-09	1.50E-06
	Benzo(g,h,i)perylene	6.48E-09	500,000	6,000	500	1.62E-06	1.94E-08	3.24E-06	6.48E-07	7.77E-09	1.30E-06
	Benzo(a)pyrene	7.84E-09	500,000	6,000	500	1.96E-06	2.35E-08	3.92E-06	7.84E-07	9.41E-09	1.57E-06
	Benzo(e)pyrene	2.66E-08	500,000	6,000	500	6.65E-06	7.98E-08	1.33E-05	2.66E-06	3.19E-08	5.32E-06
	Chrysene	3.51E-07	500,000	6,000	500	8.78E-05	1.05E-06	1.76E-04	3.51E-05	4.21E-07	7.02E-05
	Dibenz(a,h)anthracene	1.26E-09	500,000	6,000	500	3.15E-07	3.78E-09	6.31E-07	1.26E-07	1.51E-09	2.52E-07
	Fluoranthene	1.70E-07	500,000	6,000	500	4.26E-05	5.11E-07	8.52E-05	1.70E-05	2.05E-07	3.41E-05
	Fluorene	2.63E-06	500,000	6,000	500	6.56E-04	7.88E-06	1.31E-03	2.63E-04	3.15E-06	5.25E-04
	Indeno(1,2,3-cd)pyrene	1.60E-09	500,000	6,000	500	4.01E-07	4.81E-09	8.01E-07	1.60E-07	1.92E-09	3.20E-07
	2-Methylnaphthalene	8.11E-06	500,000	6,000	500	2.03E-03	2.43E-05	4.06E-03	8.11E-04	9.74E-06	1.62E-03

Table 3 (cont.)
Hot Mix Asphalt Plant Loadout Emissions
Segale-Cumberland Mine
King County, Washington

PAH HAPS[4]	Naphthalene	4.26E-06	500,000	6,000	500	1.07E-03	1.28E-05	2.13E-03	4.26E-04	5.11E-06	8.52E-04
	Perylene	7.50E-08	500,000	6,000	500	1.88E-05	2.25E-07	3.75E-05	7.50E-06	9.00E-08	1.50E-05
	Phenanthrene	2.76E-06	500,000	6,000	500	6.90E-04	8.28E-06	1.38E-03	2.76E-04	3.31E-06	5.52E-04
	Pyrene	5.11E-07	500,000	6,000	500	1.28E-04	1.53E-06	2.56E-04	5.11E-05	6.14E-07	1.02E-04
Semi-Volatile HAPS	Phenol	4.91E-05	500,000	6,000	500	1.23E-02	1.47E-04	2.45E-02	4.91E-03	5.89E-05	9.82E-03

Notes:

1. AP-42, Section 11.1 Hot Mix Asphalt Plants Table 11.1-15
2. Speciation from AP-42, Hot Mix Asphalt Plants Tables 11.1-15 and 11.1-16
3. Abated by Blue Smoke Control. Blue Smoke Control directly abates PM and indirectly abates VOC. We used reduction factors as specified by Blue Smoke Control's sales engineer.
4. Per AP-42, these PAH HAPs are organic particulate-based compounds, and thus the organic PM EF was used.

Abbreviations:

CAP - criteria air pollutant
CO - carbon monoxide
CO2 - carbon dioxide
CH4 - methane
EF - emissions factor
GHG - greenhouse gas
HAP - hazardous air pollutant
hr - hour
N2O - nitrous oxide
lb - pound
NOx - nitrogen oxides
PAH - polycylic aromatic hydrocarbons
PM - particulate matter
PM2.5 - PM of less than 2.5 microns in diameter
PM10 - PM of less than 10 microns in diameter
SO2 - sulfur dioxide
TOC - total organic compounds
VOC - volatile organic compounds
yr - year

References:

USEPA. AP-42, Fifth Edition, Vol. 1: Section 11.1 Hot Mix Asphalt Plants. Available at: https://www.epa.gov/sites/default/files/2020-10/documents/c11s01.pdf

Table 4
Rock Crushing Emissions
Segale-Cumberland Mine
King County, Washington

Crushing Plant Operating Parameters

Throughput	1500	tons/hr
Control Efficiency (Watering)	75	%
Operating hours[1]	3432	hours/yr

Emission Factors[2,3]

Emission Source	$PM_{2.5}$ (lb/ton)[4]	PM_{10} (lb/ton)	PM (lb/ton)
Tertiary Crushing	0.00036	0.0024	0.0054
Tertiary Crushing - Controlled[5]	0.0001	0.00054	0.0012

Emission Calculations - Controlled

Equipment Type	$PM_{2.5}$ (ton/yr)	PM_{10} (ton/yr)	PM (ton/yr)
Jaw Crusher - Primary Dry	0.26	1.39	3.09
Cone Crusher - Secondary	0.26	1.39	3.09
Cone Crusher - Secondary	0.26	1.39	3.09
Cone Crusher - Tertiary	0.26	1.39	3.09
Cone Crusher - Tertiary	0.26	1.39	3.09
Total	**1.29**	**6.95**	**15.44**

Notes:

1. Operating hours based on Crushing operations from 07:00-16:00 year round.
2. AP-42, Section 11.19.2 Crushed Stone Processing and Pulverized Mineral Processing
3. Table 11.19.2-2
4. PM2.5/PM10 ratio - 0.15, Background Document for Revisions to Fine Fraction Ratios Used for AP-42 Fugitive Dust Emission Factors, Midwest Research Institute (2006).
5. Controlled emission factor from AP-42, represents control of 70-80% from watering.

Abbreviations:

lb - pound
PM10 - PM of less than 10 microns in diameter
PM - particulate matter
yr - year
PM2.5 - PM of less than 2.5 microns in diameter

References:

USEPA. AP-42, Fifth Edition, Vol. 1: Section 11.19 Construction Aggregate Processing. Available at: https://www.epa.gov/sites/default/files/2020-10/documents/c11s19.pdf

Table 5
Recycled Asphalt Crushing Emissions
Segale-Cumberland Mine
King County, Washington

Recycled Asphalt Crusher Operating Parameters

Throughput	300	tons/hr
Operating Hours[1]	2,808	hours/yr

Emission Factors[2]

Emission Source	$PM_{2.5}$ (lb/ton)[3]	PM_{10} (lb/ton)	PM (lb/ton)
Crushers	0.00010	0.0005	0.0012
Screening	0.00005	0.00074	0.0022
Transfer points	0.00001	0.00005	0.00014

Emission Calculations **(ton/hr)** **(ton/hr)**

Equipment Type	Number of Equipment	$PM_{2.5}$ (ton/yr)	PM_{10} (ton/yr)	PM (ton/yr)
Crushers	2	0.08	0.45	1.0
Screen	1	0.021	0.31	0.9
Transfer Points	7	0.038	0.14	0.41
	Total:	**0.14**	**0.90**	**2.35**

Notes

1. Operating hours based on crushing operations from 07:00-16:00 year round.
2. AP-42, Section 11.19.2 Crushed Stone Processing and Pulverized Mineral Processing. Table 11.19.2-2
3. PM2.5/PM10 ratio - 0.15, MRI 2006
4. Emissions assume wet suppression on conveyors.

Abbreviations:

lb - pound
PM10 - PM of less than 10 microns in diameter
PM - particulate matter
yr - year
PM2.5 - PM of less than 2.5 microns in diameter

References:

USEPA. AP-42, Fifth Edition, Vol. 1: Section 11.19 Construction Aggregate Processing. Available at: https://www.epa.gov/sites/default/files/2020-10/documents/c11s19.pdf

Table 6
Stockpile Emissions
Segale-Cumberland Mine
King County, Washington

Stockpile Operational Parameters

Annual Operation	365	days/yr
Control Efficiency[1]	75	%
Stockpile Area	8	acres
Number of active days	365	days/year
Number of inactive days	0	days/year

Emission Factors[2]

Source	$PM_{2.5}$ (lb/acre-day)	PM_{10} (lb/acre-day)
Storage Piles	0.473	6.3

Emission Calculations - Controlled

Stockpiles	Controlled Emission Rate (ton/year)	
	$PM_{2.5}$	PM_{10}
Active	0.17	2.30

Notes

1. 75% Control Efficiency for Watering Stockpiles.
2. AP-42, Fifth Edition, Section 11.9, 10/98, Western Surface Coal Mining. Table 11.9-4.

Abbreviations:

lb - pound

PM - particulate matter

PM2.5 - PM of less than 2.5 microns in diameter

PM10 - PM of less than 10 microns in diameter

References:

USEPA. AP-42, Fifth Edition, Vol. 1: Section 11.9 Western Surface Coal Mining. Available at: https://www.epa.gov/sites/default/files/2020-10/documents/c11s09.pdf

Table 7
Storage Tank Emissions
Segale-Cumberland Mine
King County, Washington

General Operational Parameters[1]

Capacity	30,000	gallons
Cement Throughput (per tank)	10,000	tons/yr
Throughput	2,323,722	gallons
Tank Length	35	feet
Tank Diameter	45	feet
Operating Hours[2]	8760	hours/yr
Storage Tanks	3	#
Blue Smoke VOC Control[3]	60	%

Emission Calculations

Source	**Pollutant**	**Emission Rate (unabated)**	**Emission Rate (abated with Blue Smoke Control)**
		ton/yr	**ton/yr**
CAPS[4]	VOC	0.86	0.34
	CO	0.083	--
GHGs	CH_4	0.056	--
Volatile Organic HAPS	Benzene	4.4E-04	1.8E-04
	Bromomethane	8.2E-05	3.3E-05
	2-Butanone	4.2E-04	1.7E-04
	Carbon Disulfide	1.1E-04	4.4E-05
	Chloroethane	1.8E-06	7.2E-07
	Chloromethane	1.3E-04	5.1E-05
	Cumene	9.4E-04	3.8E-04
	Ethylbenzene	0.0024	9.6E-04
	Formaldehyde	7.5E-04	3.0E-04
	n-Hexane	0.0013	5.1E-04
	Isooctane	1.5E-05	6.2E-06
	Styrene	6.2E-05	2.5E-05
	Tetrachloroethene	6.6E-05	2.6E-05
	Toluene	0.0018	7.2E-04
	Trichlorofluoromethane	1.1E-05	4.4E-06
	m-/p-Xylene	0.0035	1.4E-03
	o-Xylene	6.8E-04	2.7E-04

Table 7 (cont.)
Storage Tank Emissions
Segale-Cumberland Mine
King County, Washington

PAH HAPS[5]	Acenaphthene	0.0022	8.9E-04
	Acenaphthylene	2.4E-04	9.6E-05
	Anthracene	6.0E-04	2.4E-04
	Benzo(a)anthracene	1.6E-04	6.5E-05
	Benzo(b)fluoranthene	6.5E-05	2.6E-05
	Benzo(k)fluoranthene	1.9E-05	7.5E-06
	Benzo(g,h,i)perylene	1.6E-05	6.5E-06
	Benzo(a)pyrene	2.0E-05	7.9E-06
	Benzo(e)pyrene	6.7E-05	2.7E-05
	Chrysene	8.8E-04	3.5E-04
	Dibenz(a,h)anthracene	3.2E-06	1.3E-06
	Fluoranthene	4.3E-04	1.7E-04
	Fluorene	0.0066	0.0026
	Indeno(1,2,3-cd)pyrene	4.0E-06	1.6E-06
	2-Methylnaphthalene	0.020	0.008
	Naphthalene	0.0107	0.0043
	Perylene	1.9E-04	7.5E-05
	Phenanthrene	0.0069	0.0028
	Pyrene	0.0013	0.0005
Semi-Volatile HAPS	Phenol	0.0101	0.0040

Notes

1. Specific gravity of asphalt cement is assumed 8.61 pounds per gallon.
2. Assumed continuous usage throughout the year.
3. Abated by Blue Smoke Control. Blue Smoke Control directly abates PM and indirectly abates VOC. We used reduction factors as specified by Blue Smoke Control's sales engineer. Assumed VOC control = HAP control.
4. For asphalt cement, CO Emissions are equal to 0.097 x VOC emissions based on AP-42, Section 11.1. Section 4.4.5.
5. Conservatively multiplied the AP-42 Table 11.1-15 PAH HAPs speciation profile by the organic volatile emissions due to lack of organic PM data.

Abbreviations:

CAP - criteria air pollutant
CH4 - methane
EF - emissions factor
GHG - greenhouse gas
HAP - hazardous air pollutant
hr - hour
PAH - polycyclic aromatic hydrocarbons
VOC - volatile organic compounds
yr - year

References:

USEPA. AP-42, Fifth Edition, Vol. 1: Section 11.1 Hot Mix Asphalt Plants. Available at: https://www.epa.gov/sites/default/files/2020-10/documents/c11s01.pdf

Table 8
Off-Road Equipment Emissions
Segale-Cumberland Mine
King County, Washington

Off-road Annual Emissions Calculations (Tons/year)

Year	Plant[1]	Equipment Type	Rated Horsepower (HP)	MOVES3 Equipment Category[2]	HP bin[3]	Quantity	Average daily vehicle operation (hours)[4]	Operating Days per Year	Annual hours of operation	Loadfactor	Off-road Emission (Tons/Year)									
											VOC	CO	NO_X	PM_{10}	$PM_{2.5}$	SO_2	CO_2	CH_4	N_2O	CO_2e
2021	Crushing Plant	Dozer	600	Dsl - Crawler Tractor/Dozers	300 < hp <= 600	1	9	312	2,808	0.59	0.068	0.47	1.2	0.070	0.068	0.0017	588	0.0050	0.054	604
2021	Crushing Plant	Excavator/Loader	600	Dsl - Excavators	300 < hp <= 600	1	9	312	2,808	0.59	0.050	0.33	0.84	0.050	0.049	0.0017	588	0.0038	0.054	604
2021	Crushing Plant	Off-highway haul trucks	600	Dsl - Off-highway Trucks	300 < hp <= 600	3	9	312	8,424	0.59	0.081	0.47	1.2	0.083	0.081	0.0048	1,764	0.0067	0.16	1,813
2021	Crushing Plant	Water truck	600	Dsl - Off-highway Trucks	300 < hp <= 600	0.5	9	312	1,404	0.59	0.013	0.078	0.20	0.014	0.013	8.0E-04	294	0.0011	0.027	302
2021	Crushing Plant	Road grader	600	Dsl - Graders	300 < hp <= 600	0.5	9	312	1,404	0.59	0.032	0.22	0.56	0.032	0.031	8.5E-04	294	0.0023	0.027	302
2021	Crushing Plant	Off-highway haul truck	600	Dsl - Off-highway Trucks	300 < hp <= 600	3	9	312	8,424	0.59	0.081	0.47	1.2	0.083	0.081	0.0048	1,764	0.0067	0.16	1,813
2021	Crushing Plant	Loader	600	Dsl - Rubber Tire Loaders	300 < hp <= 600	3	9	312	8,424	0.59	0.44	3.2	7.6	0.48	0.47	0.0057	1,763	0.030	0.16	1,813
2021	Asphalt Plant	Loader	600	Dsl - Rubber Tire Loaders	300 < hp <= 600	1	9	312	2,808	0.59	0.15	1.1	2.5	0.16	0.16	0.0019	588	0.010	0.054	604
2021	General Operations	8000 lb forklift[4]	86	Dsl - Rough Terrain Forklifts	75 < hp <= 100	1	3	312	0,936	0.59	0.006	0.05	0.09	0.006	0.006	8.9E-05	31	0.0004	0.003	32
2021	General Operations	Rubber tired backhoe[4]	87	Dsl - Tractors/Loaders/Backhoes	75 < hp <= 100	2	3	312	1,872	0.21	0.05	0.3	0.22	0.04	0.04	9.6E-05	26	0.0022	0.002	27
										Total:	**1.0**	**6.7**	**16**	**1.0**	**1.0**	**0.022**	**7,701**	**0.068**	**0.71**	**7,915**

Notes:

1. Emissions were estimated using emission factors from the Motor Vehicle Emission Simulator, version 3.0.0 (MOVES3) from the US EPA.
2. Crushing plant sources only operate 7am-5:30pm.
3. General Operations are daytime only, expected 25% time.
4. Rated HP not provided, Assumed MOVES3 average horsepower of horsepower bin with the highest population.

Abbreviations:

CH4 - methane
CO - carbon monoxide
CO2 - carbon dioxide
CO2e - carbon dioxide equivalents
HP - horsepower
NOx - nitrogen oxides
N2O - nitrous oxide
PM - particulate matter
PM2.5 - PM of less than 2.5 microns in diameter
PM10 - PM of less than 10 microns in diameter
SO2 - sulfur dioxide
VOC - volatile organic compound

References:

US Environmental Protection Agency, 2020. Motor Vehicle Emission Simulator, version 3.0.0 (MOVES3). Available at: https://www.epa.gov/moves/latest-version-motor-vehicle-emission-simulator-moves

Table 9
On-Road Vehicle Emissions
Segale-Cumberland Mine
King County, Washington

Summary of Vehicle Miles Travelled (VMT)

Plant	Year	Vehicle Type	Fuel Type	MOVES3 Vehicle Type[1]	Number of Trucks per Day	Annual VMT (miles)[2]
Asphalt Plant	2021	Sweeper truck	Diesel Fuel	Single Unit Short-haul Truck	1	13,152
Asphalt Plant	2021	Service truck <50,000 GVWR	Diesel Fuel	Single Unit Short-haul Truck	4	52,610

On-road Annual Emissions Calculations (Tons/year)

Plant	Year	Vehicle Type	Fuel Type	MOVES3 Vehicle Type	Number of Trucks per Day	Total Annual VMT (miles)	Regulatory Class ID	On-road Emission (Tons/Year)									
								VOC	CO	NO_X	PM_{10}	$PM_{2.5}$	SO_2	CO_2	CH_4	N_2O	CO_2e
Asphalt Plant	2021	Sweeper truck	Diesel Fuel	Single Unit Short-haul Truck	1.0	13,152	47	0.0015	0.023	0.040	0.0029	0.0011	6.0E-05	18	2.1E-04	2.6E-05	18
Asphalt Plant	2021	Service truck <50,000 GVWR	Diesel Fuel	Single Unit Short-haul Truck	4.0	52,610	47	0.0062	0.093	0.16	0.011	0.0043	2.4E-04	72	8.6E-04	1.0E-04	72
							Total:	**0.0077**	**0.12**	**0.20**	**0.014**	**0.0053**	**3.0E-04**	**89**	**0.0011**	**1.3E-04**	**89**

Notes:
1. US Environmental Protection Agency, 2020. Motor Vehicle Emission Simulator, version 3.0.0 (MOVES3).
2. * Assumed MOVES default daily VMT per vehicle. (Annual VMT/Vehicle population)

Abbreviations:

CH4 - methane
CO - carbon monoxide
CO2 - carbon dioxide
CO2e - carbon dioxide equivalents
HP - horsepower
NOx - nitrogen oxides
N2O - nitrous oxide
PM - particulate matter
PM2.5 - PM of less than 2.5 microns in diameter
PM10 - PM of less than 10 microns in diameter
SO2 - sulfur dioxide
VOC - volatile organic compound
VMT - vehicle miles traveled

References:

US Environmental Protection Agency, 2020. Motor Vehicle Emission Simulator, version 3.0.0 (MOVES3). Available at: https://www.epa.gov/moves/latest-version-motor-vehicle-emission-simulator-moves

Table 10
Seasonal On-road Vehicle Emissions
Segale-Cumberland Mine
King County, Washington

Summary of Vehicle Miles Travelled (VMT)

Year	Vehicle Type	Fuel Type	MOVES3 Vehicle Type	Number of Trucks per Day	Season	Average Trip Length (Mile/trip)	VMT per season (miles)
2021	Heavy Duty Haul Trucks	Diesel Fuel	Combination Short-haul Truck	550	Apr-Sep	2.14	183,612
2021	Heavy Duty Haul Trucks	Diesel Fuel	Combination Short-haul Truck	200	Oct-March	2.14	66,768
2021	Light/Medium Duty Trucks	MOVES Default mix	Light Commercial Truck	118	Apr-Sep	2.14	39,393
2021	Light/Medium Duty Trucks	MOVES Default mix	Light Commercial Truck	98	Oct-May	2.14	32,716

On-road Annual Emissions Calculations (Tons/year)

Year	Vehicle Type	Fuel Type	MOVES3 Vehicle Type	Average Trucks per Day	Total Annual VMT (miles)	Regulatory Class ID	On-road Emission (Tons/Year)									
							VOC	CO	NO_X	PM_{10}	$PM_{2.5}$	SO_2	CO_2	CH_4	N_2O	CO_2e
2021	Heavy Duty Haul Trucks	Diesel Fuel	Combination Short-haul Truck	375	250,380	47	0.018	0.28	0.54	0.023	0.0106	8.5E-04	252	0.0027	2.6E-04	253
2021	Light/Medium Duty Trucks	MOVES Default mix	Light Commercial Truck	108	72,109	n/a	0.0036	0.14	0.014	0.0014	4.4E-04	1.1E-04	18	5.3E-04	1.1E-04	18
						Total:	**0.022**	**0.42**	**0.55**	**0.024**	**0.0110**	**9.6E-04**	**270**	**0.0033**	**3.7E-04**	**271**

Notes:

[1] US Environmental Protection Agency, 2020. Motor Vehicle Emission Simulator, version 3.0.0 (MOVES3).

Abbreviations:

CH4 - methane
CO - carbon monoxide
CO2 - carbon dioxide
CO2e - carbon dioxide equivalents
HP - horsepower
NOx - nitrogen oxides
N2O - nitrous oxide
PM - particulate matter
PM2.5 - PM of less than 2.5 microns in diameter
PM10 - PM of less than 10 microns in diameter
SO2 - sulfur dioxide
VOC - volatile organic compound
VMT - vehicle miles traveled

References:

US Environmental Protection Agency, 2020. Motor Vehicle Emission Simulator, version 3.0.0 (MOVES3). Available at: https://www.epa.gov/moves/latest-version-motor-vehicle-emission-simulator-moves

Table 11
Paved Fugitive Dust Calculation Details
Segale-Cumberland Mine
King County, Washington

Emission Calculation Details

Emissions Calculation Formula	
E (lb/VMT) =	$k\ (sL)^{a}\ (W)^{b}$
$E_{ext} = E\ (1 - P/4*365)$	

Parameter	PM_{10}	$PM_{2.5}$
k	0.0022	0.00054
a	0.91	0.91
b	1.02	1.02

Function/Variable Description	Assumed Value	Reference
sl = silt loading	0.2	Value based on assumed average daily traffic volume of 500-4999 (source: https://gaftp.epa.gov/air/nei/2017/doc/supporting_data/nonpoint/Road%20Dust%20NEMO%20FINAL%20revised_4_9_2020.docx)
W = mean vehicle weight (tons)	10	Assumed 10 tons for averaged 20% heavy duty (40 tons) and 80% light duty vehicle (2.5 tons) mix.
P = Number of days precip per year	195	https://wrcc.dri.edu/cgi-bin/cliMAIN.pl?wa6295
E = size-specific emission factor (lb/VMT)		
E_{ext} = size-specific emission factor extrapolated for natural mitigation (lb/VMT)		

References:

USEPA. AP-42, Fifth Edition, Vol. I, Section 13.2.1 Paved Roads, Table 13.2.1-1. Available at: https://www.epa.gov/sites/default/files/2020-10/documents/13.2_fugitive_dust_sources.pdf

Table 12
Fugitive Dust Emissions for Paved Roads Travel
Segale-Cumberland Mine
King County, Washington

Fugitive Dust Emission Estimations for Vehicles on Paved Roads for 2021

Plant	Year	Vehicle Type	MOVES3 Vehicle Type	Fuel Type	Number of Trucks	Annual VMT per vehicle (miles)	Regulatory Class ID	Mean Vehicle Weight (tons)	Controlled EF (lb/VMT)		Emission Rates					
											PM_{10}			$PM_{2.5}$		
									PM_{10}	$PM_{2.5}$	(lb/hr)	(lb/day)	(tons/yr)	(lb/hr)	(lb/day)	(tons/yr)
Asphalt Plant	2021	Sweeper truck	Single Unit Short-haul Truck	Diesel Fuel	1	13,152	47	10	0.005	0.0011	0.01	0.17	0.03	0.00	0.04	0.01
Asphalt Plant	2021	Service truck <50,000 GVWR	Single Unit Short-haul Truck	MOVES default mix	4	52,610	47	10	0.005	0.0011	0.06	0.67	0.12	0.01	0.16	0.03
										Total:	**0.07**	**0.83**	**0.15**	**0.02**	**0.20**	**0.04**

Notes:

1. See Table 11 for more information on the parameters used in the calculation.

Abbreviations:

EF - Emission factor
hr - hour
lb - pound
PM - particulate matter
PM2.5 - PM of less than 2.5 microns in diameter
PM10 - PM of less than 10 microns in diameter
VMT - vehicle miles traveled
yr - year

Table 13
Seasonal Fugitive Dust Emissions for Paved Roads Travel
Segale-Cumberland Mine
King County, Washington

Seasonal Fugitive Dust Emission Estimations for Vehicles on Paved Roads for 2021

Year	Vehicle Type	MOVES3 Vehicle Type	Fuel Type	Annual Average Trucks per Day	Average Trip Length (miles/trip)	Regulatory Class ID	Mean Vehicle Weight (tons)	Controlled EF (lb/VMT)		Annual Avg Emission Rates			Annual Avg		
										PM_{10}			$PM_{2.5}$		
								PM_{10}	$PM_{2.5}$	(lb/hr)	(lb/day)	(tons/yr)	(lb/hr)	(lb/day)	(tons/yr)
2021	Heavy Duty Haul Trucks	Combination Short-haul Truck	Diesel Fuel	375	2.04	47	10	0.005	0.0011	0.25	3.53	0.55	0.06	0.87	0.14
2021	Light/Medium Duty Trucks	Light Commercial Truck	MOVES default mix	108	2.04	MOVES default mix	10	0.005	0.0011	0.0731	1.02	0.16	0.02	0.25	0.04
									Total:	**0.33**	**4.55**	**0.71**	**0.08**	**1.12**	**0.17**

Notes:
1. See Table 11 for more information on the parameters used in the calculation.
2. Seasonal vehicle operations are assumed to occur 312 days per year.

Abbreviations:
EF - Emission factor
hr - hour
lb - pound
PM - particulate matter
PM2.5 - PM of less than 2.5 microns in diameter
PM10 - PM of less than 10 microns in diameter
VMT - vehicle miles traveled
yr - year

Table 14
Unpaved Fugitive Dust Calculation Details
Segale-Cumberland Mine
King County, Washington

Emission Calculation Details

Emissions Calculation Formula	
E (lb/VMT) =	$k\ (s/12)^a\ (W/3)^b$
$E_{ext} = E\ [(365 - P)/365]$	

Parameter	PM_{10}	$PM_{2.5}$
k	1.5	0.15
a	0.9	0.9
b	0.45	0.45

Function/Variable Description	Assumed Value	Reference
s = surface material silt content (%)	8.3	EPA AP-42 Section 13.2.2, Table 13.2.2-1
W = mean vehicle weight (tons)	32	Weighted based on anticipated VMT of unpaved road traffic assuming a weight of 4 tons for light duty trucks and 40 tons for heavy duty trucks.
M = surface material moisture content (%)	0.8	https://gaftp.epa.gov/air/nei/2017/doc/supporting_data/nonpoint/Road%20Dust%20NEMO%20FINAL%20revised_4_9_2020.docx
P = Number of days precip per year	195	https://wrcc.dri.edu/cgi-bin/cliMAIN.pl?wa6295
CE = emission control percent for unpaved roads	50%	watering, MgCl
E = size-specific emission factor (lb/VMT)		
E_{ext} = size-specific emission factor extrapolated for natural mitigation (lb/VMT)		

References:

USEPA. AP-42, Fifth Edition, Vol. I, Section 13.2.2 Unpaved Roads, Table 13.2.2-2. Available at:
https://www.epa.gov/sites/default/files/2020-10/documents/13.2_fugitive_dust_sources.pdf

Table 15
Seasonal Fugitive Dust Emissions for Unpaved Roads Travel
Segale-Cumberland Mine
King County, Washington

Seasonal Fugitive Dust Emission Estimations for Vehicles on Unpaved Roads for 2021

Year	Vehicle Type	MOVES3 Vehicle Type	Fuel Type	Annual Average Trucks per Day	Average Trip Length (miles/trip)	Regulatory Class ID	Mean Vehicle Weight (tons)	Controlled Em. Factor (lb/VMT)		Emission Rates					
										Annual Avg PM_{10}			Annual Avg $PM_{2.5}$		
								PM_{10}	$PM_{2.5}$	(lb/hr)	(lb/day)	(tons/yr)	(lb/hr)	(lb/day)	(tons/yr)
2021	Heavy Duty Haul Trucks	Combination Short-haul Truck	Diesel Fuel	375	0.10	47	32	0.73	0.073	1.96	27.26	4.25	0.20	2.73	0.43
2021	Light/Medium Duty Trucks	Light Commercial Truck	MOVES Default mix	108	0.10	n/a	32	0.73	0.073	0.56	7.85	1.22	0.06	0.78	0.12
									Total	**2.52**	**35.11**	**5.48**	**0.25**	**3.51**	**0.55**

Notes:
1. See Table 14 for information on the parameters used in this calculation.

Acronyms:
EF - Emission factor
hr - hour
lb - pound
PM - particulate matter
PM2.5 - PM of less than 2.5 microns in diameter
PM10 - PM of less than 10 microns in diameter
VMT - vehicle miles traveled
yr - year

Table 16
CAP Emissions Inventory Summary with Blue Smoke Control
Segale-Cumberland Mine
King County, Washington

Source	Pollutant Emissions (tons per year)					
	$PM_{2.5}$	PM_{10}	NO_X	SO_2	CO	VOC
Crushing Plant	1.3	6.9	--	--	--	--
Off-road	0.99	1.0	16	0.022	6.7	0.97
On-road	0.016	0.038	0.75	1.3E-03	0.53	0.030
Paved-fugitive Dust	0.21	0.86	--	--	--	--
Unpaved-fugitive Dust	0.55	5.5	--	--	--	--
Stockpiles	0.17	2.3	--	--	--	--
Asphalt Plant	0.44	0.56	14.1	3.7	84	6.9
Asphalt Silo	7.2E-03	7.2E-03	--	--	0.29	1.2
Asphalt Loadout	6.5E-03	6.5E-03	--	--	0.34	0.39
Recycled Asphalt	0.14	0.90	--	--	--	--
Storage Tanks	--	--	--	--	0.083	0.34
Total (tons/yr)	**3.8**	**18**	**31**	**3.7**	**91**	**9.9**

Notes:

1. Emissions for the Asphalt Plant, Asphalt Silo, Asphalt Loadout, and Storage Tanks are abated by Blue Smoke Control. Blue Smoke Control directly abates PM and indirectly abates VOC. Control efficiencies provided by Blue Smoke Control's sales engineer. Assumed VOC control is equivalent to HAP control.

Abbreviations:

CAP - criteria air pollutant
CO - carbon monoxide
HAP - hazardous air pollutant
NOx - nitrous oxides
PM - particulate matter
PM2.5 - PM of less than 2.5 microns in diameter
PM10 - PM of less than 10 microns in diameter
SO2 - sulfur dioxide
VOC - volatile organic compounds

Table 17
TAP Emissions Inventory Summary with Blue Smoke Control
Segale-Cumberland Mine
King County, Washington

HAPS	CAS	Asphalt Plant	Asphalt Silo	Asphalt Loadout	Storage Tanks	Total
		(tons/yr)				
Acenaphthene	83-32-9	1.4E-04	1.2E-04	8.9E-05	8.9E-04	**1.2E-03**
Acenaphthylene	208-96-8	8.6E-04	3.6E-06	9.5E-06	9.6E-05	**9.7E-04**
Anthracene	120-12-7	2.2E-05	3.3E-05	2.4E-05	2.4E-04	**3.2E-04**
Benzo(a)anthracene	56-55-3	2.1E-05	1.4E-05	6.5E-06	6.5E-05	**1.1E-04**
Benzo(b)fluoranthene	205-99-2	1.0E-05	--	2.6E-06	2.6E-05	**3.9E-05**
Benzo(k)fluoranthene	207-08-9	4.1E-06	--	7.5E-07	7.5E-06	**1.2E-05**
Benzo(g,h,i)perylene	191-24-2	4.0E-06	--	6.5E-07	6.5E-06	**1.1E-05**
Benzo(a)pyrene	50-32-8	9.8E-07	--	7.8E-07	7.9E-06	**9.6E-06**
Benzo(e)pyrene	192-97-2	1.1E-05	2.4E-06	2.7E-06	2.7E-05	**4.3E-05**
Chrysene	218-01-9	1.8E-05	5.3E-05	3.5E-05	3.5E-04	**4.6E-04**
Dibenz(a,h)anthracene	53-70-3	--	--	1.3E-07	1.3E-06	**1.4E-06**
Fluoranthene	206-44-0	6.1E-05	3.8E-05	1.7E-05	1.7E-04	**2.9E-04**
Fluorene	86-73-7	3.8E-04	2.6E-04	2.6E-04	2.6E-03	**3.5E-03**
Indeno(1,2,3-cd)pyrene	193-39-5	7.0E-07	--	1.6E-07	1.6E-06	**2.5E-06**
2-Methylnaphthalene	91-57-6	7.4E-03	1.3E-03	8.1E-04	8.1E-03	**1.8E-02**
Naphthalene	91-20-3	9.0E-03	4.6E-04	4.3E-04	4.3E-03	**1.4E-02**
Perylene	198-55-0	8.8E-07	7.6E-06	7.5E-06	7.5E-05	**9.1E-05**
Phenanthrene	85-01-8	7.6E-04	4.6E-04	2.8E-04	2.8E-03	**4.3E-03**
Pyrene	129-00-0	5.4E-05	1.1E-04	5.1E-05	5.1E-04	**7.3E-04**
Phenol	108-95-2	--	--	4.9E-03	4.0E-03	**8.9E-03**
Benzene	71-43-2	3.9E-02	3.9E-04	2.2E-04	1.8E-04	**4.0E-02**
Bromomethane	74-83-9	--	6.0E-05	4.0E-05	3.3E-05	**1.3E-04**
2-Butanone	78-93-3	--	4.8E-04	2.0E-04	1.7E-04	**8.5E-04**
Carbon Disulfide	75-15-0	--	1.9E-04	5.4E-05	4.4E-05	**2.9E-04**
Chloroethane	75-00-3	--	4.9E-05	8.7E-07	7.2E-07	**5.0E-05**
Chloromethane	74-87-3	--	2.8E-04	6.2E-05	5.1E-05	**3.9E-04**
Cumene	92-82-8	--	--	4.6E-04	3.8E-04	**8.3E-04**
Ethylbenzene	100-41-4	0.024	4.6E-04	1.2E-03	9.6E-04	**2.7E-02**
Formaldehyde	50-00-0	0.31	8.4E-03	3.7E-04	3.0E-04	**3.2E-01**
n-Hexane	100-54-3	--	1.2E-03	6.2E-04	5.1E-04	**2.4E-03**
Isooctane	540-84-1	4.0E-03	3.8E-06	7.5E-06	6.2E-06	**4.0E-03**
Methylene Chloride	75-09-2	--	3.3E-06	--	--	**3.3E-06**
MTBE	596899	--	--	--	--	**0.0E+00**
Styrene	100-42-5	--	6.6E-05	3.0E-05	2.5E-05	**1.2E-04**
Tetrachloroethene	127-18-4	--	--	3.2E-05	2.6E-05	**5.8E-05**
Toluene	100-88-3	--	7.6E-04	8.7E-04	7.2E-04	**2.3E-03**
1,1,1-Trichloroethane	71-55-6	4.8E-03	--	--	--	**4.8E-03**
Trichloroethene	79-01-6	--	--	--	--	**0.0E+00**
Trichlorofluoromethane	75-69-4	--	--	5.4E-06	4.4E-06	**9.9E-06**
o-Xylene	95-47-6	--	6.9E-04	3.3E-04	2.7E-04	**1.3E-03**
Hexane	110-54-3	0.092	--	--	--	**9.2E-02**
Toluene	108-88-3	0.015	--	--	--	**1.5E-02**
Xylene	1330-20-7	0.020	2.4E-03	1.7E-03	1.4E-03	**2.6E-02**

Notes:

[1] Emissions for the Asphalt Plant, Asphalt Silo, Asphalt Loadout, and Storage Tanks are abated by Blue Smoke Control. Blue Smoke Control directly abates PM and indirectly abates VOC. Control efficiencies provided by Blue Smoke Control's sales engineer. Assumed VOC control is equivalent to HAP control.

Abbreviations:

CAS - Chemical Abstracts Services
HAP - hazardous air pollutant
PM - particulate matter
TAP - toxic air pollutant
VOC - volatile organic compound
yr - year

Table 18
CAP Emissions Inventory Summary without Blue Smoke Control
Segale-Cumberland Mine
King County, Washington

Pollutant	Pollutant Emissions (tons per year)					
	$PM_{2.5}$	PM_{10}	NO_X	SO_2	CO	VOC
Crushing Plant	1.3	6.9	--	--	--	--
Off-road	0.99	1.0	16	0.022	6.7	0.97
On-road	0.016	0.038	0.75	1.3E-03	0.53	0.030
Paved-fugitive Dust	0.21	0.86	--	--	--	--
Unpaved-fugitive Dust	0.55	5.5	--	--	--	--
Stockpiles	0.17	2.3	--	--	--	--
Asphalt Plant	8.7	11	14	3.7	84	17
Asphalt Silo	0.14	0.14	--	--	0.29	3.0
Asphalt Loadout	0.13	0.13	--	--	0.34	0.98
Recycled Asphalt	0.14	0.90	--	--	--	--
Storage Tanks	--	--	--	--	0.083	0.86
Total (tons/yr)	**12**	**29**	**31**	**3.7**	**91**	**23**

Notes:

1. Emissions shown in this table are not abated by Blue Smoke Control.

Abbreviations:

CAP - criteria air pollutant
CO - carbon monoxide
HAP - hazardous air pollutant
NOx - nitrous oxides
PM - particulate matter
PM2.5 - PM of less than 2.5 microns in diameter
PM10 - PM of less than 10 microns in diameter
SO2 - sulfur dioxide
VOC - volatile organic compounds

Table 19
TAP Emissions Inventory Summary without Blue Smoke Control
Segale-Cumberland Mine
King County, Washington

HAPS	CAS	Asphalt Plant	Asphalt Silo	Asphalt Loadout	Storage Tanks	Total (tons/yr)
Acenaphthene	83-32-9	3.5E-04	3.0E-04	2.2E-04	2.2E-03	**3.1E-03**
Acenaphthylene	208-96-8	2.2E-03	8.9E-06	2.4E-05	2.4E-04	**2.4E-03**
Anthracene	120-12-7	5.5E-05	8.3E-05	6.0E-05	6.0E-04	**8.0E-04**
Benzo(a)anthracene	56-55-3	5.3E-05	3.6E-05	1.6E-05	1.6E-04	**2.7E-04**
Benzo(b)fluoranthene	205-99-2	2.5E-05	--	6.5E-06	6.5E-05	**9.6E-05**
Benzo(k)fluoranthene	207-08-9	1.0E-05	--	1.9E-06	1.9E-05	**3.1E-05**
Benzo(g,h,i)perylene	191-24-2	1.0E-05	--	1.6E-06	1.6E-05	**2.8E-05**
Benzo(a)pyrene	50-32-8	2.5E-06	--	2.0E-06	2.0E-05	**2.4E-05**
Benzo(e)pyrene	192-97-2	2.8E-05	6.0E-06	6.6E-06	6.7E-05	**1.1E-04**
Chrysene	218-01-9	4.5E-05	1.3E-04	8.8E-05	8.8E-04	**1.1E-03**
Dibenz(a,h)anthracene	53-70-3	--	--	3.2E-07	3.2E-06	**3.5E-06**
Fluoranthene	206-44-0	1.5E-04	9.5E-05	4.3E-05	4.3E-04	**7.2E-04**
Fluorene	86-73-7	9.5E-04	0.001	6.6E-04	6.6E-03	**8.8E-03**
Indeno(1,2,3-cd)pyrene	193-39-5	1.8E-06	--	4.0E-07	4.0E-06	**6.2E-06**
2-Methylnaphthalene	91-57-6	1.9E-02	0.003	2.0E-03	2.0E-02	**4.4E-02**
Naphthalene	91-20-3	2.3E-02	0.001	1.1E-03	1.1E-02	**3.5E-02**
Perylene	198-55-0	2.2E-06	1.9E-05	1.9E-05	1.9E-04	**2.3E-04**
Phenanthrene	85-01-8	1.9E-03	0.001	6.9E-04	6.9E-03	**1.1E-02**
Pyrene	129-00-0	1.4E-04	2.8E-04	1.3E-04	1.3E-03	**1.8E-03**
Phenol	108-95-2	--	--	1.2E-02	1.0E-02	**2.2E-02**
Benzene	71-43-2	9.8E-02	9.7E-04	5.4E-04	4.4E-04	**9.9E-02**
Bromomethane	74-83-9	--	1.5E-04	1.0E-04	8.2E-05	**3.3E-04**
2-Butanone	78-93-3	--	1.2E-03	5.1E-04	4.2E-04	**2.1E-03**
Carbon Disulfide	75-15-0	--	4.9E-04	1.4E-04	1.1E-04	**7.3E-04**
Chloroethane	75-00-3	--	1.2E-04	2.2E-06	1.8E-06	**1.3E-04**
Chloromethane	74-87-3	--	7.0E-04	1.6E-04	1.3E-04	**9.8E-04**
Cumene	92-82-8	--	--	1.1E-03	9.4E-04	**2.1E-03**
Ethylbenzene	100-41-4	0.06	1.2E-03	2.9E-03	2.4E-03	**6.6E-02**
Formaldehyde	50-00-0	0.78	2.1E-02	9.1E-04	7.5E-04	**8.0E-01**
n-Hexane	100-54-3	--	3.0E-03	1.6E-03	1.3E-03	**5.9E-03**
Isooctane	540-84-1	1.0E-02	9.4E-06	1.9E-05	1.5E-05	**1.0E-02**
Methylene Chloride	75-09-2	--	8.2E-06	--	--	**8.2E-06**
MTBE	596899	--	--	--	--	**0.0E+00**
Styrene	100-42-5	--	1.6E-04	7.6E-05	6.2E-05	**3.0E-04**
Tetrachloroethene	127-18-4	--	--	8.0E-05	6.6E-05	**1.5E-04**
Toluene	100-88-3	--	1.9E-03	2.2E-03	1.8E-03	**5.9E-03**
1,1,1-Trichloroethane	71-55-6	1.2E-02	--	--	--	**1.2E-02**
Trichloroethene	79-01-6	--	--	--	--	**0.0E+00**
Trichlorofluoromethane	75-69-4	--	--	1.4E-05	1.1E-05	**2.5E-05**
o-Xylene	95-47-6	--	1.7E-03	8.3E-04	6.8E-04	**3.3E-03**
Hexane	110-54-3	0.230	--	--	--	**2.3E-01**
Toluene	108-88-3	0.038	--	--	--	**3.8E-02**
Xylene	1330-20-7	0.050	6.1E-03	4.3E-03	3.5E-03	**6.4E-02**

Notes:

1. Emissions shown in this table are not abated by Blue Smoke Control.

Abbreviations:

CAS - Chemical Abstracts Services
HAP - hazardous air pollutant
PM - particulate matter
TAP - toxic air pollutant
VOC - volatile organic compound
yr - year

Table 20
GHG Emissions Inventory
Segale-Cumberland Mine
King County, Washington

Pollutant	Pollutant Emissions (MT/yr)			
	CO_2	CH_4	N_2O	GHG (CO_2e)
Crushing Plant	--	--	--	--
Off-road	6,987	0.062	0.65	7,181
On-road	326	3.9E-03	4.5E-04	327
Paved-fugitive Dust	--	--	--	--
Unpaved-fugitive Dust	--	--	--	--
Stockpiles	--	--	--	--
Asphalt Plant	34,362	3.6	2.5	35,190
Asphalt Silo		7.2E-03		0.18
Asphalt Loadout		0.061		1.5
Recycled Asphalt	--	--	--	--
Storage Tanks	--	--	--	--
Total (tons/yr)	**41,675**	**3.8**	**3.1**	**42,699**

Notes:

1. Emissions are converted to carbon dioxide equivalents using global warming potentials presented in the Intergovernmental Panel on Climate Change (IPCC) Fourth Assessment Report.

References:

IPCC. 2007. Fourth Assessment Report of the Intergovernmental Panel on Climate Change. Available at: https://www.ipcc.ch/report/ar4/syr/

Table 21
Modeling Source Parameters
Segale-Cumberland Mine
King County, Washington

Modeled Areapoly Sources[1]

Source Category	SRCGRP	Source Type	Release Height	Number of Vertices	IVD	Area
			m	m	m	m2
Off-road	M1S1	Areapoly	5	19	1.4	282,326
Off-road	M2S1	Areapoly	5	28	1.4	123,569
Off-road	M3S1	Areapoly	5	28	1.4	190,449

Modeled Area Sources[2]

Source Category	SRCGRP	Source Type	Release Height	Length of X	Length of Y	Area
			m	m	m	m2
Stockpiles	SA_M1	Area	0	244	133	32,405

Modeled Point Sources[3,4]

Source Category	SRCGRP	Source Type	Release Height	Stack Temp	Stack Velocity	Stack Diameter
			m	K	m/s	m
Asphalt Plant	APS	Point	9.1	378	9.1	1.2
Storage Tanks	TANK1	Point	4	0	0.0010	0.0010
Storage Tanks	TANK2	Point	4	0	0.0010	0.0010
Storage Tanks	TANK3	Point	4	0	0.0010	0.0010

Modeled Volume Sources[5,6,7]

Source Category	SRCGRP	Source Type	Release Height	ILD	IVD
			m	m	m
Crushing Plant	RCFP1	Volume	3.3	0.25	0.77
Crushing Plant	RCFP2	Volume	3.3	0.25	0.77
On-road Exhaust	M1RD	Volume	2.7	4.4	2.5
On-road Exhaust	M2N_S1	Volume	2.7	4.4	2.5
On-road Exhaust	M2S_RD	Volume	2.7	4.4	2.5
On-road Exhaust	M3N_S15	Volume	2.7	4.4	2.5
On-road Exhaust	MR_S1	Volume	2.7	4.4	2.5
On-road Fugitive Dust (Paved)	FM1RD	Volume	2.7	4.4	2.5
On-road Fugitive Dust (Paved)	FM2N_S1	Volume	2.7	4.4	2.5
On-road Fugitive Dust (Paved)	FM2S_RD	Volume	2.7	4.4	2.5
On-road Fugitive Dust (Paved)	FM3N_S15	Volume	2.7	4.4	2.5
On-road Fugitive Dust (Paved)	FMR_S1	Volume	2.7	4.4	2.5
On-road Fugitive Dust (Unpaved)	FUPR_M1	Volume	2.7	4.4	2.5
Asphalt Silo	SILO	Volume	22	0.29	1.7
Asphalt Loadout	APLD	Volume	2.8	0.29	2.3
Recycled Asphalt Crusher	RAC	Volume	3.3	0.25	0.77

Notes:

1. Off-road equipment was modeled using Bay Area Air Quality Management District (BAAQMD) guidelines for modeling construction equipment.
2. Stockpiles were conservatively assumed to have a release height of zero.
3. Asphalt plant stack parameters were taken from the representative 2009 rules for Georgia Generic Air Quality permit for Asphalt Plants.
4. Storage tank parameters were based on Santa Barbara County Air Pollution Control District modeling guidance for liquid storage tanks. When the stack temperature is set to zero, AERMOD will default to ambient temperature.
5. Crusher dimensions were calculated using measurements from the Screen machine JHT Mobile Jaw Crusher and the Screen Machine CXT Mobile Cone Crusher specification sheets.
6. Source parameters for paved and unpaved roads were calculated using the USEPA Haul Road guidance and dimensions from a Caterpillar 740 GC 50-ton articulated truck brochure.
7. Asphalt loadout and silo parameters were calculated using measurements from project site plans.

Abbreviations:

IVD - initial vertical dimension	K - Kelvin	m^2 - meter squared
ILD - initial lateral dimension	m - meters	s - seconds

Table 21 (cont.)
Modeling Source Parameters
Segale-Cumberland Mine
King County, Washington

References:

Georgia Department of Natural Resources - Environmental Protection Division - Air Protection branch. 2009. Generic Air Quality Permit for Asphalt Plants. Available at: https://epd.georgia.gov/generic-air-permits

BAAQMD, 2020. BAAQMD Health Risk Assessment Modeling Protocol. Available at: https://www.baaqmd.gov/~/media/files/ab617-community-health/facility-risk-reduction/documents/baaqmd_hra_modeling_protocol-pdf.pdf?la=en

SBCAPCD. 2020. SBCAPCD Modeling Guidelines for Air Quality Assessments. Available at: https://www.ourair.org/wp-content/uploads/aqia.pdf

USEPA. 2022. EPA Haul Road Workgroup Final Report Submissions to EPA-OAQPS. Available at: https://www.epa.gov/sites/default/files/2020-10/documents/haul_road_workgroup-final_report_package-20120302.pdf

Table 22
Modeling Variable Emissions Rate Factors (EMISFACT)
Segale-Cumberland Mine
Kings County, Washington

Source Category	SRCGRP	Day of Week	EMISFACT
Crushing Plant[1]	RCFP1, RCFP2	Weekday	7*0 11*1 6*0
		Saturday	7*0 11*1 6*0
		Sunday	24*0
Off-road[2]	M1S1, M2S1, M3S1	Weekday	7*0 9*1 8*0
		Saturday	7*0 9*1 8*0
		Sunday	24*0
Stockpiles[3]	SA_M1	Weekday	24*1
		Saturday	24*1
		Sunday	24*1
Recycled Asphalt Crusher[1]	RAC	Weekday	7*0 11*1 6*0
		Saturday	7*0 11*1 6*0
		Sunday	24*0
Storage Tanks[3]	TANK1, TANK2, TANK3	Weekday	24*1
		Saturday	24*1
		Sunday	24*1

Source Category	SRCGRP	Day of Week	Season	
			Nov-Mar	Apr-Oct
Asphalt Plant[4]	APS	Weekday	8*0 8*1 8*0	4*1 3*0 9*1 3*0 5*1
		Saturday	8*0 8*1 8*0	4*1 3*0 9*1 3*0 5*1
		Sunday	24*0	24*0
Asphalt Silo[4]	SILO	Weekday	8*0 8*1 8*0	4*1 3*0 9*1 3*0 5*1
		Saturday	8*0 8*1 8*0	4*1 3*0 9*1 3*0 5*1
		Sunday	24*0	24*0
Asphalt Loadout[4]	APLD	Weekday	8*0 8*1 8*0	4*1 3*0 9*1 3*0 5*1
		Saturday	8*0 8*1 8*0	4*1 3*0 9*1 3*0 5*1
		Sunday	24*0	24*0
On-road Exhaust[5]	M1RD, M2N_S1, M2S_RD, M3N_S15, MR_S1	Weekday	8*0 8*1 8*0	4*1 3*0 9*1 3*0 5*1
		Saturday	8*0 8*1 8*0	4*1 3*0 9*1 3*0 5*1
		Sunday	24*0	24*0
On-road Fugitive Dust (Paved)[5]	FM1RD, FM2N_S1, FM2S_RD, FM3N_S15, FMR_S1	Weekday	8*0 8*1 8*0	4*1 3*0 9*1 3*0 5*1
		Saturday	8*0 8*1 8*0	4*1 3*0 9*1 3*0 5*1
		Sunday	24*0	24*0
On-road Fugitive Dust (Unpaved)[5]	FUPR_M1	Weekday	8*0 8*1 8*0	4*1 3*0 9*1 3*0 5*1
		Saturday	8*0 8*1 8*0	4*1 3*0 9*1 3*0 5*1
		Sunday	24*0	24*0

Notes:

1. The crushing plant and recycled asphalt crusher are expected to limit operations from 7am-6pm, Monday through Saturday.
2. Off-road equipment is expected to operate between 7am-4pm, Monday through Saturday.
3. The stockpiles an storage tanks are expected to emit continuously, regardless of operational schedule. As a result, they are modeled
4. The Asphalt Plant, Silo, and Loadout are expected to limit operation from 8am-4pm, Monday through Saturday, during the rainy
5. On-road sources, including both exhaust and fugitive dust emissions, are expected to follow the same schedule as the Asphalt Plant.

Table 23
Modeling Variable Emissions Rate Factors (EMISFACT) for On-Road Emissions (1-hr and 24-hr)
Segale-Cumberland Mine
Kings County, Washington

Source Category[1]	SRCGRP	$PM_{2.5}$ Emissions (lb/hr)		Ratio	Day of Week	Season	
		Nov-Mar	Apr-Oct			Nov-Mar	Apr-Oct
On-road Exhaust	M1RD, M2N_S1, M2S_RD, M3N_S15, MR_S1	0.0065	0.0072	0.8971	Weekday	8*0 8*0.8971 8*0	4*1 3*0 9*1 3*0 5*1
					Saturday	8*0 8*0.8971 8*0	4*1 3*0 9*1 3*0 5*1
					Sunday	24*0	24*0
On-road Fugitive Dust (Paved)	FM1RD, FM2N_S1, FM2S_RD, FM3N_S15, FMR_S1	0.1032	0.1029	0.9969	Weekday	8*0 8*1 8*0	4*1 3*0 9*1 3*0 5*1
					Saturday	8*0 8*1 8*0	4*1 3*0 9*1 3*0 5*1
					Sunday	24*0	24*0
On-road Fugitive Dust (Unpaved)	FUPR_M1	0.271	0.270	0.9963	Weekday	8*0 8*1 8*0	4*1 3*0 9*1 3*0 5*1
					Saturday	8*0 8*1 8*0	4*1 3*0 9*1 3*0 5*1
					Sunday	24*0	24*0

Source Category[1]	SRCGRP	PM_{10} Emissions (lb/hr)		Ratio	Day of Week	Season	
		Nov-Mar	Apr-Oct			Nov-Mar	Apr-Oct
On-road Exhaust	M1RD, M2N_S1, M2S_RD, M3N_S15, MR_S1	0.011	0.012	0.9316	Weekday	8*0 8*0.9316 8*0	4*1 3*0 9*1 3*0 5*1
					Saturday	8*0 8*0.9316 8*0	4*1 3*0 9*1 3*0 5*1
					Sunday	24*0	24*0
On-road Fugitive Dust (Paved)	FM1RD, FM2N_S1, FM2S_RD, FM3N_S15, FMR_S1	0.421	0.419	0.9969	Weekday	8*0 8*1 8*0	4*1 3*0 9*1 3*0 5*1
					Saturday	8*0 8*1 8*0	4*1 3*0 9*1 3*0 5*1
					Sunday	24*0	24*0
On-road Fugitive Dust (Unpaved)	FUPR_M1	2.707	2.697	0.9963	Weekday	8*0 8*1 8*0	4*1 3*0 9*1 3*0 5*1
					Saturday	8*0 8*1 8*0	4*1 3*0 9*1 3*0 5*1
					Sunday	24*0	24*0

Source Category[1]	SRCGRP	NO_x Emissions (lb/hr)		Ratio	Day of Week	Season	
		Nov-Mar	Apr-Oct			Nov-Mar	Apr-Oct
On-road Exhaust	M1RD, M2N_S1, M2S_RD, M3N_S15, MR_S1	0.332	0.378	0.8781	Weekday	8*0 8*0.8781 8*0	4*1 3*0 9*1 3*0 5*1
					Saturday	8*0 8*0.8781 8*0	4*1 3*0 9*1 3*0 5*1
					Sunday	24*0	24*0

Source Category[1]	SRCGRP	SO_2 Emissions (lb/hr)		Ratio	Day of Week	Season	
		Nov-Mar	Apr-Oct			Nov-Mar	Apr-Oct
On-road Exhaust	M1RD, M2N_S1, M2S_RD, M3N_S15, MR_S1	5.84E-04	6.25E-04	0.9333	Weekday	8*0 8*0.9333 8*0	4*1 3*0 9*1 3*0 5*1
					Saturday	8*0 8*0.9333 8*0	4*1 3*0 9*1 3*0 5*1
					Sunday	24*0	24*0

Source Category[1]	SRCGRP	CO Emissions (lb/hr)		Ratio	Day of Week	Season	
		Nov-Mar	Apr-Oct			Nov-Mar	Apr-Oct
On-road Exhaust	M1RD, M2N_S1, M2S_RD, M3N_S15, MR_S1	0.273	0.254	0.9294	Weekday	8*0 8*1 8*0	4*0.9294 3*0 9*0.9294 3*0 5*0.9294
					Saturday	8*0 8*1 8*0	4*0.9294 3*0 9*0.9294 3*0 5*0.9294
					Sunday	24*0	24*0

Notes:

1. On-road emissions (both exhaust and fugitive dust) have seasonal variation between the rainy season (November through March) and the busy season (April through October). For the 24-hr and 1-hr averaging periods, the maximum emissions rate between the two seasons was used as the modeled emissions rate. As a result, the variable modeled emissions rate factor was scaled to adjust for this difference in emissions rate. To do so, the ratio between the smaller emissions rate and the larger emissions rate was used as the EMISFACT for the season in which the smallest emissions rate occurs. For the season in which the largest emissions rate occurs, an EMISFACT of 1 is used during the operating hours.

Abbreviations:

hr - hour
lb - pound

Table 24
Modeling Emissions Rates
Segale-Cumberland Mine
King County, Washington

CAP Modeling Emissions Rates

Source Category	SRCGRP	Source Type	Seasonal?[1]	Area	Length	# Volume	$PM_{2.5}$		PM_{10}	NO_x		SO_2	CO	$PM_{2.5}$		PM_{10}	NO_x		SO_2	CO
							lb/hr by avg-period [lb/hr/m² for area sources]							g/s by avg period [g/s/m² for area sources]						
				m²			Annual	24-hr	24-hr	1-hr	Annual	1-hr	1-hr	Annual	24-hr	24-hr	1-hr	Annual	1-hr	1-hr
Crushing Plant[2]	RCFP1	Volume	N	--	--	1	3.8E-01	3.8E-01	2.0E+00	0	0	0	0	4.7E-02	4.7E-02	2.6E-01	0	0	0	0
	RCFP2	Volume	N	--	--	1	3.8E-01	3.8E-01	2.0E+00	0	0	0	0	4.7E-02	4.7E-02	2.6E-01	0	0	0	0
Off-road[3]	M1S1	Areapoly	N	282,549	--	--	1.3E-06	1.3E-06	1.3E-06	1.9E-05	1.9E-05	2.7E-08	8.7E-06	1.6E-07	1.6E-07	1.7E-07	2.4E-06	2.4E-06	3.4E-09	1.1E-06
	M2S1	Areapoly	N	123,455	--	--	1.3E-06	1.3E-06	1.3E-06	1.9E-05	1.9E-05	2.7E-08	8.7E-06	1.6E-07	1.6E-07	1.7E-07	2.4E-06	2.4E-06	3.4E-09	1.1E-06
	M3S1	Areapoly	N	190,545	--	--	1.3E-06	1.3E-06	1.3E-06	1.9E-05	1.9E-05	2.7E-08	8.7E-06	1.6E-07	1.6E-07	1.7E-07	2.4E-06	2.4E-06	3.4E-09	1.1E-06
On-road[4]	M1RD	Volume	Y	--	187	20	2.1E-05	2.0E-05	3.2E-05	1.0E-03	9.5E-04	1.7E-06	7.5E-04	2.6E-06	2.5E-06	4.0E-06	1.3E-04	1.2E-04	2.2E-07	9.4E-05
	M2N_S1	Volume	Y	--	115	12	2.1E-05	2.0E-05	3.3E-05	1.1E-03	9.6E-04	1.7E-06	7.6E-04	2.6E-06	2.5E-06	4.1E-06	1.3E-04	1.2E-04	2.2E-07	9.6E-05
	M2S_RD	Volume	Y	--	170	18	2.1E-05	2.0E-05	3.2E-05	1.0E-03	9.5E-04	1.7E-06	7.5E-04	2.6E-06	2.5E-06	4.1E-06	1.3E-04	1.2E-04	2.2E-07	9.5E-05
	M3N_S15	Volume	Y	--	105	11	2.1E-05	2.0E-05	3.3E-05	1.1E-03	9.6E-04	1.7E-06	7.6E-04	2.6E-06	2.5E-06	4.1E-06	1.3E-04	1.2E-04	2.2E-07	9.6E-05
	MR_S1	Volume	Y	--	2,849	299	2.1E-05	2.0E-05	3.3E-05	1.1E-03	9.6E-04	1.7E-06	7.6E-04	2.6E-06	2.5E-06	4.1E-06	1.3E-04	1.2E-04	2.2E-07	9.6E-05
Paved FD[4]	FM1RD	Volume	Y	--	187	20	2.7E-04	2.8E-04	1.1E-03	0	0	0	0	3.4E-05	3.6E-05	1.4E-04	0	0	0	0
	FM2N_S1	Volume	Y	--	115	12	2.7E-04	2.9E-04	1.2E-03	0	0	0	0	3.4E-05	3.6E-05	1.5E-04	0	0	0	0
	FM2S_RD	Volume	Y	--	170	18	2.7E-04	2.8E-04	1.2E-03	0	0	0	0	3.4E-05	3.6E-05	1.5E-04	0	0	0	0
	FM3N_S15	Volume	Y	--	105	11	2.7E-04	2.9E-04	1.2E-03	0	0	0	0	3.4E-05	3.6E-05	1.5E-04	0	0	0	0
	FMR_S1	Volume	Y	--	2,849	299	2.7E-04	2.9E-04	1.2E-03	0	0	0	0	3.4E-05	3.6E-05	1.5E-04	0	0	0	0
Unpaved FD	FUPR_M1	Volume	Y	--	262	35	7.2E-03	7.7E-03	7.7E-02	0	0	0	0	9.1E-04	9.7E-04	9.7E-03	0	0	0	0
Stockpiles	SA_M1	Area	N	32,405	--	--	1.2E-06	1.2E-06	1.6E-05	0	0	0	0	1.5E-07	1.5E-07	2.0E-06	0	0	0	0
Asphalt Plant	APS	Point	Y	--	--	--	2.0E-01	2.0E-01	2.6E-01	6.5E+00	6.5E+00	1.7E+00	3.9E+01	2.5E-02	2.5E-02	3.3E-02	8.2E-01	8.2E-01	2.1E-01	4.9E+00
Asphalt Silo	SILO	Volume	Y	--	--	1	3.3E-03	1.4E-02	1.4E-02	0	0	0	5.9E-01	4.2E-04	1.8E-03	1.8E-03	0	0	0	7.4E-02
Asphalt Loadout	APLD	Volume	Y	--	--	1	3.0E-03	1.3E-02	1.3E-02	0	0	0	6.7E-01	3.8E-04	1.6E-03	1.6E-03	0	0	0	8.5E-02
Recycled Asphalt Crusher	RAC	Volume	N	--	--	1	1.0E-01	1.0E-01	6.4E-01	0	0	0	0	1.3E-02	1.3E-02	8.1E-02	0	0	0	0
Storage Tanks[5]	TANK1	Point	N	--	--	--	0	0	0	0	0	0	6.3E-03	0	0	0	0	0	0	8.0E-04
	TANK2	Point	N	--	--	--	0	0	0	0	0	0	6.3E-03	0	0	0	0	0	0	8.0E-04
	TANK3	Point	N	--	--	--	0	0	0	0	0	0	6.3E-03	0	0	0	0	0	0	8.0E-04

TAP Modeling Emissions Rates

Source Category	SRCGRP	Source Type	Seasonal?[1]	Area	Length	# Volume	Benzene	Formaldehyde	Naphthalene	Benzene	Formaldehyde	Naphthalene
							lb/hr			g/s		
				m²			Annual	Annual	Annual	Annual	Annual	Annual
Asphalt Plant	APS	Point	Y	--	--	--	1.8E-02	1.4E-01	4.1E-03	2.3E-03	1.8E-02	5.2E-04
Asphalt Silo	SILO	Volume	Y	--	--	1	1.8E-04	3.9E-03	2.1E-04	2.3E-05	4.9E-04	2.7E-05
Asphalt Loadout	APLD	Volume	Y	--	--	1	1.0E-04	1.7E-04	2.0E-04	1.3E-05	2.1E-05	2.5E-05
Storage Tanks[5]	TANK1	Point	N	--	--	--	1.4E-05	2.3E-05	3.3E-04	1.7E-06	2.9E-06	4.1E-05
	TANK2	Point	N	--	--	--	1.4E-05	2.3E-05	3.3E-04	1.7E-06	2.9E-06	4.1E-05
	TANK3	Point	N	--	--	--	1.4E-05	2.3E-05	3.3E-04	1.7E-06	2.9E-06	4.1E-05

Notes

1. If the emissions rate of a given source varies by season, the maximum lb/hr emissions rate is used for the 24-hr and 1-hr averaging period.
2. Crushing plant emissions are divided evenly between the two modeled sources.
3. Off-road emissions are divided by the sum of the areas for the three modeled sources.
4. On-road emissions (for both exhaust and fugitive dust emissions) are split across the on-road source groups by the percent of volume length for each source group out of the total length across all on-road volume source groups. The g/s emissions rate is divided by the number of volumes in each source group.
5. Storage tank emissions are split evenly across the three modeled sources.

Abbreviations:

CO - carbon monoxide	NO_2 - nitrogen dioxide
g - gram	$PM_{2.5}$ - particulate matter less than 2.5 microns in diameter
hr - hour	PM_{10} - particulate matter less than 10 microns in diameter
lb - pound	SO_2 - sulfur dioxide
m^2 - meter squared	s - second

Table 25
Background Concentrations
Segale-Cumberland Mine
King County, Washington

Pollutant	Averaging Period	Background Concentration ug/m^3
$PM_{2.5}$	Annual	5
	24-hr	14.4
PM_{10}	24-hr	41
NO_2	Annual	10.5
	1-hr	58.4
CO	8-hr	813
	1-hr	1,236
SO_2	1-hr	13.1

Notes:

1. Background concentration data for criteria pollutants were obtained from the NW-AIRQUEST background design value tool for grid cells surrounding the project site, from 2014-2017. The highest background concentration for each pollutant and averaging period was selected.
2. CO, NO_2, and SO_2 concentrations provided in ppm and ppb were converted to ug/m^3 assuming a temperature of 25°C and pressure of 1 atm.

Abbreviations:

atm - atmospheres
°C - degrees Celsius
CO - carbon monoxide
hr - hour
NO_2 - nitrogen dioxide
$PM_{2.5}$ - particulate matter less than 2.5 microns in diameter
PM_{10} - particulate matter less than 10 microns in diameter
ppb - parts per billion
ppm - parts per million
SO_2 - sulfur dioxide
ug/m^3 - micrograms per meter cubed

References:

Washington State University. 2023. NW-AIRQUEST. Available at: https://lar.wsu.edu/nw-airquest/

Table 26
NAAQS/ASIL Modeling Results
Segale-Cumberland Mine
King County, Washington

Pollutant	Averaging Period	Background Concentration (ug/m^3)	Project Contribution (ug/m^3)	Rank of Reported Project Contribution[1]	Total Concentration (ug/m^3)	NAAQS/ASIL Threshold[2] (ug/m^3)	Pass?
$PM_{2.5}$	Annual	5.0	1.6	Maximum	6.6	12	YES
	24-hr	14	6.7	98th Percentile	21	35	YES
PM_{10}	24-hr	41	65	2nd High	106	150	YES
NO_2	Annual	11	5.4	Maximum	16	100	YES
	1-hr	58.4	128.3	98th Percentile	186.7	188	YES
CO	8-hr	813	236	2nd High	1,049	10,000	YES
	1-hr	1,236	1,018	2nd High	2,254	40,000	YES
SO_2	1-hr	13.1	12.9	99th Percentile	26	196	YES
Benzene	Annual	0	0.0034	Maximum	0.003	0.13	YES
Formaldehyde	Annual	0	0.026	Maximum	0.026	0.17	YES
Naphthalene	Annual	0	0.017	Maximum	0.017	0.029	YES

Notes:

1. The reported Project impacts are based on the form of NAAQS defined by EPA. The reported Project impacts for Project impacts is the maximum annual impact.
2. NAAQS thresholds are reported by the US EPA for $PM_{2.5}$, PM_{10}, NO_2, CO, and SO_2. ASIL thresholds are reported in WAC 173-460-150 for all TAPs (Benzene, Formaldehyde, and Naphthalene).

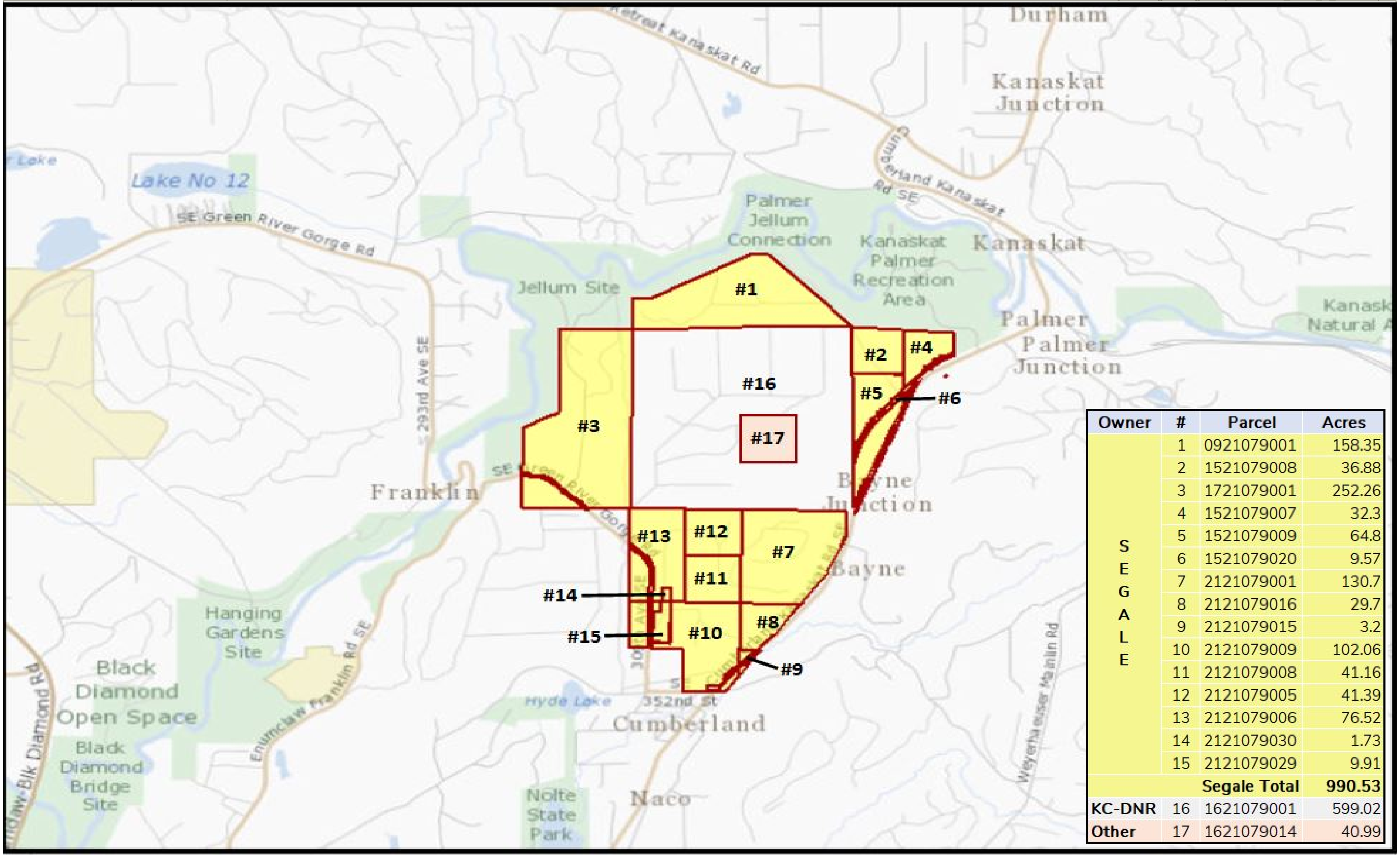
Abbreviations:

ASIL - acceptable source impact level
CO - carbon monoxide
hr - hour
NAAQS - National Ambient Air Quality Standards
NO_2 - nitrogen dioxide
$PM_{2.5}$ - particulate matter less than 2.5 microns in diameter
PM_{10} - particulate matter less than 10 microns in diameter
SO_2 - sulfur dioxide
TAP - toxic air pollutant
ug/m^3 - microgram per meter cubed

References:

USEPA. NAAQS Table. Available at: https://www.epa.gov/criteria-air-pollutants/naaqs-table
WAC Title 173 Chapter 460 Section 150. Table of ASIL, SQER and de minimis emissions values. Available at: https://apps.leg.wa.gov/wac/default.aspx?cite=173-460-150

FIGURES



Owner	#	Parcel	Acres
SEGALE	1	0921079001	158.35
	2	1521079008	36.88
	3	1721079001	252.26
	4	1521079007	32.3
	5	1521079009	64.8
	6	1521079020	9.57
	7	2121079001	130.7
	8	2121079016	29.7
	9	2121079015	3.2
	10	2121079009	102.06
	11	2121079008	41.16
	12	2121079005	41.39
	13	2121079006	76.52
	14	2121079030	1.73
	15	2121079029	9.91
		Segale Total	**990.53**
KC-DNR	16	1621079001	599.02
Other	17	1621079014	40.99

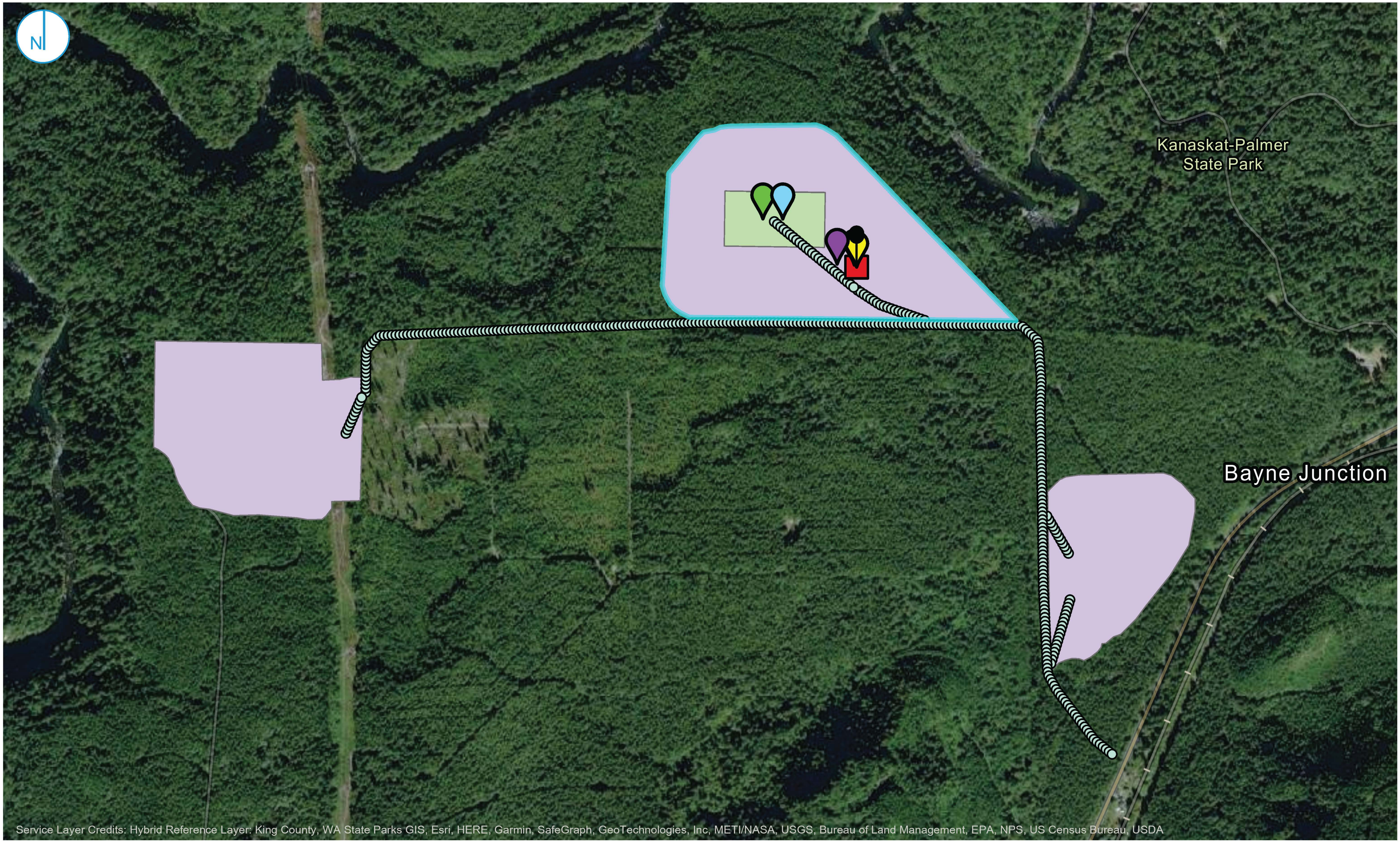
0 2,500 5,000 Feet

PROJECT SITE LOCATION

Segale-Cumberland Mine
King County, Washington

FIGURE 01

RAMBOLL US CONSULTING, INC.
A RAMBOLL COMPANY



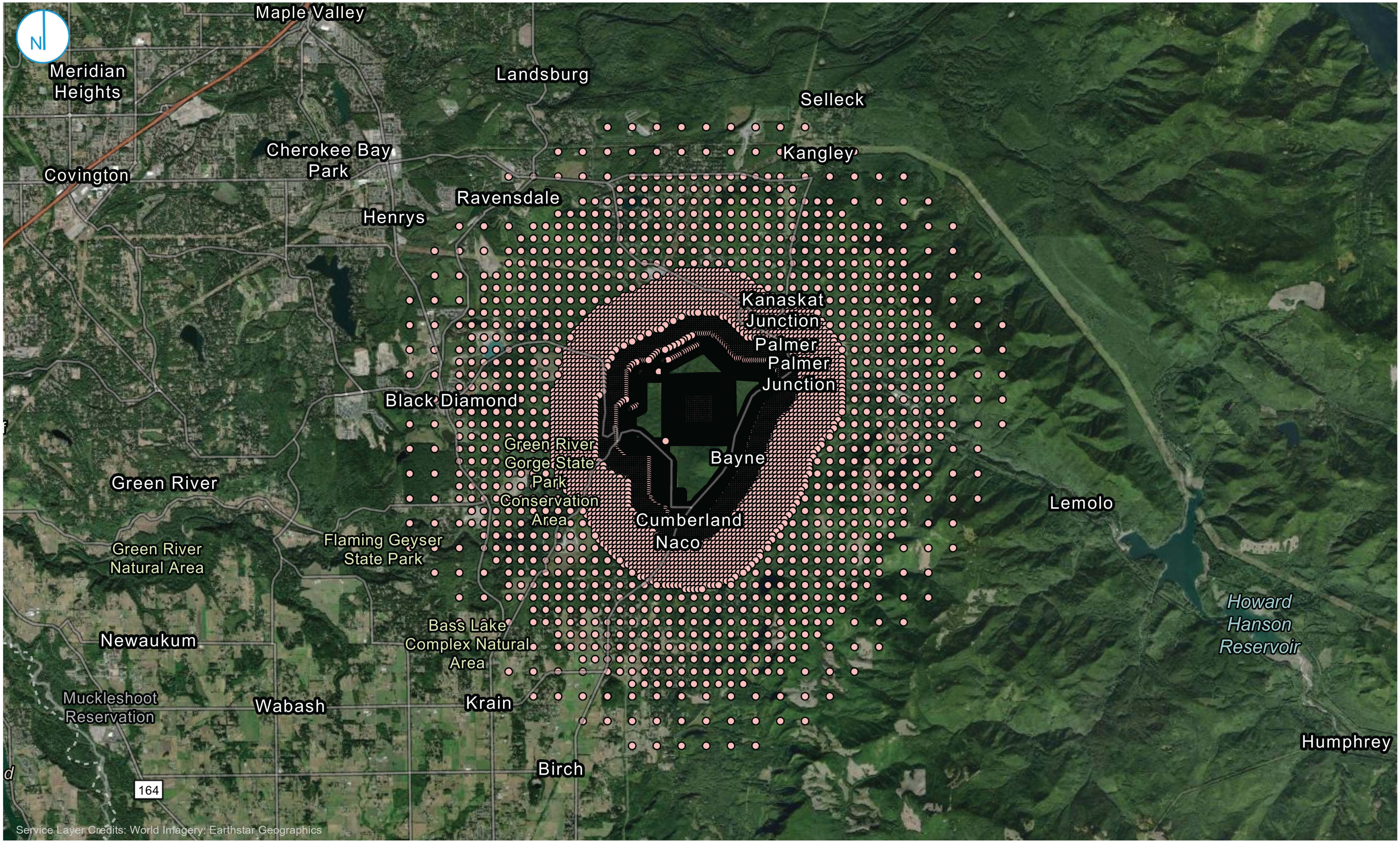
- Roadways
- Asphalt Loadout (APLD)
- Asphalt Plant (APS)
- Asphalt Silo (SILO)
- Crushing Plant (RCFP1)
- Crushing Plant (RCFP2)
- Recycled Asphalt Crusher (RAC)
- Off-Road Areas
- Stockpile (SA_M1)
- Tanks

MODELED SOURCES

Segale-Cumberland Mine
King County, Washington

FIGURE 02

RAMBOLL US CONSULTING, INC.
A RAMBOLL COMPANY



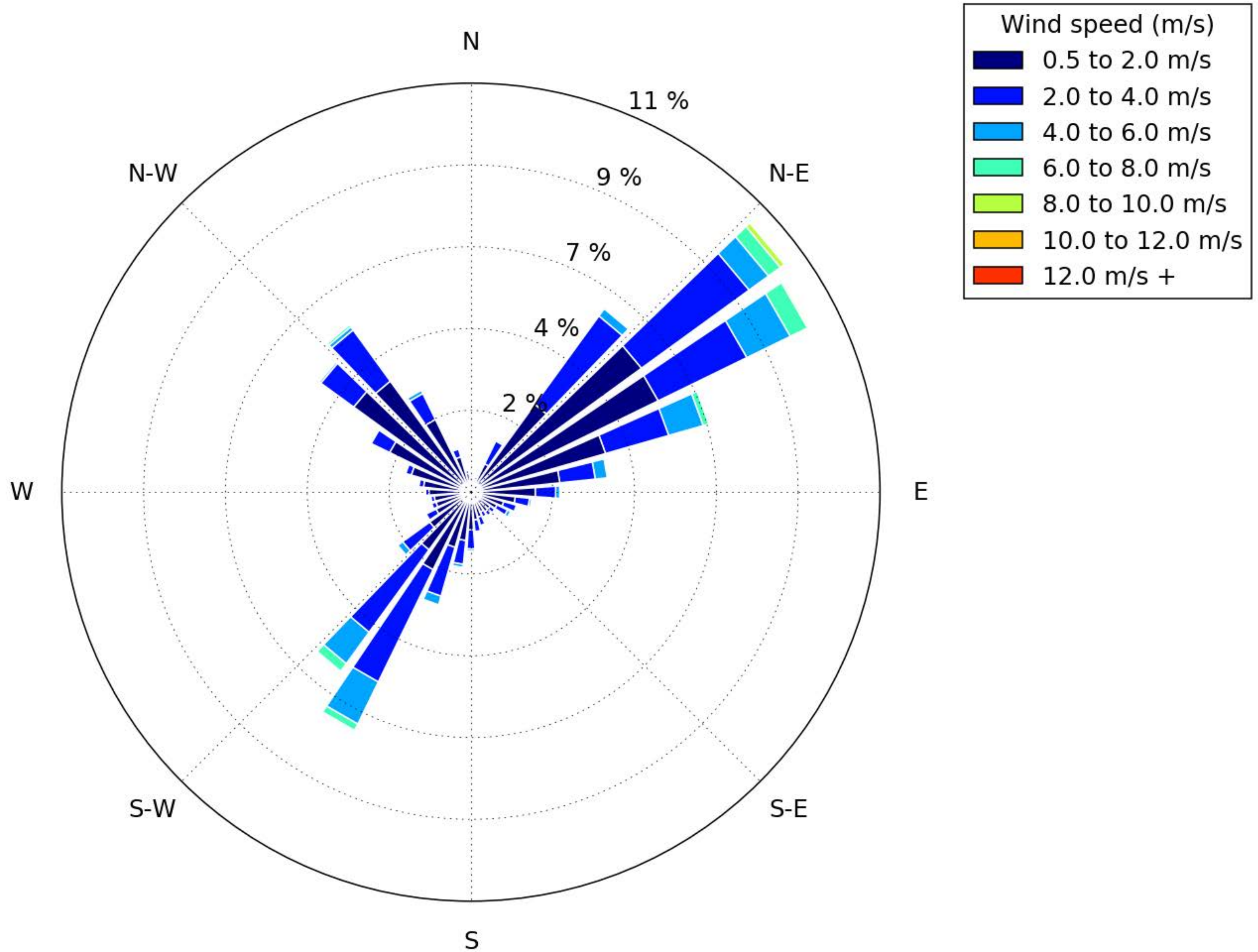
0 2,500 5,000
Feet

RECEPTOR GRID

Segale-Cumberland Mine
King County, Washington

FIGURE 03

RAMBOLL US CONSULTING, INC.
A RAMBOLL COMPANY



5-YEAR WINDROSE - MUD MOUNTAIN MONITORING STATION

Segale-Cumberland Mine
King County, Washington

FIGURE 04

RAMBOLL US CONSULTING, INC.
A RAMBOLL COMPANY