AIR DISPERSION MODELING ANALYSIS

Esmeralda 7 Project Programmatic Environmental Impact Statement/Resource Management Plan Amendment

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1. INTRODUCTION

1.1 Project Overview

The United States (US) Department of the Interior, Bureau of Land Management (BLM), Battle Mountain District Office is preparing a programmatic-level environmental impact statement (EIS) and resource management plan amendment (RMPA) to support the BLM's decision-making on the development of seven utility-scale photovoltaic (PV) solar facilities (Esmeralda 7) with battery energy storage systems (BESS) on BLM-administered lands in Esmeralda County, Nevada. The seven proposed facilities would be geographically contiguous and encompass approximately 62,300 acres of BLM-administered lands approximately 30 miles west of Tonopah, Nevada (**Figure 1-1**, Planning Area).

The EIS will analyze the potential impacts associated with the construction, operations and maintenance, and decommissioning of the seven utility-scale PV solar facilities with BESS proposed by US Solar Assets LLC, Nivloc Solar Energy LLC, CG Western Renewables III LLC, 335ES 8me LLC, 336SP 8me LLC, and Boulevard Associates LLC.

Because the proposed Facility is on public lands under BLM jurisdiction, the submittal of an Air Quality Impact Assessment (AQIA) is required as part of the EIS. This air quality modeling report documents the methodology used to prepare the air quality analyses. This report seeks to fully document and report the methods and techniques used to perform the modeling.

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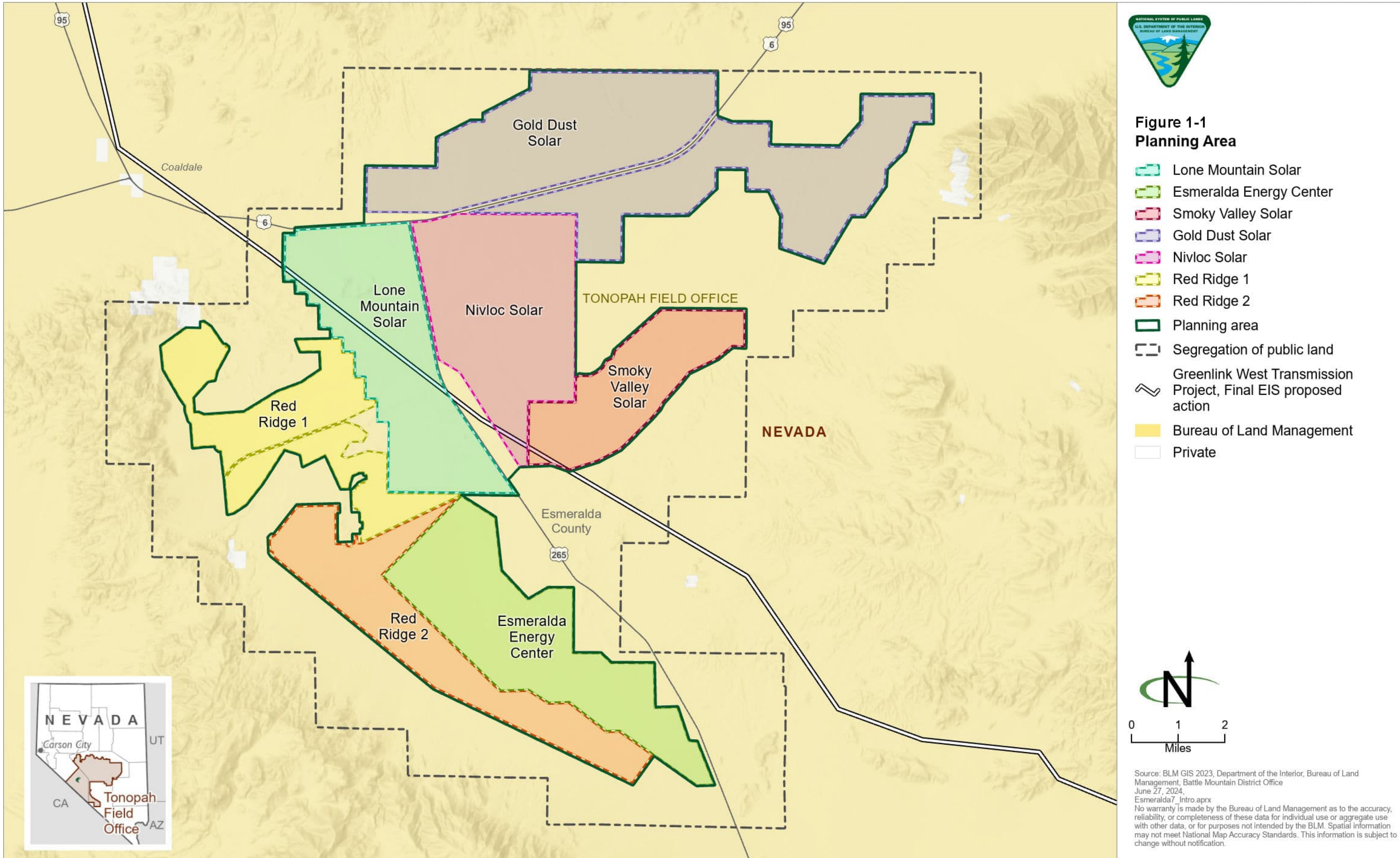

Figure 1-1
Planning Area
Lone Mountain Solar
Esmeralda Energy Center
Smoky Valley Solar
Gold Dust Solar
Nivloc Solar
Red Ridge 1
Red Ridge 2
Planning area
Segregation of public land
Greenlink West Transmission Project, Final EIS proposed action
Bureau of Land Management
Private
Gold Dust Solar
Coaldale
Lone Mountain Solar
Nivloc Solar
TONOPAH FIELD OFFICE
Smoky Valley Solar
Red Ridge 1
NEVADA
Esmeralda County
Red Ridge 2
Esmeralda Energy Center
95
6
265
NEVADA
Carson City
UT
CA
AZ
Tonopah Field Office
0
1
2
Miles
Source: BLM GIS 2023, Department of the Interior, Bureau of Land Management, Battle Mountain District Office
June 27, 2024,
Esmeralda7_Intro.aprx
No warranty is made by the Bureau of Land Management as to the accuracy, reliability, or completeness of these data for individual use or aggregate use with other data, or for purposes not intended by the BLM. Spatial information may not meet National Map Accuracy Standards. This information is subject to change without notification.

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2. PROJECT DESCRIPTION

2.1 Alternative A. Proposed Action Alternative

Under Alternative A, the Proposed Action, there would be the potential for up to 62,300 acres of solar development within the seven projects currently proposed within the planning area. The proposed projects include the development of PV solar facilities, including solar arrays, energy storage, roads, and electric generation intertie (gen-tie) lines, within the seven solar ROWs, as outlined in each project's plan of development (POD).

Table 2-1 provides a summary overview of each proposed project. Because the project designs vary and will be refined prior to individual decisions concerning project approval, the Proposed Action is based on standard PV facility designs, construction, O&M, and decommissioning. The description of standard methods is outlined in Appendix A, Reasonably Foreseeable Development Scenario, of the Supplemental Information Report.

Table 2-1. Summary of Each Project in the Planning Area

Applicant	Project	Description
US Solar Assets, LLC	Lone Mountain Solar	1-gigawatt (GW) PV and 500-megawatt (MW) battery storage system; 8,350 acres
Nivloc Solar Energy LLC	Nivloc Solar	500 MW PV and battery storage system; 8,280 acres
CG Western Renewables III LLC	Smoky Valley Solar	1 GW PV and battery storage system; 4,890 acres
335ES 8me LLC 335EP 8me LLC	Red Ridge 1 Solar Red Ridge 2 Solar	600 MW PV and battery storage system; 6,190 and 6,860 acres, respectively
Boulevard Associates, LLC	Esmeralda Energy Center	1 GW PV and battery storage system; 8,360 acres
Gold Dust Solar, LLC	Gold Dust Solar	1.5 GW PV and 1 GW battery storage system; 16,720 (acres after excluding overlapping highway corridors).

Sources: 335ES 8me LLC 2021; 336SP 8me LLC 2021; Boulevard Associates, LLC 2021; CG Western Renewables III LLC 2021; Gold Dust Solar, LLC 2021; Nivloc Solar Energy LLC 2021; US Solar Assets 2021. Additional/updated estimates were submitted to the BLM by project applicants in July 2023.

Source for project area/ROW acres: BLM GIS 2023

Note: Some of the ROW acres were adjusted to deduct areas that overlap the Greenlink West corridor.

Construction of the facilities would include site preparation and stabilization, temporary use areas, gravel and aggregate materials, water sources and storage, dust and stormwater control, and reclamation in temporary disturbance areas.

The timelines for construction would vary by project with estimates of 18 to 36 months. The timing of project approvals and availability of construction contractors and workforce would also differ by project. It is assumed that full buildout of all projects could be completed within 5 years from the Record of Decision (ROD) for the EIS/RMPA. Based on the 5-year buildout, 845 workforce personnel could be anticipated within the planning area at any given time.

2.2 Alternative B. Soils and Vegetation Conservation Alternative

This alternative would be the same as the Proposed Action, but there would be no amendment to the Tonopah RMP to change the slope requirement for the planning area to a maximum of 10 percent. Development on slopes greater than 5 percent would be based on the additional slope criteria outlined in the Solar RMPA (BLM 2012; see below). In addition, applicants would limit traditional construction grading methods, which remove all vegetation and compact the soil, to a maximum of 35 percent of the proposed development area. Applicants would use mowing in the rest of the development area to leave vegetation intact. In mowed areas, vegetation would be mowed to a height of 24 inches (61 centimeters) but no less than 18 inches (46 centimeters), where justified.

According to the 2012 Solar RMPA, applications may include some lands with up to 10 percent slope where higher slope inclusions meet all of the following: (1) they are proximate to variance lands in the application, (2) they are not otherwise excluded from development, (3) they allow for the avoidance or minimization of resource conflicts, and (4) they do not create any significant new or additional conflicts. In such cases, a land use plan amendment would not have to be adopted as part of the project-specific analysis to permit the slope exception.

2.3 Alternative C. No Action Alternative

Under Alternative C, the No Action Alternative, the BLM would not amend its RMP. In addition, future development could be constrained by the existing VRM classifications or slope requirements.

2.4 Impacts

As discussed in the Final PEIS for Solar Energy Development in Six Southwestern States (BLM and DOE 2012), potential impacts on ambient air quality associated with a solar project would be of most concern during the construction phase, which will be completed within 5 years for the Proposed Action. During construction, fugitive dust from soil disturbances and engine exhaust from heavy equipment and commuter/delivery/support vehicular traffic within and around the facility would contribute to air emissions of criteria pollutants, volatile organic compounds, greenhouse gases, and a small amount of hazardous air pollutants. Typically, potential impacts of fugitive dust emissions on ambient air quality would be higher than those of engine exhaust emissions.

During the operations phase, only a few sources with generally low-level emissions would exist. A solar facility would either not burn fossil fuels or burn only small amounts during operation. Conversely, solar facilities would displace air emissions that would otherwise be released from fossil fuel power plants. Emissions from the solar facility operations would include fugitive dust and engine exhaust emissions from vehicles and heavy equipment associated with regular site inspections, infrequent maintenance activities, and wind erosion from bare grounds and access roads (BLM and DOE 2012). Emissions would also be dependent on the solar technology used and may include criteria pollutants and hazardous air pollutants from small boilers, space heating boilers, emergency power generators (typically only operating a few hours a month), and emergency fire water pumps.

As discussed in the Solar PEIS (DOE and BLM 2012), decommissioning/reclamation activities are similar to construction activities but are on a more limited scale and of shorter duration. Additionally, air quality impacts will be minimized due to less fleet turnover, increases in efficiency, and likely use of alternative fuels during decommissioning. Potential impacts on ambient air quality would be correspondingly less than those from construction activities. Decommissioning activities would last for a short period, and their potential impacts would be moderate and temporary.

For construction, operation, and decommissioning, impacts would be minimized through the implementation of programmatic design features.

Consistent with the methodologies proposed in the PEIS, air dispersion modeling was only conducted for the construction phase of the project. In order to evaluate worst-case emissions impacts, the modeling assumed construction of all seven projects simultaneously.

2.5 Potential To Emit

A summary of the project Potential-To-Emit (PTE) emissions for each site at the Facility is shown in **Table 2-2**. Detailed emissions calculations are included in **Appendix A**.

Table 2-2. Annual Criteria Pollutant PTE Emissions Summary (tpy) - Entire Project

Site	PM_{10}	$PM_{2.5}$	SO_2	CO	NO_x	VOC
Lone Mountain Solar	2913	292	9.88	80.76	6.47	15.08
Smoky Valley Solar	1737	174	15.17	81.06	8.36	20.44
Gold Dust Solar	5656	566	22.77	138.92	13.18	31.77
Nivloc Solar	2507	251	7.59	45.73	4.37	10.55
Esmeralda Energy Center	2922	292	7.60	57.86	4.82	11.33
Red Ridge 1 Solar	2168	217	9.15	105.48	7.12	15.89
Red Ridge 2 Solar	2332	234	9.15	105.48	7.12	15.89
Total	**20235**	**2027**	**81.31**	**615.28**	**51.44**	**120.94**

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3. MODELING DESCRIPTION

This air dispersion modeling analysis was conducted to compare dispersion modeling results with background concentrations to the National Ambient Air Quality Standards (NAAQS) and Nevada Ambient Air Quality Standards (NVAAQS) for all relevant pollutants and averaging periods. The air dispersion modeling methods applied were based on the work plan provided to BLM on August 23, 2023, and approved via email from Frank Giles, Air Resource Specialist, California and Nevada, BLM, on August 23, 2023.

3.1 Facility Location

The proposed Esmeralda 7 project will be located in Esmeralda County, Nevada. The North American Datum (NAD83) Zone 11 Universal Trans Mercator (UTM) coordinates for the facility are as follows:

- 435,748.23 m Easting
- 4,201,716.99 m Northing

3.2 Dispersion Model

The modeling was completed using the United States Environmental Protection Agency (U.S. EPA)-approved American Meteorological Society (AMS)/U.S. EPA Regulatory Model (AERMOD) Version 22112[1], using elevated terrain, the PRIME building downwash algorithms, and U.S. EPA regulatory defaults.

3.3 Air Pollutants Modeled

3.3.1 Significance Impact Analysis

Based on the emissions estimates developed for the project, and anticipated ambient impacts, a significance analysis was not conducted for the project.

3.3.2 Ambient Impact Analysis

The ambient impacts modeling included ambient air concentrations of criteria air pollutants, including particulate matter less than 10 microns in aerodynamic diameter (PM_{10}), particulate matter less than 2.5 microns in aerodynamic diameter ($PM_{2.5}$), nitrogen oxides (NO_x), sulfur dioxide (SO_2), and carbon monoxide (CO) emitted from the facilities' anticipated emissions sources. The emissions of the regulated air pollutants were modeled to determine ambient air concentrations for the following regulatory averaging periods for the NAAQS, consistent with 40 CFR Part 50:

- 24-hour for PM_{10};
- 24-hour and annual for $PM_{2.5}$;
- 1-hour and annual for Nitrogen Dioxide (NO_2);
- 1-hour and 3-hour for SO_2; and
- 1-hour and 8-hour for CO.

[1] EPA released an updated version of AERMOD (version 23132) in October 2023. EPA updated the AERMET meteorological processor and AERMOD dispersion model on October 23, 2023 to Version 23132. The updates to AERMET were focused on overwater applications. The updates to AERMOD were various bug fixes, enhancements, and updates to alpha and beta options that were not used in this application. Therefore, these updates are not expected to have an affect on the modeling done using Version 22112 of these programs.

Because the NVAAQS differ from the NAAQS, the following regulatory averaging periods and pollutants were be modeled for the NVAAQS consistent with NAC 445B.22097:

- 24-hour for PM_{10};
- 24-hour and annual for $PM_{2.5}$;
- 1-hour and annual for NO_2;
- 1-hour, 3-hour, 24-hour, and annual for SO_2; and
- 1-hour and 8-hour for CO.

3.4 Building Downwash

The Esmeralda 7 project does not include any buildings located proximate to any point sources, therefore building downwash effects were not considered.

3.5 Meteorological Data

Meteorological data used in the dispersion modeling analysis was processed and provided by the Nevada Department of Environmental Protection (NDEP). Data was processed by NDEP using the meteorological preprocessor AERMET Version 22112. The data consists of one year (April 1, 2014 – March 31, 2015) of National Weather Service (NWS) surface data collected at the Tonopah Airport approximately 36 miles east of the Facility. Concurrent upper air observations used in AERMET were obtained from the Tonopah Airport in Nevada. The use of the station's meteorological data for modeling the Facility's air pollutant emissions is justified because it is in close proximity to the Facility and provides representative compatibility with terrain orientation.

3.6 Terrain Data

Elevations for all modeled receptors were electronically generated through the AERMOD terrain processor, AERMAP Version 22112, and the applicable United States Geological Survey (USGS) 1/3 arc second resolution National Elevation Dataset (NED). AERMAP determines the elevation of each receptor by interpolation. All source release heights are referenced to ground surface elevations.

In addition to terrain elevation, an additional parameter called the hill height scale is required for each receptor to execute AERMOD's terrain modeling algorithms. The 1/3 arc second NED extending out 50 kilometers from Facility sources was used for calculating the hill height scales. Because the receptor domain only extends 10 kilometers from the boundary, the 50-kilometer NED extent is more than necessary to capture the 10% slope from each and every receptor in the modeling domain. AERMOD computes the impact at a receptor as a weighted interpolation between horizontal and terrain-following states using a critical dividing streamline approach. This scheme assumes that part of the plume mass will have enough energy to ascend and traverse over a terrain feature and the remainder will impinge and traverse around a terrain feature under certain meteorological conditions. The hill height scale is computed by the AERMAP terrain preprocessor for each receptor as a measure of the one terrain feature in the modeling domain that would have the greatest effect on plume behavior at that receptor.

3.7 Project Datum

The project datum was set in NAD83, Zone 11 UTM coordinates. All emission sources, receptors, the fenceline, and elevation references are in NAD83, Zone 11 UTM coordinates.

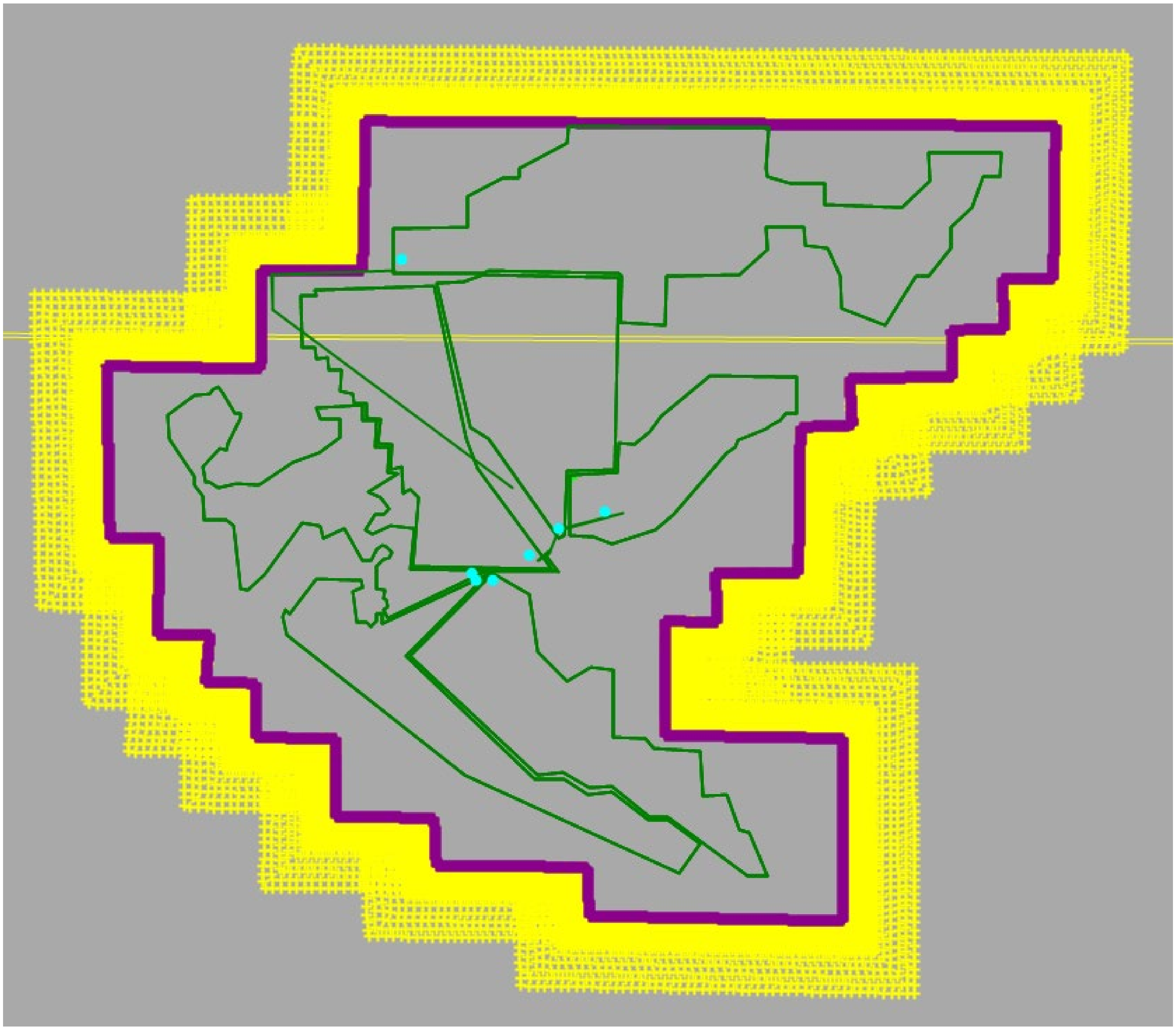
3.8 Receptor Grid and Facility Boundary

For the purposes of establishing a facility boundary, consideration of adequate barriers to public access included the installation of fencing, construction of safety berms, and inclusion of natural terrain features that restrict public access. The boundary is based on the entire boundary of the seven sites of the facility and the segregation of public land from the project area. **Figure 3-1** shows the contiguous boundary of all seven facilities. The planning areas of the seven projects collectively comprise the planning area for the EIS; this collected area boundary is what is considered the Facility boundary. The following tiered Cartesian receptor array will be used for analysis:

- "Boundary" receptors spaced at approximately 25-meter intervals along the boundary of the Facility;
- Cartesian grid receptors, spaced at 50-meter intervals, out to a distance of at least 500 meters from the boundary;
- Cartesian grid receptors, spaced at 100-meter intervals, out to a distance of at least 1,000 meters from the boundary;
- Cartesian grid receptors, spaced at 250-meter intervals, out to a distance of at least 2,250 meters from the boundary; and
- Receptors will not be generated within the Facility boundary.

The boundary receptors and full receptor grid are shown in **Figure 3-1**, with boundary receptors in purple and gridded discrete receptors in yellow.

Figure 3-1. Model Receptors – Full View



3.9 Operating Scenarios

Air dispersion modeling was only conducted for the construction phase of the project. To evaluate worst-case emissions impacts, the modeling assumes construction of all seven projects simultaneously occurring over the shortest anticipated construction period of 5 years.

Hourly, daily, and annual emissions of pollutants were calculated using emission unit process rates, emission factors, engineering estimates, and pollution control efficiencies (if applicable). The following sections contain a detailed description of the methodology used to calculate emissions for Esmeralda 7. Each section contains the emission units pertaining to a general activity at the Facility. The calculation of process rates, determination of emissions information, and application of control efficiencies are discussed for each emission unit.

The emissions associated with each general activity were calculated for each of the seven sites (Lone Mountain, Smoky Valley, Gold Dust, Nivloc, Esmeralda Energy Center, Red (Rhyolite) Ridge #1, and Red (Rhyolite) Ridge #2) at Esmeralda 7. If site-specific information was available for a specific emission source, then each site's emissions for that source were calculated using known information. Site-specific information was only available for the Gold Dust site. The emissions for each other site were determined by scaling from the Gold Dust data using a photovoltaic (PV) ratio developed for each site based on the power capacity built at each site. The scaling methodology and site-specific data were used to confirm that the inventories were consistently calculated across all seven sites. In each section, the methodology of scaling or using site-specific data was specified for each emission source.

A detailed emissions inventory is included in **Appendix A**.

3.9.1 Unpaved Roads

When a vehicle travels over an unpaved road, the force of the wheels on the road surface causes pulverization of surface material. Particles are lifted and dropped from the rolling wheels, and the road surface is exposed to strong air currents in turbulent shear with the surface. The turbulent wake behind the vehicle continues to act on the road surface after the vehicle has passed.

The fugitive dust from vehicle traffic on the unpaved roads of each site at Esmeralda 7 were calculated using the PV ratio scaling factor. The types of vehicles travelling on the unpaved roads include forklifts, trucks, scrapers, front loaders, excavators, and more. The vehicle miles traveled by each vehicle for site preparation, fence installation, PV installation, and operation were provided for Gold Dust and then scaled for each site using the PV ratio. The weight of the vehicles is based on the approximate tonnage of each type of vehicle determined from an internet-based search of publicly available information, as manufacturer specifications were not provided or available. The emission factors for vehicular traffic on unpaved roads are from U.S. EPA AP-42, Section 13.2.2 (Unpaved Roads), November 2006. A control efficiency of 75% was applied to the calculated emissions to account for the use of road base materials, watering of the roads and reduced vehicle speeds on unpaved surfaces.[2] For hours of operation, the site staff provided exact hours of operation for all vehicles and equipment for the Gold Dust facility in hours per day. Annual hours of operation were then determined by multiplying by 365 days per year. Uncontrolled PM, PM_{10} and $PM_{2.5}$ emission factors were calculated using the following equation from AP-42, Section 13.2.2 (November 2006):

$$EF = k\left(\frac{s}{12}\right)^a \left(\frac{W}{3}\right)^b \left(\frac{365-p}{365}\right)$$

Where:

E = size-specific emission factor (lb per VMT)
k = particle size multiplier, per AP-42 Table 13.2.2-2 (November, 2006)
S = surface material silt content (%), WRAP Fugitive Dust Handbook (September, 2006)[3]
W = mean vehicle weight (tons)

[2] Per AP-42 Section 13.2.2, Figure 13.2.2-2 for a moisture ratio of 2. The 75% control efficiency is also consistent with the control efficiency associated with basic watering and road base provided in Emission Factors for Paved and Unpaved Haul Roads, January 12, 2015 memorandum from Regg Olsen, Permitting Branch Manager Utah Department of Environmental Quality, Division of Air Quality (DAQ) to Utah DAQ Permitting Branch. A 75% control efficiency was also used for the Gemini Solar Project as documented in the Air Quality and Climate Change Technical Report, Gemini Solar Project N-84631, Clark County, Nevada (RCH Group, 2019).

[3] WRAP Fugitive Dust Handbook. September 7, 2006. Table 6-2 Typical Silt Content Values of Surface Material on Public Unpaved Roads, Publicly accessible roads, Grave/crushed limestone.

a, b = constant, per AP-42 Table 13.2.2-2 (November, 2006)
p = days per year with > 0.01 in precipitation, per AP-42 Figure 13.2.2-1 (November, 2006)

3.9.2 Fugitive Dust from Construction Activities

Fugitive dust emissions from site preparation, grading equipment passes, soil movement, unloading/loading of materials, and other construction-related activities is based on site-specific data related to permanent and temporary disturbances of the land for each site. The land disturbance area for each site was provided by site staff.

The Midwest Research Institute (MRI) includes an emission factor for worst-case conditions of 0.42-ton PM_{10} per acre-month.[4] This emission factor is appropriate for large-scale construction operations, which involve substantial earthmoving operations without control measures. For an average-case scenario, an emission factor of 0.11 tons per acre-month was used, which assumes a dust control effectiveness of watering, reducing speed on unpaved surfaces, and other measures. The $PM_{2.5}$ emission factor assumed for construction activities will be 10% of the PM_{10} emission factor based on the MRI reference. The bulk of the operations that will take place are site preparation-related activities. Using these emission factors, the average-case and worst-case scenario emissions from fugitive dust from construction activities were calculated. The average-case scenario was used in air dispersion modeling because this scenario is most representative of the likely impacts of construction activities on the surrounding area given the already conservative assumption that all seven of the projects will be constructed concurrently and the additional assumptions documented in Section 3.4 of the Air Quality and Climate Change Supplemental Environmental Report (BLM 2024). Hours of operation were not needed to calculate these emissions because the emission factors were given on a per month basis.

3.9.3 Off-Road Equipment

Construction of the Project would require the use of heavy-duty equipment, such as excavators, loaders, forklifts, and off-road haul trucks. Emission factors for Tier 4 engines were used from "Nonroad Compression-Ignition Engines: Exhaust Emission Standards" released by the U.S. EPA for Tier 4 Final engines. Emission factors for HAPs were taken from AP-42 Section 3.2 for Diesel Engines, AP-42 Section 3.3 Table 3.3-2: Speciated Organic Compound Emissions Factors for Uncontrolled Diesel Engines, and 40 CFR Part 98, Subpart C, Table C-1 and C-2 for Distillate Fuel Oil No. 2. The emissions are calculated using Gold Dust for engine power ratings, fuel types, hours of operation, and vehicle miles travels, and then scaling the emissions using the PV ratio for each site. For hours of operation, the site staff provided exact hours of operation for all vehicles and equipment for the Gold Dust facility in hours per day. The hours of operations for the other six sites were scaled by the PV ratio from the Gold Dust data. Annual hours of operation were then determined by multiplying by 365 days per year.

3.9.4 On-Road Vehicles: Construction Vehicles

On-road vehicle emissions from construction vehicles are based on information provided on the Gold Dust site and scaled for each site using the PV ratio. Emission factors for on-road vehicles includi9ng trucks buses, ambulances and more were calculated in MOVES within Esmeralda County in 2029 using MOVES3.0.3 model. The estimates of on-site on-road equipment for the substation construction, gen-tie construction, and site preparation for Gold Dust were provided by site staff. The MOVES source type, fuel type, equivalent full-load operating time, and vehicle miles traveled per day were provided for each truck and construction

[4] MRI. (1974, November). Emission Inventory of Agricultural Tilling, Unpaved Roads and Airstrips and Construction Sites. https://nepis.epa.gov/Exe/ZyPURL.cgi?Dockey=2000Z8L8.TXT

vehicle for Gold Dust. Then, the emissions for the other six sites were calculated using the PV ratio to scale the emissions from the Gold Dust site. For hours of operation, the site staff provided exact hours of operation for all vehicles and equipment for the Gold Dust facility in hours per day. The hours of operations for the other six sites were scaled by the PV ratio from the Gold Dust data. Annual hours of operation were then determined by multiplying by 365 days per year.

3.9.5 On-Road Vehicles: Employee Commuting

On-road vehicle emissions from employee commuting are based on site-specific information about the number of employees. On-road vehicle emissions from employees were computed using the U.S. EPA's emission factor model, MOVES, to estimate on-road emissions. Employee trips were modeled using the light-duty auto classification. Paved road dust, break wear, and tire wear particulate emissions were also accounted for and included in the analysis using MOVES emission factors and methodologies from the U.S. EPA. Vehicle use for employee commuting is assumed to be 50% passenger car and 50% passenger truck. Peak hourly trips represent the maximum number of daily worker trips during peak travel. The percentage of daily traffic that occurs during the peak hour is determined using data from the US Federal Highway Administration's "Traffic Monitoring Guide" below. Average and peak mileage represent round-trip travel. These values are based on the vehicle usage assumptions in the "Gemini Solar Project Air Quality and Climate Change Technical Report" (December 2019), Section 2.5. Hours of operation were not needed to calculate these emissions because the emission factors were given on an annual basis. Daily and hourly emissions were then calculated on a 365-day basis and a 24-hour basis, respectively.

3.10 Source Characterization

A general description of how each source type was assessed is presented below.

3.10.1 Point Sources

The emergency generators associated with each site were modeled as point sources in the model for the Facility. Each of the seven sites had an emergency generator, and the location of the generator was approximated based on gen-tie line maps. The release height, temperature, exit velocity, and diameter of the emergency generators were all assumed to be 20 feet, 900 °F, 50 meters per second, and 12 inches, respectively. These parameter assumptions are based on standard parameters for diesel generators.

3.10.2 Area Sources

Four different emission sources are modeled as area sources in the Facility model. The fugitive dust related to construction activities was assumed to be the area of the site associated with it. The release height is assumed to be zero for fugitive dust from construction since emissions are generated at or near the land surface. The fugitive dust and combustion emissions associated with off-road construction equipment were allocated to the same area as fugitive dust emissions. The release height for these combustion emissions was assumed to be 10 meters. Lastly, the off-road equipment vehicle fugitive dust and combustion emissions associated with construction of the gen-tie line was approximated across the area where the gen-tie line was being installed for each site. A release height of 10 meters was also assumed for these emission sources as well.

3.10.3 Volume Sources

Emissions associated with vehicles travelling on roads of each site were modeled as volume sources using the Facility site maps provided by the project proponents. The width of the road was assumed to be 25 feet. The truck height was assumed to be 4.3 meters. These values were used to calculate the distance between volume sources, volume height, release height, initial lateral dimension, and initial vertical dimension based on the 2012 EPA Haul Road Workgroup Final Report.

3.11 Background Concentrations

Pursuant to NDEP guidance, background concentrations are considered negligible for gaseous pollutants and were therefore not included for NO_2, SO_2, or CO modeling for comparison against the NVAAQS. Background concentration data was included for gaseous pollutants for comparison against the NAAQS. The modeling for PM_{10} and $PM_{2.5}$ included regional background concentrations to determine compliance with the PM_{10} and $PM_{2.5}$ NVAAQS and NAAQS. Background concentrations for the following pollutants and averaging periods were added to the modeled concentration for the following averaging periods:[5]

- 10.2 micrograms (µg) per m^3 for 24-hour PM_{10};
- 7.0 µg/m^3 for 24-hour $PM_{2.5}$; and
- 2.3 µg/m^3 for Annual $PM_{2.5}$.

Appendix W of 40 CFR Part 50 contains requirements for obtaining representative background concentrations. Specifically, "air quality data should be used to establish background concentrations in the vicinity of the source(s) under consideration". Based on this, the NO_2 background concentrations were determined from the 3 most recent years of complete data (2020 - 2022) collected at the Trona monitor in Searles Valley, 160 miles from the Facility. This monitor is representative of the actual background concentration at the Facility due to its proximity to the site along with its similar climatology and elevation. A summary of the monitor's 1-hour and annual NO_2 background data is contained **Table 3-1**.The CO and SO_2 background concentrations were determined based on complete data from 2020 - 2022 collected at White Mountain Research Center at Owens Valley Lab, approximately 53 miles from the Facility. This monitor is the closest in proximity to the site that detects active CO and SO_2. Additionally, the monitor has a similar climatology and elevation to the Facility, a summary of the CO and SO_2 background concentration data may be found in **Table 3-2**. All background data was obtained from EPA's AirData Software for all pollutants.[6]

The design values of each pollutant are shown in **Table 3-1** and **Table 3-2** below.

[5] Scott Speckart, Nevada Division of Environmental Protection, Bureau of Air Quality Planning Staff Engineer, e-mail to Shannon Manoulian, Trinity Consultants, on August 15, 2023, regarding particulate matter background concentrations in the planning area.

[6] Interactive Map of Air Quality Monitors | US EPA

Table 3-1. Representative NO_2 Background Concentrations

Pollutant	Averaging Period	Site Name	Distance to Facility (miles)	Year	Concentration Format	Concentration [a] (ppb)	
						Actual	Design Value
NO_2	Annual	Trona-Athol, Searles Valley	160	2020	Arithmetic Mean	3.3	3.4
				2021		3.2	
				2022		3.6	
	1-hr			2020	98th Percentile	32.1	34.5
				2021		37.7	
				2022		33.7	

a. Background concentrations obtained from EPA's AirData Air Quality Monitors.

Table 3-2. Representative CO and SO2 Background Concentrations

Pollutant	Averaging Period	Site Name	Distance to Facility (miles)	Year	Concentration Format	Concentration [a] (ppm CO/ppb SO_2)	
						Reading	Design Value
CO	8-hr	White Mountain Research Center - Owens Valley Lab	53	2020	2nd High Value	1.7	1.7
				2021		0.8	
				2022		0.3	
	1-hr			2020	2nd High Value	2.2	2.2
				2021		0.9	
				2022		0.4	
SO_2	1-hr			2020	Average of 99th percentiles	0.6	0.5
				2021		0.5	
				2022		0.5	

a. Background concentrations obtained from EPA's AirData Air Quality Monitors.

As a conservative estimate, the SO_2 1-hr background concentration data was used for comparison against the 3-hr, 24-hr, and Annual averages as well.

3.12 NO_x Modeling Considerations

The majority of the oxides of nitrogen (NO_X) emissions from air emission sources are in the form of nitric oxide (NO), whereas EPA has established a NAAQS for nitrogen dioxide (NO_2). EPA's "Guideline on Air Quality Models" describes a three-tiered screening approach to calculating NO_2 concentrations based on dispersion model predictions of NO_X concentrations.

The three tiers, arranged in order from simplest to most refined, are:

- Tier 1 – Assume full conversion of NO to NO_2, so that the NO_x predicted by AERMOD is 100% NO_2
- Tier 2 – Ambient Ratio Method (ARM), where model predicted NO_X concentrations are multiplied by a NO_2/NO_X ambient ratio, derived from ambient monitoring data.
- Tier 3 – More detailed methods that account for the plume dispersion and chemistry may be considered on a case-by-case basis, including the Ozone Limiting Method (OLM) and the Plume Volume Molar Ratio Method (PVMRM).

The Facility was modeled using the Tier 2 methodology. For the modeling of the Facility, the regulatory update to the ARM methodology (ARM2) was used for the assessment of 1-hr and annual NO_2 impacts. All regulatory defaults were maintained when utilizing the ARM2 methodology in this assessment.

3.13 Effects of Nearby Facilities

BLM was consulted to determine information on other activities within the cumulative assessment boundary for the air resources (50 km/31 miles) out from the planning area. BLM's review focused on commercial mining with plans of operation greater than 5 acres disturbance and large-scale utility projects such as Greenlink West and Western Bounty. Given that specific information on the activities included in BLM's review is limited, the cumulative analysis focused on the types of actions and overall acres of disturbance. These sources were screened based on a Q/d technique to identify sources that could be excluded from the analysis because they do not impact receptors in the project area. The Q/d analysis is further described below.

3.14 Regional Source Inventory

For any off-site impact calculated in the Significance Analysis that is greater than the SIL for a given pollutant, a NAAQS and/or Increment analysis incorporating nearby sources is required. The initial off-site inventory radius will be the radius of the pollutant-specific largest significant impact area (SIA) to a maximum distance of 50 km from the facility.[7] Under EPA's guidance in Section IV.C.1 of the draft *New Source Review Manual* applicable to "deterministic" NAAQS, all sources within the SIA no matter how small or distant would be included in the regional inventory, and the remaining sources outside of the SIA but within 50 km would be assumed to potentially contribute to ground-level concentrations within the SIA and would be evaluated for possible inclusion in the NAAQS analysis.[8] For purposes of this evaluation, off-site inventory data was obtained from the following sources:

- EPA's 2020 National Emissions Inventory (NEI) data [9]
- NDEP's GIS map [10]
- NDEP Public Document Search [11]

Sources from the raw inventories were initially screened in the three neighboring counties (i.e., Esmeralda, Mineral and Nye counties) and facilities falling outside the 50 km radius were removed from the analysis. The remaining sources within the initial 50 km screening distance were then screened based on an emission (Q) over distance (d) screening technique such as the "20D" procedure to identify small and distant sources that could be excluded from the NAAQS analysis because they are not anticipated to impact receptors in the SIA.[12] Using the "20D" screening procedure, sources were excluded from the inventories for the short- and

[7] Pursuant to 40 CFR Part 51, Appendix W the maximum domian of the AERMOD model is 50 km. Therefore, any sources outside a 50 km circle from the facility would be outside the maximum domain noted in 40 CFR Part 51.

[8] EPA, *New Source Review Workshop Manual*, Draft October 1990.

[9] EPA, 2020 NEI data, availabe at: https://www.epa.gov/air-emissions-inventories/2020-national-emissions-inventory-nei-data

[10] NDEP GIS map, available at: https://webgis.ndep.nv.gov/Html5Viewer/index.html?viewer=eMap.eMap_HTML

[11] NDEP Public Document Search, available at: https://ecms.nv.gov/ndep/

[12] 57 FR 8079, March 6, 1992.

long-term averaging periods if the entire facility's emissions (tpy) are less than 20 times the distance (km) from the facility. **Table 3-3** below summarizes the Q/d analysis for facilities within 50 km.

Table 3-3. Esmeralda Regional Inventory

Facility Name	Emissions Q^a (tons)	Distance from project, d (km)	Q/d	Q/d < 20?
Argentum Mine [b]	124.2	28.9	4.30	Yes
Silver Peak Operations [b]	56.7	24.7	2.30	Yes
Grefco Minerals, Inc. [b]	115	39.3	2.91	Yes
Mineral Ridge Mine [b]	117	18.8	6.19	Yes
Circle L Ranch Airport [c]	1.23	41.2	0.03	Yes
Dyer Airport [c]	1.57	45.9	0.03	Yes
Goldfield Bonanza [b]	3.61	52.0	0.07	Yes
Heart of Nature [b]	16.5	8.00	2.07	Yes
Gemfield Mine Site [b]	148.8	49.3	3.02	Yes
Crow Springs Project [b]	24.9	33.6	0.74	Yes
Rhyolite Ridge Lithium -Boron Quarry [b]	301.3	20.3	14.9	Yes
Three Hills Mine Project [b]	12.1	41.8	0.29	Yes

[a] Q should be the sum of emissions of NOx, CO, filterable PM_{10}, filterable $PM_{2.5}$, condensable PM and SO_2. Conservatively, Q is the sum of emissions of NOx, CO, PM_{10}, $PM_{2.5}$, and SO_2.

[b] For these facilities, Q emissions represent facility-wide potential emissions from NDEP's database.

[c] For these facilities, Q emissions represent facility-wide actual emissions from EPA 2020 NEI database.

As shown in **Table 3-3** above, the Q/d is below 20 for all the facilities within 50 km.

3.15 Model Summary Analysis and Digital Model Files

A summary of the results of the modeling analysis is provided in Section 4.

3.16 Alternative and Cumulative Scenarios

At this time, the emission sources are limited to a single set-up; therefore, alternative scenarios affecting air quality were not modeled. The maximum impacts were assessed under a single scenario that represents the reasonable maximum-case alternative. While other configurations may be considered, the proposed scenario has been developed to ensure that the highest dispersion impacts will be assessed in a manner that generates the maximum air quality impacts for evaluation relative to regulatory standards.

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4. AIR DISPERSION MODELING ANALYSIS RESULTS

This air quality dispersion modeling analysis is provided to demonstrate the impacts of the Facility emissions relative to the applicable NAAQS and NVAAQS. The maximum ambient concentrations of 24-hr PM_{10} and 24-hr $PM_{2.5}$ would exceed the NAAQS/NVAAQS. However, the emissions calculations and modeling methodology assume a worst-case scenario where all construction equipment operates concurrently within each project site and all construction activities occur concurrently at all seven of the individual project sites. This worst-case scenario is unlikely to occur in practice.

No current or reasonably foreseeable future emissions sources will contribute to cumulative impacts. As such, a cumulative impact scenario was not modeled.

4.1 Significant Impact Analysis Results

Ambient impacts analysis modeling was conducted for all sources in a single modeling iteration. A separate significant impact analysis was not necessary to assess modeled ambient compliance.

4.2 Ambient Impacts Analysis Results

The results of the ambient impact analysis are shown in **Table 4-1** below. For each pollutant, the Table includes the averaging period, the form of the standard, and a comparison to the NAAQS and NVAAQS.

Table 4-1. NVAAQS/NAAQS Model Results

Modeled Pollutant	Design Value	Modeled Impacts ($\mu g/m^3$)	Background ($\mu g/m^3$)	Impacts + Background ($\mu g/m^3$)	NAAQS ($\mu g/m^3$)	Impacts Below NAAQS?	NVAAQS ($\mu g/m^3$)	Impacts Below NVAAQS?
PM_{10} 24hr	H2H/H1H[1]	313.1/692.7	10.2	323.3/702.9	150	No	150	No
$PM_{2.5}$ 24hr	H8H	28.6	7.0	35.6	35	No	35	No
$PM_{2.5}$ Annual	Max Avg	7.8	2.3	10.1	12	Yes	12	Yes
NO_2 1hr	H8H	16.1	64.9/0	81.0/16.1	188	Yes	188	Yes
NO_2 Annual	Max	0.2	6.4/0	6.6/0.2	100	Yes	100	Yes
SO_2 1hr	H4H	17.7	1.3/0	19.0/17.7	196	Yes	196	Yes
SO_2 3hr	H2H/H1H[2]	9.6/14.2	1.3/0	10.9/14.2	1300	Yes	1300	Yes
SO_2 24hr	H1H	3.5	0	3.5	---	---	365	Yes
SO_2 Annual	Max	17.66	0	17.66	---	---	80	Yes
CO 1hr	H2H/H1H[3]	94.7/128.63	2520/0	2614/128.63	40000	Yes	40500	Yes
CO 8hr	H2H/H1H[3]	25.7/30.33	1948/0	1973.7/30.33	10000	Yes	10500	Yes

[1] The form of the standard for NAAQS is H2H (not to be exceeded more than once per year for 1 year of meteorological data) and the form of the standard for NVAAQS is H1H.

[2] The form of the standard for NAAQS is H2H and the form of the standard for NVAAQS is H1H.

[3] The form of the standard for NAAQS is H2H and the form of the standard for NVAAQS is H1H.

4.3 Ozone and Secondary $PM_{2.5}$ Impact

4.3.1 Ozone Impacts

When precursor emissions for ozone (VOC and NO_X) and/or $PM_{2.5}$ (SO_2 and NO_X) trigger PSD review, ozone and secondary $PM_{2.5}$ ambient impacts must be reviewed. Although the Proposed Action will not trigger a PSD review an ozone impact analysis was conducted to provide additional context to support the conclusion that impacts to air quality from the Proposed Action would not be significant. As part of the revisions made to the *Guideline on Air Quality Models* on January 17, 2017, the U.S. EPA promulgated a two-tiered approach for addressing single-source impacts on O_3. The first tier involves the use of technically credible relationships between precursor emissions and source's impact in combination with other supportive information and analysis for the purpose of estimating secondary impacts from a particular source. The second tier involves application of more sophisticated case-specific chemical transport models (e.g., photochemical grid models).

The U.S. EPA developed a tier 1 demonstration tool for O_3 precursor emissions called Modeled Emission Rates for Precursors (MERPs). The development of the tool and related guidance is summarized in an updated memorandum from U.S. EPA dated July 29, 2022.[13] The basic idea behind the MERPs is to use technically credible air quality modeling to relate precursor emissions and peak secondary pollutant impacts from hypothetical sources. In developing the MERPs the EPA utilized photochemical grid modeling (PGM) platforms for the hypothetical sources that utilize current state of the science algorithms and equations to evaluate plume dispersion and chemical transformations. The PGM evaluations were completed for emission rates of 3,000 tpy, 1,000 tpy, and 500 tpy of NO_x or VOC as well as stack heights of 10 meters (approximately 30 ft) and 90 meters (approximately 300 ft). To derive a MERP value, the PGM predicted relationship between precursor emissions from hypothetical sources and their downwind maximum impacts can be combined with a significant impact level using the following equation:

$$\text{MERP} = \text{SIL Value} \times \frac{\text{Modeled emission rate from hypothetical source}}{\text{Modeled air quality impact from hypothetical source}}$$

Because the SIL for ozone is 1 ppb, the MERP effectively defines the emission rates that will generate an ozone impact of 1 ppb from the source. Pursuant to EPA guidance[14] the U.S. EPA data for the hypothetical source closest to and in the most similar terrain as the Esmeralda facility was used to determine the estimated secondary formation of O_3 for the Facility. This is the Churchill, NV source. The U.S. EPA-determined MERP value was found in U.S. EPA's MERPs View Qlik. Based on the site-wide emission profile for fugitive and non-fugitive of approximately 51.4 tpy of NO_x and 120.9 tpy of VOC, the hypothetical source with the lowest emission rate of 500 tpy was used. Furthermore, the main source of NO_x emissions is the vehicular traffic and tailpipe emission fugitive sources with a release height of approximately 10 ft (or approximately 3.7 meters). Vehicle emissions are low-lying, transient emission sources that quickly dissipate over a large area due to the nature of vehicle usage. To compare these vehicle emissions to the MERPs is conservative, as the MERPs consider the impacts from single, stationary sources with consistent dispersion characteristics. **Table 4-2** presents the MERP calculation parameters and result.

[13] U.S. EPA Memorandum, Guidance for Ozone and Fine Particulate Matter Permit Modeling, July 29, 2022.

[14] Ibid.

Table 4-2. Esmeralda 7 - Reasonable Maximum Case MERP Value: O_3

Secondary Pollutant	Source Pollutant	Stack Height (m)	Source	Emission Rate (tpy)	MERP (tpy)
O_3 – 8-hour	NOx	10	Churchill	500	218
	VOC	10	Churchill	500	4,489

The proposed secondary O_3 precursor emissions increase from the Facility can be calculated and also expressed as a percent of the MERP for each precursor and then summed. A value less than 100% indicates that the 1 ppb ozone SIL will not be exceeded (i.e., the project does not have a significant impact and no further analysis is needed) when considering the combined impacts of the precursor emissions on 8-hour O_3 emissions:

$$\left[\frac{NO_x \text{ Project Emissions}}{NO_x \text{ MERP}} + \frac{\text{VOC Project Emissions}}{\text{VOC MERP}}\right] x\, 100 < 100\%$$

Based on the considerations above, the analysis for the Facility is as follows:

$$O_3 - 8 \text{ hour:} \left[\frac{51.4 \text{ tpy}}{218 \text{ tpy}} + \frac{120.9 \text{ tpy}}{4{,}489 \text{ tpy}}\right] x\, 100 = 26.27\%$$

The results demonstrate that the site-wide NO_x and VOC emissions are expected to generate an ozone impact of 0.26 ppb which is less than the 1 ppb ozone SIL. Therefore, the ozone impacts from the Proposed Action are not expected to be significant.

4.3.2 Secondary $PM_{2.5}$ Impacts

For the secondary $PM_{2.5}$ impacts, NO_x and SO_2 are both precursors to secondary $PM_{2.5}$ formation, and the contributions to secondarily formed $PM_{2.5}$ are considered together. For purposes of evaluating impacts associated with secondary $PM_{2.5}$, the U.S. EPA has devised a two-tier approach as detailed in 40 CFR 51. The U.S. EPA developed a tier 1 demonstration tool for secondary $PM_{2.5}$ precursor emissions called MERPs. The development of the tool and related guidance is summarized in a memorandum from U.S. EPA dated July 29, 2022[15] To derive a MERP value, the model predicted relationship between precursor emissions from hypothetical sources and their downwind maximum impacts can be combined with a SIL using the following equation:

$$\text{MERP} = \text{SIL Value x } \frac{\text{Modeled emission rate from hypothetical source}}{\text{Modeled air quality impact from hypothetical source}}$$

The air quality modeling results for the Churchill, NV hypothetical source were used to derive MERPs using the U.S. EPA recommended SILs for $PM_{2.5}$ (1.2 µg/m^3 for the 24-hour averaging time and 0.2 µg/m^3 for the annual averaging time). The modeled emission rate and air quality impacts are obtained from U.S. EPA's December 28, 2018 workbook with underlying maximum impact and MERPs information for each

[15] U.S. EPA Memorandum, Guidance for Ozone and Fine Particulate Matter Permit Modeling, July 29, 2022.

hypothetical source.[16] Because air dispersion modeling of primary $PM_{2.5}$ impacts have been conducted for the Esmeralda 7 Proposed Action and it has been determined that the Facility is above the SIL, the MERPs are not used to compare against the SIL, instead the predicted concentration of secondary formation of $PM_{2.5}$ is added to the predicted primary $PM_{2.5}$ impacts as a conservative estimate of total $PM_{2.5}$ impacts from the facility.[17] The hypothetical source assuming the lowest emission rate of 500 tpy and the lowest stack height of 10 meters was used, which generates the reasonable maximum-case derived MERPs. **Table 4-3** presents the MERP calculation parameters and result.

Table 4-3. Esmeralda 7 - Reasonable Maximum Case MERP Value: $PM_{2.5}$

Secondary Pollutant	SIL (µg/m³)	Source Pollutant	Stack Height (m)	Source	Emission Rate (tpy)	Calculated MERP (tpy)
$PM_{2.5}$ – 24 hr	1.2	NOx	10	Churchill	500	13,241
		SO_2	10	Churchill	500	1,122
$PM_{2.5}$ - Annual	0.2	NOx	10	Churchill	500	54,533
		SO_2	10	Churchill	500	11,610

The proposed secondary $PM_{2.5}$ precursor emissions increase can be expressed as a percent of the lowest MERP for each precursor and then summed to determine predicted secondary $PM_{2.5}$ impacts.

$$\left[\frac{\text{Modeled Value}}{\text{NAAQS}} + \frac{NO_x\ \text{Project Emissions}}{NO_x\ \text{MERP}} + \frac{SO_2\ \text{Project Emissions}}{SO_2\ \text{MERP}}\right] x\ 100 < 100\%$$

Based on the considerations above, the analysis for the Facility is as follows:

$$PM_{2.5} - 24\ \text{hour:} \left[\frac{35.6\ \mu g/m^3}{35\ \mu g/m^3} + \frac{51.44\ \text{tpy}}{13{,}241\ \text{tpy}} + \frac{81.31\ \text{tpy}}{1{,}122\ \text{tpy}}\right] x\ 100 = 109.3\%$$

$$PM_{2.5} - \text{Annual:} \left[\frac{10.1\ \frac{\mu g}{m^3}}{12\ \frac{\mu g}{m^3}} + \frac{51.44\ \text{tpy}}{54{,}533\ \text{tpy}} + \frac{81.31\ \text{tpy}}{11{,}610\ \text{tpy}}\right] x\ 100 = 84.96\%$$

Similar to primary 24-hr $PM_{2.5}$ impacts, the secondary 24-hr $PM_{2.5}$ would exceed the NAAQS/NVAAQS. However, the emissions calculations and modeling methodology assume a worst-case scenario where all construction equipment operates concurrently within each project site and all construction activities occur concurrently at all seven of the individual project sites. This worst-case scenario is unlikely to occur in practice. The value for the annual averaging time is less than 100%, which indicates that the secondary annual $PM_{2.5}$ impact is less than the NAAQS and NVAAQS.

[16] U.S. EPA's Clean Air Act Permit Modeling Guidance webpage. Available online: https://www.epa.gov/scram/clean-air-act-permit-modeling-guidance.

[17] U.S. EPA Memorandum, Guidance for Ozone and Fine Particulate Matter Permit Modeling, July 29, 2022, page 51: "The EPA recommends that the modeled design concentrations of primary $PM_{2.5}$ and the Tier 1 or 2 assessed secondary $PM_{2.5}$ impacts should be added to the monitor-based design value for comparison to the NAAQS, as appropriate."

4.4 Conclusions

The modeling analysis conducted demonstrates that the emissions from the Proposed Action will have estimated impacts below the NAAQS and NVAAQS for all pollutants and applicable standards with the exception of 24-hr PM_{10} and 24-hr $PM_{2.5}$. However, the emissions calculations and modeling methodology assume a worst-case scenario where all construction equipment operates concurrently within each project site and all construction activities occur concurrently at all seven of the individual project sites. This worst-case scenario is unlikely to occur in practice.

In addition, impacts would be minimized through the implementation of programmatic design features, as discussed in Section 1.2.5 of the Air Quality and Climate Change Supplemental Environmental Report. A Surface Area Disturbance (SAD) permit would be obtained for the Proposed Action, via submittal of the NDEP's Class II Air Quality Operating Permit Application Form Surface Area Disturbance application. Nevada Administrative Code 445B.22037 requires fugitive dust to be controlled (regardless of the size or amount of acreage disturbed) and requires an ongoing program, using best practical methods, to prevent particulate matter from becoming airborne. All activities that have the potential to adversely affect the local air quality must implement all appropriate measures to limit controllable emissions.

Appropriate measures for dust control may consist of a phased approach to acreage disturbance rather than disturbing the entire area all at once, using wet suppression through such application methods as water trucks or water spray systems to control wind-blown dust, the application of soil-binding agents or chemical surfactant to roadways and areas of disturbed soil, and the use of wind-break or wind-limiting fencing designed to limit wind-eroded soils (NDEP 2022). The SAD permit application requires the applicant to indicate which Best Management Practices (BMPs) will be used to control dust on the project's disturbed areas.

In addition, a fugitive dust-control plan would be prepared in compliance with NDEP air quality regulations. This plan would describe measures to minimize fugitive dust emissions during construction and operations. Appropriate erosion- and dust-control measures would be implemented to comply with Esmeralda County dust-control requirements, as discussed in Section 2.4 of the Air Quality and Climate Change Supplemental Environmental Report. Dust during construction would be controlled and minimized by applying water or BLM-approved palliatives, or both.

The BMP requirements in the SAD permit, the fugitive dust-control plan, the Esmeralda County requirements, and implementation of programmatic design features would overlap and ensure that appropriate and effective dust-control measures would be implemented during the Proposed Action. Therefore, no adverse effect or significant deterioration would occur at the planning area.

Table A-1a. Annual Criteria Pollutant PTE Emissions Summary (tpy) - Entire Project

Site	PM	PM_{10}	$PM_{2.5}$	VOC	NO_X	CO	SO_2	CO_2e	Total HAP
Lone Mountain	2950	2913	292	15.08	6.47	80.76	9.88	11658.77	1.17
Smoky Valley	1794	1737	174	20.44	8.36	81.06	15.17	13003.28	0.79
Gold Dust	5741	5656	566	31.77	13.18	138.92	22.77	21484.33	1.59
Nivloc	2536	2507	251	10.55	4.37	45.73	7.59	7095.46	0.52
Esmeralda Energy Center	2950	2922	292	11.33	4.82	57.86	7.60	8481.05	0.80
Red (Rhyolite) Ridge #1	2202	2168	217	15.89	7.12	105.48	9.15	14294.41	1.80
Red (Rhyolite) Ridge #2	2366	2332	234	15.89	7.12	105.48	9.15	14277.05	1.80
Total	20538	20235	2027	120.94	51.44	615.28	81.31	90294.35	8.46
Non-Fugitive Emissions	5.20E-02	5.20E-02	5.20E-02	7.74E+00	4.07E-01	8.67E+00	2.16E+00	1.21E+03	2.92E-02
Tailpipe Emissions	6.6	6.6	3.9	113	51	607	79	89087	8

Table A-1b. Annual HAP PTE Emissions Summary (tpy) - Entire Project

Pollutants	Lone Mountain	Smoky Valley	Gold Dust	Nivloc	Esmeralda Energy Center	Red (Rhyolite) Ridge #1	Red (Rhyolite) Ridge #2	Total of Each HAP
Benzene	0.09	0.08	0.14	0.05	0.06	0.12	0.12	0.64
Toluene	0.33	0.19	0.42	0.13	0.22	0.52	0.52	2.34
Xylene	0.18	0.12	0.24	0.08	0.13	0.29	0.29	1.33
1,3-Butadiene	0.01	0.01	0.01	0.00	0.01	0.01	0.01	0.07
Formaldehyde	0.06	0.08	0.12	0.04	0.04	0.06	0.06	0.47
Acetaldehyde	0.05	0.06	0.09	0.03	0.04	0.06	0.06	0.38
Acrolein	0.00	0.01	0.01	0.00	0.00	0.01	0.01	0.04
Naphthalene	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.02
PAH	0.01	0.01	0.01	0.00	0.00	0.01	0.01	0.05
Ethanol	0.25	0.14	0.30	0.10	0.17	0.41	0.41	1.76
2,2,4-Trimethylpentane	0.07	0.04	0.08	0.03	0.05	0.11	0.11	0.48
Ethyl Benzene	0.05	0.03	0.06	0.02	0.03	0.08	0.08	0.33
Hexane	0.08	0.04	0.09	0.03	0.05	0.12	0.12	0.54
Propionaldehyde	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
Styrene	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
Total HAPs for Each Facility	1.17	0.79	1.59	0.52	0.80	1.80	1.80	**8.46**

Table A-2a. Annual Criteria Pollutant PTE Emissions Summary (tpy) - Lone Mountain Construction

Source	PM	PM_{10}	$PM_{2.5}$	VOC	NO_X	CO	SO_2	CO_2e	Total HAP
On-Road Vehicles - Construction Vehicles	0.11	0.11	0.04	0.25	2.09	3.73	0.01	1406.92	0.07
On-Road Vehicles - Employee Commuting	0.42	0.42	0.13	2.65	1.54	41.59	0.03	4750.57	0.97
Off-Road Equipment	0.33	0.33	0.33	12.18	2.85	35.44	9.85	5501.28	0.13
Unpaved Roads	50.43	13.61	1.36	--	--	--	--	--	--
Fugitive Dust from Construction Activities[1]	2898.72	2898.72	289.87	--	--	--	--	--	--
Total	2950.01	2913.20	291.74	15.08	6.47	80.76	9.88	11658.77	1.17

1. Average-case are used for fugitive dust emissions.

Table A-2b. Annual HAP PTE Emissions Summary (tpy) - Lone Mountain Construction

Pollutants	0	On-Road Vehicles - Construction Vehicles	On-Road Vehicles - Employee Commuting	Off-Road Equipment	Total Activities
Benzene	71-43-2	0.00	0.05	0.03	0.09
Toluene	108-88-3	0.02	0.30	0.01	0.33
Xylene	1330-20-7	0.01	0.16	0.01	0.18
1,3-Butadiene	106-99-0	0.00	0.01	0.00	0.01
Formaldehyde	50-00-0	0.01	0.01	0.04	0.06
Acetaldehyde	75-07-0	0.01	0.02	0.03	0.05
Acrolein	107-02-8	0.00	0.00	0.00	0.00
Naphthalene	91-20-3	--	--	0.00	0.00
PAH	--	--	--	0.01	0.01
Ethanol	64-17-5	0.01	0.24	--	0.25
2,2,4-Trimethylpentane	540-84-1	0.00	0.06	--	0.07
Ethyl Benzene	100-41-4	0.00	0.04	--	0.05
Hexane	110-54-3	0.00	0.07	--	0.08
Propionaldehyde	123-38-6	--	0.00	--	0.00
Styrene	100-42-5	--	0.00	--	0.00
Total HAPs	--	0.07	0.97	0.13	1.17

Table A-3a. Annual Criteria Pollutant PTE Emissions Summary (tpy) - Smoky Valley Construction

Source	PM	PM_{10}	$PM_{2.5}$	VOC	NO_X	CO	SO_2	CO_2e	Total HAP
On-Road Vehicles - Construction Vehicles	0.17	0.17	0.06	0.38	3.21	5.74	0.01	2164.49	0.10
On-Road Vehicles - Employee Commuting	0.21	0.21	0.07	1.33	0.77	20.80	0.02	2375.28	0.48
Off-Road Equipment	0.51	0.51	0.51	18.73	4.38	54.52	15.15	8463.51	0.20
Unpaved Roads	77.58	20.94	2.09	--	--	--	--	--	--
Fugitive Dust from Construction Activities[1]	1715.51	1715.51	171.55	--	--	--	--	--	--
Total	1793.98	1737.35	174.28	20.44	8.36	81.06	15.17	13003.28	0.79

1. Average-case are used for fugitive dust emissions.

Table A-3b. Annual HAP PTE Emissions Summary (tpy) - Smoky Valley Construction

Pollutants	CAS #	On-Road Vehicles - Construction Vehicles	On-Road Vehicles - Employee Commuting	Off-Road Equipment	Total Activities
Benzene	71-43-2	0.00	0.03	0.05	0.08
Toluene	108-88-3	0.02	0.15	0.02	0.19
Xylene	1330-20-7	0.02	0.08	0.01	0.12
1,3-Butadiene	106-99-0	0.00	0.00	0.00	0.01
Formaldehyde	50-00-0	0.01	0.01	0.06	0.08
Acetaldehyde	75-07-0	0.01	0.01	0.04	0.06
Acrolein	107-02-8	0.00	0.00	0.00	0.01
Naphthalene	91-20-3	--	--	0.00	0.00
PAH	--	--	--	0.01	0.01
Ethanol	64-17-5	0.02	0.12	--	0.14
2,2,4-Trimethylpentane	540-84-1	0.01	0.03	--	0.04
Ethyl Benzene	100-41-4	0.00	0.02	--	0.03
Hexane	110-54-3	0.01	0.04	--	0.04
Propionaldehyde	123-38-6	--	0.00	--	0.00
Styrene	100-42-5	--	0.00	--	0.00
Total HAPs	--	0.10	0.48	0.20	0.79

Table A-4a. Annual Criteria Pollutant PTE Emissions Summary (tpy) - Gold Dust Construction

Source	PM	PM_{10}	$PM_{2.5}$	VOC	NO_X	CO	SO_2	CO_2e	Total HAP
On-Road Vehicles - Construction Vehicles	0.26	0.26	0.09	0.57	4.82	8.61	0.01	3246.74	0.15
On-Road Vehicles - Employee Commuting	0.49	0.49	0.15	3.09	1.79	48.53	0.04	5542.33	1.13
Off-Road Equipment	0.77	0.77	0.77	28.10	6.57	81.78	22.72	12695.26	0.31
Unpaved Roads	116.37	31.42	3.14	--	--	--	--	--	--
Fugitive Dust from Construction Activities[1]	5623.04	5623.04	562.30	--	--	--	--	--	--
Total	5740.93	5655.97	566.46	31.77	13.18	138.92	22.77	21484.33	1.59

1. Average-case are used for fugitive dust emissions.

Table A-4b. Annual HAP PTE Emissions Summary (tpy) - Gold Dust Construction

Pollutants	CAS #	On-Road Vehicles - Construction Vehicles	On-Road Vehicles - Employee Commuting	Off-Road Equipment	Total Activities
Benzene	71-43-2	0.01	0.06	0.07	0.14
Toluene	108-88-3	0.04	0.35	0.03	0.42
Xylene	1330-20-7	0.03	0.19	0.02	0.24
1,3-Butadiene	106-99-0	0.00	0.01	0.00	0.01
Formaldehyde	50-00-0	0.01	0.01	0.09	0.12
Acetaldehyde	75-07-0	0.01	0.02	0.06	0.09
Acrolein	107-02-8	0.00	0.00	0.01	0.01
Naphthalene	91-20-3	--	--	0.01	0.01
PAH	--	--	--	0.01	0.01
Ethanol	64-17-5	0.03	0.28	--	0.30
2,2,4-Trimethylpentane	540-84-1	0.01	0.08	--	0.08
Ethyl Benzene	100-41-4	0.01	0.05	--	0.06
Hexane	110-54-3	0.01	0.08	--	0.09
Propionaldehyde	123-38-6	--	0.00	--	0.00
Styrene	100-42-5	--	0.00	--	0.00
Total HAPs	--	0.15	1.13	0.31	1.59

Table A-5a. Annual Criteria Pollutant PTE Emissions Summary (tpy) - Nivloc Construction

Source	PM	PM_{10}	$PM_{2.5}$	VOC	NO_X	CO	SO_2	CO_2e	Total HAP
On-Road Vehicles - Construction Vehicles	0.09	0.09	0.03	0.19	1.61	2.87	0.00	1082.25	0.05
On-Road Vehicles - Employee Commuting	0.16	0.16	0.05	0.99	0.58	15.60	0.01	1781.46	0.36
Off-Road Equipment	0.26	0.26	0.26	9.37	2.19	27.26	7.57	4231.75	0.10
Unpaved Roads	38.79	10.47	1.05	--	--	--	--	--	--
Fugitive Dust from Construction Activities[1]	2496.45	2496.45	249.65	--	--	--	--	--	--
Total	2535.74	2507.42	251.03	10.55	4.37	45.73	7.59	7095.46	0.52

1. Average-case are used for fugitive dust emissions.

Table A-5b. Annual HAP PTE Emissions Summary (tpy) - Nivloc Construction

Pollutants	CAS #	On-Road Vehicles - Construction Vehicles	On-Road Vehicles - Employee Commuting	Off-Road Equipment	Total Activities
Benzene	71-43-2	0.00	0.02	0.02	0.05
Toluene	108-88-3	0.01	0.11	0.01	0.13
Xylene	1330-20-7	0.01	0.06	0.01	0.08
1,3-Butadiene	106-99-0	0.00	0.00	0.00	0.00
Formaldehyde	50-00-0	0.00	0.00	0.03	0.04
Acetaldehyde	75-07-0	0.00	0.01	0.02	0.03
Acrolein	107-02-8	0.00	0.00	0.00	0.00
Naphthalene	91-20-3	--	--	0.00	0.00
PAH	--	--	--	0.00	0.00
Ethanol	64-17-5	0.01	0.09	--	0.10
2,2,4-Trimethylpentane	540-84-1	0.00	0.02	--	0.03
Ethyl Benzene	100-41-4	0.00	0.02	--	0.02
Hexane	110-54-3	0.00	0.03	--	0.03
Propionaldehyde	123-38-6	--	0.00	--	0.00
Styrene	100-42-5	--	0.00	--	0.00
Total HAPs	--	0.05	0.36	0.10	0.52

Table A-6a. Annual Criteria Pollutant PTE Emissions Summary (tpy) - Esmeralda Energy Center Construction

Source	PM	PM_{10}	$PM_{2.5}$	VOC	NO_X	CO	SO_2	CO_2e	Total HAP
On-Road Vehicles - Construction Vehicles	0.09	0.09	0.03	0.19	1.61	2.87	0.00	1082.25	0.05
On-Road Vehicles - Employee Commuting	0.28	0.28	0.09	1.77	1.02	27.73	0.02	3167.04	0.65
Off-Road Equipment	0.26	0.26	0.26	9.37	2.19	27.26	7.57	4231.75	0.10
Unpaved Roads	38.79	10.47	1.05	--	--	--	--	--	--
Fugitive Dust from Construction Activities[1]	2910.60	2910.60	291.06	--	--	--	--	--	--
Total	2950.01	2921.69	292.48	11.33	4.82	57.86	7.60	8481.05	0.80

1. Average-case are used for fugitive dust emissions.

Table A-6b. Annual HAP PTE Emissions Summary (tpy) - Esmeralda Energy Center Construction

Pollutants	CAS #	On-Road Vehicles - Construction Vehicles	On-Road Vehicles - Employee Commuting	Off-Road Equipment	Total Activities
Benzene	71-43-2	0.00	0.03	0.02	0.06
Toluene	108-88-3	0.01	0.20	0.01	0.22
Xylene	1330-20-7	0.01	0.11	0.01	0.13
1,3-Butadiene	106-99-0	0.00	0.00	0.00	0.01
Formaldehyde	50-00-0	0.00	0.01	0.03	0.04
Acetaldehyde	75-07-0	0.00	0.01	0.02	0.04
Acrolein	107-02-8	0.00	0.00	0.00	0.00
Naphthalene	91-20-3	--	--	0.00	0.00
PAH	--	--	--	0.00	0.00
Ethanol	64-17-5	0.01	0.16	--	0.17
2,2,4-Trimethylpentane	540-84-1	0.00	0.04	--	0.05
Ethyl Benzene	100-41-4	0.00	0.03	--	0.03
Hexane	110-54-3	0.00	0.05	--	0.05
Propionaldehyde	123-38-6	--	0.00	--	0.00
Styrene	100-42-5	--	0.00	--	0.00
Total HAPs	--	0.05	0.65	0.10	0.80

Table A-7a. Annual Criteria Pollutant PTE Emissions Summary (tpy) - Red (Rhyolite) Ridge #1 Construction

Source	PM	PM_{10}	$PM_{2.5}$	VOC	NO_X	CO	SO_2	CO_2e	Total HAP
On-Road Vehicles - Construction Vehicles	0.10	0.10	0.04	0.23	1.93	3.45	0.01	1298.70	0.06
On-Road Vehicles - Employee Commuting	0.70	0.70	0.22	4.42	2.56	69.32	0.05	7917.61	1.61
Off-Road Equipment	0.31	0.31	0.31	11.24	2.63	32.71	9.09	5078.10	0.12
Unpaved Roads	46.55	12.57	1.26	--	--	--	--	--	--
Fugitive Dust from Construction Activities[1]	2154.57	2154.57	215.46	--	--	--	--	--	--
Total	2202.23	2168.25	217.27	15.89	7.12	105.48	9.15	14294.41	1.80

1. Average-case are used for fugitive dust emissions.

Table A-7b. Annual HAP PTE Emissions Summary (tpy) - Red (Rhyolite) Ridge #1 Construction

Pollutants	CAS #	On-Road Vehicles - Construction Vehicles	On-Road Vehicles - Employee Commuting	Off-Road Equipment	Total Activities
Benzene	71-43-2	0.00	0.09	0.03	0.12
Toluene	108-88-3	0.01	0.49	0.01	0.52
Xylene	1330-20-7	0.01	0.27	0.01	0.29
1,3-Butadiene	106-99-0	0.00	0.01	0.00	0.01
Formaldehyde	50-00-0	0.01	0.02	0.04	0.06
Acetaldehyde	75-07-0	0.01	0.03	0.02	0.06
Acrolein	107-02-8	0.00	0.00	0.00	0.01
Naphthalene	91-20-3	--	--	0.00	0.00
PAH	--	--	--	0.01	0.01
Ethanol	64-17-5	0.01	0.40	--	0.41
2,2,4-Trimethylpentane	540-84-1	0.00	0.11	--	0.11
Ethyl Benzene	100-41-4	0.00	0.07	--	0.08
Hexane	110-54-3	0.00	0.12	--	0.12
Propionaldehyde	123-38-6	--	0.00	--	0.00
Styrene	100-42-5	--	0.00	--	0.00
Total HAPs	--	0.06	1.61	0.12	1.80

Table A-8a. Annual Criteria Pollutant PTE Emissions Summary (tpy) - Red (Rhyolite) Ridge #2 Construction

Source	PM	PM_{10}	$PM_{2.5}$	VOC	NO_x	CO	SO_2	CO_2e	Total HAP
On-Road Vehicles - Construction Vehicles	0.10	0.10	0.04	0.23	1.93	3.45	0.01	1298.70	0.06
On-Road Vehicles - Employee Commuting	0.70	0.70	0.22	4.42	2.56	69.32	0.05	7917.61	1.61
Off-Road Equipment	0.31	0.31	0.31	11.24	2.63	32.71	9.09	5060.74	0.12
Unpaved Roads	46.55	12.57	1.26	--	--	--	--	--	--
Fugitive Dust from Construction Activities[1]	2317.92	2317.92	231.79	--	--	--	--	--	--
Total	2365.58	2331.60	233.61	15.89	7.12	105.48	9.15	14277.05	1.80

1. Average-case are used for fugitive dust emissions.

Table A-8b. Annual HAP PTE Emissions Summary (tpy) - Red (Rhyolite) Ridge #2 Construction

Pollutants	CAS #	On-Road Vehicles - Construction Vehicles	On-Road Vehicles - Employee Commuting	Off-Road Equipment	Total Activities
Benzene	71-43-2	0.00	0.09	0.03	0.12
Toluene	108-88-3	0.01	0.49	0.01	0.52
Xylene	1330-20-7	0.01	0.27	0.01	0.29
1,3-Butadiene	106-99-0	0.00	0.01	0.00	0.01
Formaldehyde	50-00-0	0.01	0.02	0.04	0.06
Acetaldehyde	75-07-0	0.01	0.03	0.02	0.06
Acrolein	107-02-8	0.00	0.00	0.00	0.01
Naphthalene	91-20-3	--	--	0.00	0.00
PAH	--	--	--	0.01	0.01
Ethanol	64-17-5	0.01	0.40	--	0.41
2,2,4-Trimethylpentane	540-84-1	0.00	0.11	--	0.11
Ethyl Benzene	100-41-4	0.00	0.07	--	0.08
Hexane	110-54-3	0.00	0.12	--	0.12
Propionaldehyde	123-38-6	--	0.00	--	0.00
Styrene	100-42-5	--	0.00	--	0.00
Total HAPs	--	0.06	1.61	0.12	1.80