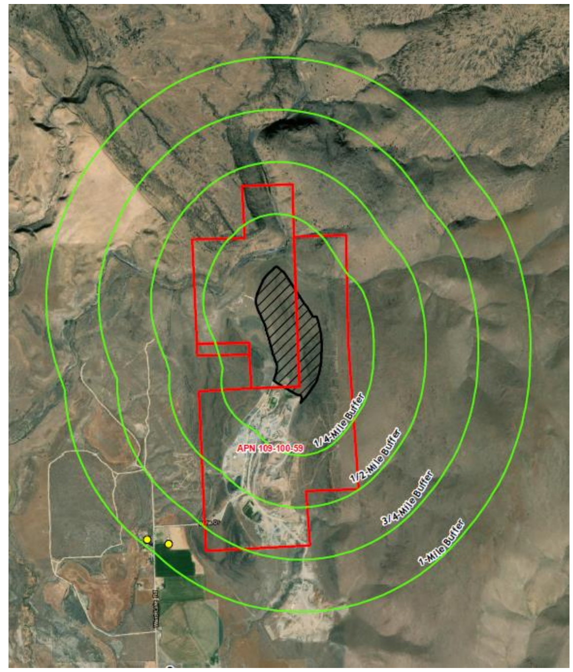
Ward Lake Pit Expansion
Air Quality and Health Risk Assessment Technical Report



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1.0 INTRODUCTION

This document presents results of an air quality analysis and health risk assessment (HRA) associated with the proposed Ward Lake Pit Expansion near Susanville, California in Lassen County. This document provides an overview of the existing air quality conditions at the project site, an analysis of potential air quality impacts that would result from implementation of the proposed project, and identification of applicable regulatory requirements. Issues related to climate change and greenhouse gas (GHG) emissions are also addressed.

The HRA focuses on health impacts on existing residences and schools from diesel generators and offroad equipment associated with the aggregate extraction and resultant diesel particulate matter (DPM) emissions from the proposed project. The HRA was prepared based on the California Office of Environmental Health Hazard Assessment (OEHHA)'s *Air Toxics Hot Spots Program Guidance Manual for Preparation of Health Risk Assessments*.[1] The HRA was conducted to determine the health impacts, in terms of excess cancer risk and non-cancer hazards, using the significance levels identified within the State CEQA Guidelines, Appendix G.

The supporting information, methodology, assumptions, and results used in the air quality analysis are provided in **Attachment A: Air Quality Calculations**. The supporting methodology, assumptions, and results used in the HRA are provided in **Attachment B: Health Risk Assessment Methodology, Assumptions, and Results**. For existing residents and schools, the HRA indicates less-than-significant health impacts from proposed project activities associated with diesel generators and offroad equipment.

The air quality analysis includes a review of criteria pollutant[2] emissions such as carbon monoxide (CO)[3], nitrogen oxides (NO_x)[4], sulfur dioxide (SO_2)[5], volatile organic compounds

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[1] Office of Environmental Health Hazard Assessment, *Air Toxics Hot Spots Program Guidance Manual for Preparation of Health Risk Assessments*, February 2015, Accessed January 26, 2021, http://oehha.ca.gov/air/hot_spots/hotspots2015.html

[2] Criteria air pollutants refer to those air pollutants for which the USEPA and CARB has established National Ambient Air Quality Standards (NAAQS) and California Ambient Air Quality Standards (CAAQS) under the Federal Clean Air Act (CAA).

[3] CO is a non–reactive pollutant that is a product of incomplete combustion of organic material, and is mostly associated with motor vehicle traffic, and in wintertime, with wood–burning stoves and fireplaces.

[4] When combustion temperatures are extremely high, as in aircraft, truck and automobile engines, atmospheric nitrogen combines with oxygen to form various oxides of nitrogen (NO_x). Nitric oxide (NO) and NO_2 are the most significant air pollutants generally referred to as NO_x. Nitric oxide is a colorless and odorless gas that is relatively harmless to humans, quickly converts to NO_2 and can be measured. Nitrogen dioxide has been found to be a lung irritant capable of producing pulmonary edema.

[5] SO_2 is a combustion product of sulfur or sulfur–containing fuels such as coal and diesel. SO_2 is also a precursor to the formation of atmospheric sulfate and particulate matter and contributes to potential atmospheric sulfuric acid formation that could precipitate downwind as acid rain.

(VOC) as reactive organic gases (ROG)[6], particulate matter less than 10 micrometers (coarse or PM_{10}), particulate matter less than 2.5 micrometers (fine or $PM_{2.5}$).[7]

2.0 PROJECT OVERVIEW

The existing surface mining operation (100,000 tons per year annual limit) is presently permitted for the mining of rock, crushing, screening, washing, material stockpiling, fuel storage; operation of a cement plant (12,000 cubic-yard annual limit) and asphalt plant (400,000 tons per year); and the use of settling ponds, scales, an office and a truck shop. Grading, excavating, and blasting are prohibited onsite between January 1 and March 31 annually, except in a state of emergency. Currently permitted operations at the project site allow the applicant to provide materials for emergency projects and construction projects that require continuous 24-hour operations. In order to respond to emergency projects, the annual removal volume of the mine presently could exceed 100,000 tons. The majority of operations occur from April through October. In addition, the current operation includes mining from 2020 through 2030 to allow increased extraction of materials from the site.

The Lassen County Air Pollution Control District (APCD) is the local air district governing Lassen County which is part of the Northeast Plateau Air Basin. The Lassen County APCD requires permits for proposed construction, alteration or replacement of equipment or facilities which may cause the issuance of air contaminants. The Ward Lake Pit maintains a permit to operate (PTO-19-140: expiration date March 31, 2024) for existing onsite equipment such as a hot mix asphalt plant, a lime slurry mix plant, a concrete plant, a crushing plant, a sand wash plant, and several diesel generators. As of the permit issuance, the facility had five diesel generators with the following upgrades or replacements planned:

- One 750 horsepower (hp) diesel generator associated with the asphalt plant, which has been switched to line power.
- One 750 hp diesel generator associated with the aggregate plant, which will be switched to line power by January of 2022.
- One 755 hp diesel generator associated with the aggregate plant, which will be updated with Air District approved Tier 4 engine[8] or switched to line power by January of 2023.

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[6] VOC means any compound of carbon, excluding carbon monoxide, carbon dioxide, carbonic acid, metallic carbides or carbonates, and ammonium carbonate, which participates in atmospheric photochemical reactions and thus, a precursor of ozone formation. ROG are any reactive compounds of carbon, excluding methane, CO, CO_2 carbonic acid, metallic carbides or carbonates, ammonium carbonate, and other exempt compounds. The terms VOC and ROG are often used interchangeably.

[7] PM_{10} and $PM_{2.5}$ consists of airborne particles that measure 10 microns or less in diameter and 2.5 microns or less in diameter, respectively. PM_{10} and $PM_{2.5}$ represent fractions of particulate matter that can be inhaled into the air passages and the lungs, causing adverse health effects.

- One 475 hp diesel generator associated with the lime plant, which will be updated with Air District approved Tier 4 engine or switched to line power by January of 2024.
- One 470 hp diesel generator associated with the wash plant, which will be updated with Air District approved Tier 4 engine or switched to line power by January of 2025.

The facility also has a daily and annual limit on the number of haul truck trips.

The proposed project includes increasing the crushing operations (from 100,000 to 200,000 tons per year) and expansion of the mine to include an additional 78.6 acres of mining area. The typical and maximum daily operations are not expected to change as a result of the proposed project. However, the annual number of crushing operation hours may be greater as a result of the proposed project in order to process the greater annual; amount of aggregate. This change in hours of operation may also include the 755 hp diesel generator associated with the aggregate plant (which by January of 2023 will be an Air District approved Tier 4 engine or switched to line power).[9] Therefore, the air quality analysis (to be conservative) included greater hours of operation for the diesel generator associated with the aggregate plant and assumed the diesel generator would not be replaced by line power.

The end date of mining would be extended to 2050; an additional 20 years. The equipment supporting for material processing (i.e., loaders, excavators) would also increase in annual operations to match the increase in crushing operations. The proposed project would not change the hot mix asphalt plant, the lime slurry mix plant, the concrete plant, portable plant, and diesel generator operations associated with hot mix asphalt plant and portable plant nor would the proposed project change the daily or annual haul truck trip limit.[10] Therefore, the air quality analysis and HRA focuses on pollutant emissions associated with the aggregate processing operations and supporting activities (i.e., blasting operations and diesel generators associated with crushing and offroad equipment such as loaders, excavators, and dozers).

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[8] USEPA has implemented regulations and a tiering system to reduce emissions from off-road equipment with increasing combustion efficiency (i.e., decreasing emissions) where Tier 1 is the least efficient (greatest emissions) and Tier 4 is the most efficient (least emissions). The regulations have been implemented over time such that Tier 1 was phased out in the 1990's and Tier 2 was required, followed by implementation of Tier 3 and Tier 4 by 2015 with a phase out of Tier 2.

[9] Per applicant, the diesel generator associated with the aggregate plant is assumed to increase in operations by 33 percent on an annual basis to sufficiently adjust to the increase in aggregate production.

[10] Haul truck volumes would not change as a result of the proposed project and is currently limited by the following condition of approval: haul trucks (loaded or empty) associated with the mining operation shall not exceed a daily average of 26 round trips (26 arriving and 26 departing) throughout the calendar year and shall not exceed a daily maximum of 275 round trips (275 arriving and 275 departing), with a maximum of 173 total trips occurring between the hours of 10:00 p.m. and 7:00 a.m., excluding personal employee vehicles and light-duty trucks assigned to employees. The maximum number of annual truck trips would continue to be 8,112.

Equipment onsite includes loaders, generators, a concrete batch plant, concrete trucks, service truck, man lift, belly dump, articulated dump truck, crusher and asphalt batch plant. Wet suppression is used when necessary to control dust caused by excavation, processing activities, and materials transport.

3.0 EXISTING CONDITIONS

The project site is located in the Northeast Plateau Air Basin (Air Basin), which comprises Siskiyou, Modoc and Lassen counties. The Air Basin has a climate regime that is distinct from the rest of California. The Air Basin has sharply defined seasons that follow a continental, rather than marine, pattern. Winters are cold and snowy; summers are warm and dry. The Air Basin includes part of the Klamath Mountains to the west and the Cascade Range and Modoc Plateau, plus a slice of the Great Basin along its eastern edge. Mount Shasta rises 14,162 feet, dominating the view from much of the basin. Another volcanic peak, Mount Lassen, stands 10,457 feet high. Extensive forestland runs across saddles between the region's peaks. The volcanic Modoc Plateau extends across the northeastern expanse, with an elevation mostly above 4,500 feet.

The region receives little to no transported air pollution from major urban areas. As in many rural areas in California, particulates from dust and wood smoke are sometimes a problem. Only the city of Yreka experiences occasional ozone concentrations that approach "near exceedances".

Land uses such as residences, schools, children's daycare centers, hospitals, and convalescent homes are considered to be more sensitive than the general public to poor air quality because the population groups associated with these uses have increased susceptibility to respiratory distress. Persons engaged in strenuous work or exercise also have increased sensitivity to poor air quality. California Air Resources Board (CARB) has identified the following people as most likely to be affected by air pollution: children less than 14 years of age, the elderly over 65 years of age, athletes, and those with cardiovascular and chronic respiratory diseases. These groups are classified as sensitive population groups.

Residential areas are considered more sensitive to air quality conditions than commercial and industrial areas, because people generally spend longer periods of time at their residences, resulting in greater exposure to ambient air quality conditions. Recreational uses are also considered sensitive, due to the greater exposure to ambient air quality conditions and because the presence of pollution detracts from the recreational experience.

The project site is surrounded by open grazing lands. Immediately adjacent to and south of the site, a smaller aggregate mine is located on Bureau of Land Management (BLM)-administered land. Other BLM land is located to the east and south and the Wells Ranch is located directly to the north. Six homes are located on parcels from 10 to 80 acres in size to the west and south along Ward Lake Road.

The nearest residence is approximately 875 feet from the western property line of the project site. Shaffer Elementary School is located 2.4 miles to the southeast of the project site.

Federal Clean Air Act

The federal Clean Air Act (CAA) was first signed into law in 1970. In 1977, and again in 1990, the law was substantially amended. The federal CAA is the foundation for a national air pollution control effort, and it is composed of the following basic elements: National Ambient Air Quality Standards (NAAQS) for criteria air pollutants, hazardous air pollutant standards, state attainment plans, motor control measures, stratospheric ozone protection, and enforcement provisions. The USEPA is responsible for administering the federal CAA. The federal CAA requires the USEPA to set NAAQS for several problem air pollutants based on human health and welfare criteria. Two types of NAAQS were established: primary standards, which protect public health, and secondary standards, which protect the public welfare from non-health-related adverse effects such as visibility reduction.

California Clean Air Act

The California CAA was first signed into law in 1988. The California CAA provides a comprehensive framework for air quality planning and regulation, and spells out, in statute, the state's air quality goals, planning and regulatory strategies, and performance. CARB is the agency responsible for administering the California CAA. CARB established California Ambient Air Quality Standards (CAAQS) pursuant to the California Health and Safety Code (CH&SC) [§39606(b)], which are similar to the federal standards.

Ambient Air Quality Standards

Regulation of air pollutants is achieved through both NAAQS and CAAQS and emissions limits for individual sources. Regulations implementing the federal CAA and its subsequent amendments established NAAQS (national standards) for the six criteria pollutants. California has adopted more stringent CAAQS (state standards) for most of the criteria air pollutants. In addition, California has established CAAQS for sulfates, hydrogen sulfide, vinyl chloride, and visibility-reducing particles. Because of the meteorological conditions in the state, there is considerable difference between state and federal standards in California.

The ambient air quality standards are intended to protect the public health and welfare, and they incorporate an adequate margin of safety. They are designed to protect those segments of the public most susceptible to respiratory distress, known as sensitive receptors, including asthmatics, the very young, elderly, people weak from other illness or disease, or persons engaged in strenuous work or exercise. Healthy adults can tolerate occasional exposure to air pollution levels somewhat above the ambient air quality standards before adverse health effects are observed.

Under amendments to the federal CAA, USEPA has classified air basins or portions thereof, as either "attainment" or "non-attainment" for each criteria air pollutant, based on whether or not the national standards have been achieved. The California CAA, which is patterned after the federal CAA, also requires areas to be designated as "attainment" or "non-attainment" for the state standards. Thus, areas in California have two sets of attainment/nonattainment designations: one set with respect to the federal standards and one set with respect to the state standards.

Table 1 shows the federal and state ambient air quality standards for different criteria pollutants and also summarizes the related health effects and principal sources for each pollutant.

Table 1: Ambient Air Quality Standards and Major Pollutant Sources

Pollutant	Averaging Time	State Standard	Federal Standard	Major Pollutant Sources
Ozone	8 hour	0.070 ppm	0.070 ppm	Formed when ROG and NOx react in the presence of sunlight. Major sources include on-road motor vehicles, solvent evaporation, and commercial/ industrial mobile equipment.
	1 hour	0.09 ppm	---	
Carbon Monoxide	8 hour	9.0 ppm	9 ppm	Internal combustion engines, primarily gasoline-powered motor vehicles
	1 Hour	20 ppm	35 ppm	
Nitrogen Dioxide	Annual Average	0.030 ppm	0.053 ppm	Motor vehicles, petroleum refining operations, industrial sources, aircraft, ships, and railroads
	1 Hour	0.18 ppm	0.100 ppm	
Sulfur Dioxide	Annual Average	---	0.030 ppm	Fuel combustion, chemical plants, sulfur recovery plants and metal processing
	24 Hour	0.04 ppm	0.14 ppm	
	1 Hour	0.25 ppm	0.075 ppm	
Particulate Matter (PM10)	Annual Arithmetic Mean	20 µg/m³	---	Dust- and fume-producing industrial and agricultural operations, combustion, atmospheric photochemical reactions, and natural activities (e.g., wind-raised dust and ocean sprays)
	24 hour	50 µg/m³	150 µg/m³	
Particulate Matter (PM2.5)	Annual Arithmetic Mean	12 µg/m³	12 µg/m³	Fuel combustion in motor vehicles, equipment, and industrial sources; residential and agricultural burning; also, formed from photochemical reactions of other pollutants, including NOx, sulfur oxides, and organics.
	24 hour	---	35 µg/m³	
Lead	Calendar Quarter	---	1.5 µg/m³	Present source: lead smelters, battery manufacturing & recycling facilities. Past source: combustion of leaded gasoline.
	30 Day Average	1.5 µg/m³	---	

NOTE: ppm = parts per million; and µg/m³ = micrograms per cubic meter
SOURCE: California Air Resources Board, *Air Quality Standards*, Accessed January 26, 2021, https://ww2.arb.ca.gov/resources/california-ambient-air-quality-standards.

Local Air Quality

There are no ambient air quality monitoring stations or other facilities conducting ambient air quality monitoring of toxic contaminants in Lassen County; therefore, local ambient concentrations are not available. The only ambient air quality monitoring station located in the Northeast Plateau Air Basin is the Yreka-Foothill Drive Monitoring Station, located approximately 170 miles northwest in Yreka within Siskiyou County. Consideration of data from "regional sites" impacted by similar natural and man-made sources is an accepted practice by the USEPA; therefore, a summary of ambient air quality monitoring data collected by the Yreka-Foothill Drive Monitoring Station for ozone and $PM_{2.5}$ (PM_{10} monitoring was discontinued in 2016) is provided in **Table 2**. Although the region experiences elevated concentrations, Lassen County is in attainment/unclassified for federal and state PM_{10} and $PM_{2.5}$ standards as well as ozone.[11]

Table 2: Air Quality Data Summary (2017 - 2019)

	Standard[a]	**2017**	**2018**	**2019**
Ozone				
Highest 1 Hour Average (ppm)[b]	0.090	0.053	0.089	0.069
Days over State Standard		0	0	0
Highest 8 Hour Average (ppm)[b]	0.070	0.049	**0.075**	0.059
Days over National Standard		0	**4**	0
Highest 8 Hour Average (ppm)[b]	0.070	0.049	0.075	0.059
Days over State Standard		0	4	0
Particulate Matter ($PM_{2.5}$)				
Highest 24 Hour Average (µg/m³)[b]	35	**79**	**143**	**74**
Days over National Standard		**26**	**57**	**4**
State Annual Average (µg/m³)[b]	12	11.1	**14.4**	5.9

NOTES: Values in **bold** are in excess of at least one applicable standard.

a. Generally, state standards and national standards are not to be exceeded more than once per year.
b. ppm = parts per million; µg/m³ = micrograms per cubic meter.
c. PM_{10} is not measured every day of the year. Number of estimated days over the standard is based on 365 days per year.

Source: California Air Resources Board, *Air Quality Trend Summaries*, https://www.arb.ca.gov/adam/trends/trends1.php

According to the Lassen County APCD, the Air Quality Index in Lassen County is classified as "GOOD" for the majority of the year, although events such as wildfires and inversion layers in winter months can periodically degrade air quality

[11] Maps of State and Federal Area Designations, https://ww2.arb.ca.gov/resources/documents/maps-state-and-federal-area-designations

According to the Lassen County 2012 Regional Transportation Plan, elevated PM_{10} concentrations can be caused by sources including fugitive dust, combustion from automobiles and heating, road salt, and conifers, among others. Constituents that comprise suspended particulates include organic, sulfate, and nitrate aerosols that are formed in the air from emitted hydrocarbons, chloride, sulfur oxides, and oxides of nitrogen. Particulates reduce visibility and pose a health hazard by causing respiratory and related problems CARB further identifies motor vehicles, wood-burning stoves and fireplaces, dust from construction, landfills, and agriculture, wildfires and brush/waste burning, industrial sources, and windblown dust from open lands as major sources of PM_{10}.

Toxic Air Contaminants

Toxic Air Contaminants (TAC) are pollutants that may be expected to result in an increase in mortality or serious illness or that may pose a present or potential hazard to human health. Health effects include cancer, birth defects, neurological damage, damage to the body's natural defense system, and diseases that lead to death. Although ambient air quality standards exist for criteria pollutants, no such standards exist for TAC. Many pollutants are identified as TAC because of their potential to increase the risk of developing cancer or because of their acute or chronic health risks. For TAC that are known or suspected carcinogens, the CARB has consistently found that there are no levels or thresholds below which exposure is free of risk. Individual TAC vary greatly in the risk they present. At a given level of exposure, one TAC may pose a hazard that is many times greater than another. For certain TAC, a unit risk factor can be developed to evaluate cancer risk. For acute and chronic health risks, a similar factor called a Hazard Index is used to evaluate risk. In the early 1980s, CARB established a statewide comprehensive air toxics program to reduce exposure to air toxics. The Toxic Air Contaminant Identification and Control Act (Assembly Bill [AB] 1807) created California's program to reduce exposure to air toxics. The Air Toxics "Hot Spots" Information and Assessment Act (AB 2588) supplements the AB 1807 program by requiring a statewide air toxics inventory and notification of people exposed to a significant health risk and sensitive receptors.

Lassen County General Plan

The Natural Resources Element of the Lassen County General Plan includes the following applicable goal, policies, and implementation measures related to air quality:[12]

Goal N-22: Air quality of high standards to safeguard public health, visual quality, and the reputation of Lassen County as an area of exceptional air quality.

[12] Lassen County General Plan, *Natural Resources Element*, September 1999.

Policy NR-74: The Board of Supervisors will continue to consider, adopt and enforce feasible air quality standards which protect the quality of the County's air resources.

NR-Q: The County will continue to regulate the emission of pollutants within its jurisdiction through the regulations and procedures adopted for the Lassen County APCD.

NR-R: In review of proposed projects pursuant to the CEQA, the County shall consider potential air quality impacts and shall, through the APCD, support appropriate measures for mitigation of significant environmental impacts upon air quality.

Policy NR-75: The County shall consider the appropriateness and feasibility of air pollution control requirements for individual projects and may grant variances to specific requirements pursuant to established procedural guidelines.

Lassen County APCD Rule 4:18 (Fugitive Dust Emissions)

Compliance with regulatory requirements related to fugitive dust are applicable to reduce impacts to less than significant. Based on Lassen County APCD Rule 4:18 (Fugitive Dust Emissions), reasonable precautions shall be taken to prevent particulate matter from becoming airborne, including, but not limited to, the following provisions:

a. Covering open bodied trucks when used for transportation materials likely to give rise to airborne dust.

b. Installation and use of hoods, fans, and other fabric filters to enclose and vent the handling of dusty materials. Containment methods may be employed during sandblasting and other similar operations.

c. The application of asphalt, oil, water or suitable chemicals to dirt roads, material stockpiles, land clearing, excavation, grading or other surfaces which can give rise to airborne dusts.

d. The prompt removal of earth or other material from paved streets onto which earth or other material for earth moving equipment, erosion by water, or other means has been deposited.

4.0 IMPACT ANALYSIS

Short-term (daily) and long-term (annual) air quality impacts related to the operation of the proposed project were evaluated. The analysis focuses on daily and annual emissions from operational (mobile, area, stationary, and fugitive sources) activities. The proposed project could affect air quality during proposed project operations. Construction activities would be minimal as it is a modification of the annual production levels for existing equipment.

Regulatory requirements such as fugitive dust measures are incorporated into the impact analysis. Regulatory models used to estimate air quality impacts include:

- CARB EMFAC[13] emissions inventory model. EMFAC is the latest emission inventory model that calculates emission inventories and emission rates for motor vehicles operating on roads in California. This model reflects CARB's current understanding of how vehicles travel and how much they emit. EMFAC can be used to show how California motor vehicle emissions have changed over time and are projected to change in the future.
- CARB OFFROAD[14] emissions inventory model. OFFROAD is the latest emission inventory model that calculates emission inventories and emission rates for off-road equipment such as loaders, excavators, and off-road haul trucks operating in California. This model reflects CARB's current understanding of how equipment operates and how much they emit. OFFROAD can be used to show how California off-road equipment emissions have changed over time and are projected to change in the future.
- USEPA AP-42, Compilation of Air Pollutant Emission Factors, has been published since 1972 as the primary compilation of USEPA's emission factor information. It contains emission factors and process information for more than 200 air pollution source categories. A source category is a specific industry sector or group of similar emitting sources. The emission factors have been developed and compiled from source test data, material balance studies, and engineering estimates.[15]
- AERMOD (American Meteorological Society/USEPA Regulatory Model, Version 19191) is an atmospheric dispersion model which can simulate point, area, volume, and line emissions sources and has the capability to include simple, intermediate, and complex terrain along with meteorological conditions and multiple receptor locations.[16,17]

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[13] California Air Resources Board, *EMFAC2017 User's Guide*, March 1, 2018, Accessed January 15, 2021, https://ww3.arb.ca.gov/msei/downloads/emfac2017-volume-i-users-guide.pdf and https://www.arb.ca.gov/emfac/2017/

[14] California Air Resources Board, *Mobile Source Emissions Inventory Documentation – Off Road Diesel Equipment*, Accessed January 15, 2021, https://ww2.arb.ca.gov/our-work/programs/mobile-source-emissions-inventory/road-documentation/msei-documentation-road and https://ww3.arb.ca.gov/msei/ordiesel/ordas_ef_fcf_2017.pdf

[15] US Environmental Protection Agency, AP 42, Compilation of Air Pollutant Emission Factors, Fifth Edition, Volume I, Accessed January 26, 2021, https://www.epa.gov/air-emissions-factors-and-quantification/ap-42-compilation-air-emissions-factors

[16] US Environmental Protection Agency, Preferred/Recommended Models, *AERMOD Modeling System*, Accessed January 26, 2021, https://www3.epa.gov/ttn/scram/dispersion_prefrec.htm#aermod

[17] Title 40 CFR Part 51, *Revision to the Guideline on Air Quality Models: Adoption of a Preferred General Purpose (Flat and Complex Terrain) Dispersion Model and Other Revisions; Final Rule,* Accessed January 26, 2021, http://www.epa.gov/ttn/scram/guidance/guide/appw_05.pdf

AERMOD is commonly executed to yield 1-hour maximum and annual average concentrations (in μg/m³) at each receptor.

Threshold of Significance

The significance of potential impacts was determined based on State CEQA Guidelines, Appendix G. Using Appendix G evaluation thresholds, the proposed project would be considered to have significant air quality impacts if it were to:

A. Conflict with or obstruct implementation of the applicable air quality plan;
B. Result in a cumulatively considerable net increase of any criteria pollutant for which the project region is non-attainment under an applicable federal or state ambient air quality standard;
C. Expose sensitive receptors to substantial pollutant concentrations; or
D. Result in other emissions (such as those leading to odors) adversely affecting a substantial number of people.

The thresholds of significance applied to assess project-level health impacts are: exposure of persons by siting a new source or a new sensitive receptor to substantial levels of TAC resulting in (a) a cancer risk level greater than 10 in one million, and (b) a noncancerous risk (chronic or acute) hazard index greater than 1.0. For this threshold, sensitive receptors include residential uses, schools, parks, daycare centers, nursing homes, and medical centers. Lassen County does not contain thresholds of significance for cumulative health impacts. Therefore, it is appropriate to use the project-level thresholds because the project-level threshold identifies project's incremental contribution to health impacts. Project impacts which are below the project-level thresholds would be presumed to contribute a less than significant health impact to the cumulative condition (i.e., less than cumulatively considerable net increase). Lastly, Lassen County does not contain thresholds of significance related to $PM_{2.5}$ concentrations associated with project emissions.[18]

Lassen County Rules and Regulations include general provisions and rules for APCD-issued permits, fees, prohibitions (including but not limited to nuisance, particulate matter, specific air contaminants, open burning, gasoline storage, reduction of odorous matter, fugitive dust emissions, and equipment breakdown), procedures, new source siting, and Title V permits.

[18] The Bay Area Air Quality Management District has a $PM_{2.5}$ concentration threshold for health impacts and a cumulative threshold for health impacts and the South Coast Air Quality Management District has PM_{10} and $PM_{2.5}$ concentration thresholds. These thresholds have been adopted by these air districts, in part, due to the region's nonattainment status with regard to these pollutions. Lassen County is in attainment/unclassified for federal and state PM_{10} and $PM_{2.5}$ standards as well as ozone. It is not required that Lassen County implement thresholds of significance that other air districts have deemed necessary for their air pollution situation.

Operation of the project would be implemented in compliance with the Lassen County APCD Air Quality Rules and Regulations. The proposed project would be required to modify its air quality permit.

Lassen County APCD has a nuisance rule which implicitly regulates pollutants other than those for which criteria standards have been adopted. Rule 4:2 states that a person shall not discharge from any source whatsoever such quantities of air contaminants or other materials which cause injury, detriment, nuisance or annoyance to any considerable number of persons or to the public or which endanger the comfort, repose, health or safety of any such persons or the public or which cause or have a natural tendency to cause injury or damage to business and property. Rule 4:2 may be interpreted to restrict ambient concentrations of pollutants, such as toxic and hazardous pollutants, until other standards are in place.

Lassen County APCD Rule 4:18 states that reasonable precautions shall be taken to prevent particulate matter from becoming airborne and allows for the application of asphalt, oil, water, or suitable chemicals to dirt roads, material stockpiles, land clearing, excavation, grading or other surfaces which can give rise to airborne dusts.

Additionally, the Lassen County APCD Rule 6:4 includes the following Best Available Control Technology (BACT) Emission thresholds: An applicant shall apply BACT to a new source or modification of an existing source, except cargo carriers, for each affected pollutant emitted, including halogenated hydrocarbons, under the following conditions:

1). A new stationary source emits more than 150 pound per day of ROG, NO_x, PM_{10}, or $PM_{2.5}$; or 550 pounds per day of CO. These hourly thresholds are equivalent to 27 tons per year and 100 tons per year, respectively, based on 365 days per year.

2). A modification of an existing stationary source will result in a net emission increase of an affected pollutant by an amount more than any of the limits above.

3). A new source or modification subject to BACT for any pollutant subject to this section shall apply BACT for any other affected pollutant emitted from the new source or modification, if the Air Pollution Control Officer should so require.

Air Emission Estimates

The air quality analysis focuses on pollutant (combustion and fugitive dust) emissions associated with the aggregate processing operations, blasting operations, and supporting equipment (i.e., diesel generators associated with crushing and wash plant and offroad equipment such as loaders, excavators, and dozers).

Table 1 displays the daily emissions for the existing conditions. **Table 2** displays the daily emissions for the proposed project. **Table 3** displays the incremental daily (proposed project minus existing condition) emissions for the proposed project. The only incremental daily emissions change is related to the blasting operations due to greater blasting zone size. The daily processing rates would not change and thus, the associated daily emissions would not change.

TABLE 1
Existing Conditions Daily Emissions (pounds)

Emission Source	ROG	CO	NO_x	SO_2	PM_{10}	$PM_{2.5}$
Onsite Equipment	0.94	9.23	6.13	0.03	0.22	0.21
Generator - Crushing Plant	1.34	14.8	200	123	1.75	1.75
Generator - Portable Plant	0.71	13.0	87.5	13.2	1.50	1.50
Generator - Wash Plant	0.70	12.9	86.4	13.0	1.48	1.48
Aggregate Plant	-	-	-	-	16.5	2.48
Wash Plant	-	-	-	-	4.12	0.62
Sand Plant	-	-	-	-	9.38	1.41
Unpaved Travel	-	-	-	-	22.2	3.33
Material Handling	-	-	-	-	2.33	0.35
Blasting	-	-	-	-	4.04	0.61
Haul Trucks	0.73	7.61	91.6	0.39	0.43	0.41
Total	**4.43**	**57.6**	**471**	**150**	**64.0**	**14.1**

Source: RCH Group, 2021.

TABLE 2
Proposed Project Daily Emissions (pounds)

Emission Source	ROG	CO	NO_x	SO_2	PM_{10}	$PM_{2.5}$
Onsite Equipment	0.94	9.23	6.13	0.03	0.22	0.21
Generator - Crushing Plant	1.34	14.8	200	123	1.75	1.75
Generator - Portable Plant	0.71	13.0	87.5	13.2	1.50	1.50
Generator - Wash Plant	0.70	12.9	86.4	13.0	1.48	1.48
Aggregate Plant	-	-	-	-	16.5	2.48
Wash Plant	-	-	-	-	4.12	0.62
Sand Plant	-	-	-	-	9.38	1.41
Unpaved Travel	-	-	-	-	22.2	3.33
Material Handling	-	-	-	-	2.33	0.35
Blasting	-	-	-	-	7.42	1.11
Haul Trucks	0.73	7.61	91.6	0.39	0.43	0.41
Total	**4.43**	**57.6**	**471**	**150**	**67.3**	**14.6**

Source: RCH Group, 2021.

TABLE 3
Daily Increment Emissions (pounds)

Emission Source	ROG	CO	NO_x	SO_2	PM_{10}	$PM_{2.5}$
Existing Condition	4.43	57.6	471	150	64.0	14.1
Proposed Project	4.43	57.6	471	150	67.3	14.6
Project Increment	**0.52**	**5.71**	**77.1**	**47.6**	**12.3**	**2.42**
Significance Threshold	150	550	150	-	150	150
Significant (Yes/No)	No	No	No	-	No	No

Source: RCH Group, 2021.

Table 4 displays the annual emissions for the existing conditions. **Table 5** displays the annual emissions for the proposed project. **Table 6** displays the incremental annual (proposed project minus existing condition) emissions for the proposed project. The incremental annual emissions would be greater due to the proposed project as a result of the greater annual production rates.

TABLE 4
Existing Conditions Annual Emissions (tons)

Emission Source	ROG	CO	NO_x	SO_2	PM_{10}	$PM_{2.5}$
Onsite Equipment	0.03	0.34	0.23	<0.01	0.01	0.01
Generator - Crushing Plant	0.18	2.01	27.2	16.8	0.24	0.24
Generator - Portable Plant	0.10	1.78	11.9	1.80	0.20	0.20
Generator - Wash Plant	0.10	1.76	11.8	1.78	0.20	0.20
Aggregate Plant	-	-	-	-	0.23	0.03
Wash Plant	-	-	-	-	0.07	0.01
Sand Plant	-	-	-	-	0.07	0.01
Unpaved Travel	-	-	-	-	1.33	0.20
Material Handling	-	-	-	-	0.14	0.02
Blasting	-	-	-	-	0.01	0.00
Haul Trucks	0.01	0.11	1.35	0.01	0.01	0.01
Total	**0.42**	**6.00**	**52.5**	**20.4**	**2.51**	**0.94**

Source: RCH Group, 2021.

TABLE 5
Proposed Project Annual Emissions (tons)

Emission Source	ROG	CO	NO_x	SO_2	PM_{10}	$PM_{2.5}$
Onsite Equipment	0.06	0.61	0.39	<0.01	0.01	0.01
Generator - Crushing Plant	0.23	2.50	33.9	20.9	0.30	0.30
Generator - Portable Plant	0.10	1.78	11.9	1.80	0.20	0.20
Generator - Wash Plant	0.10	1.76	11.8	1.78	0.20	0.20
Aggregate Plant					0.47	0.07

Wash Plant					0.07	0.01
Sand Plant					0.07	0.01
Unpaved Travel					2.00	0.30
Material Handling					0.21	0.03
Blasting					0.03	0.00
Haul Trucks	0.01	0.11	1.35	0.01	0.01	0.01
Total	**0.49**	**6.76**	**59.3**	**24.5**	**3.55**	**1.15**

Source: RCH Group, 2021.

TABLE 6
Annual Increment Emissions (pounds)

Emission Source	ROG	CO	NO_x	SO_2	PM_{10}	$PM_{2.5}$
Existing Condition	0.42	6.00	52.5	20.4	2.51	0.94
Proposed Project	0.49	6.76	59.3	24.5	3.55	1.15
Project Increment	**0.07**	**0.77**	**6.80**	**4.10**	**1.04**	**0.21**
Significance Threshold	27	100	27	-	27	27
Significant (Yes/No)	No	No	No	-	No	No

Source: RCH Group, 2021.

Notably, the existing emissions are in compliance via the permit to operate (PTO-19-140: expiration date March 31, 2024) for onsite equipment. This analysis is focused on the incremental emissions (proposed project minus existing condition) compared to the thresholds of significance.

The incremental daily emissions of ROG, CO, NOx, PM_{10}, and $PM_{2.5}$ are less than the significance thresholds. The incremental annual emissions of ROG, CO, NOx, PM_{10}, and $PM_{2.5}$ are less than the significance thresholds. The incremental change in emissions is solely related to the project elements associated with the aggregate plant and supporting activities (generator, unpaved travel, material handling, and blasting). The supporting information, methodology, assumptions, and results used in the air quality analysis are provided in **Attachment A: Air Quality Calculations**.

Health Impacts

The proposed project would constitute an emission source of DPM due to operations associated with generators, offroad equipment, and haul trucks. Studies have demonstrated that DPM from diesel-fueled engines is a human carcinogen and that chronic (long-term) inhalation exposure to DPM poses a chronic health risk.

Health effects from carcinogenic air toxics are usually described in terms of individual cancer risk. Individual cancer risk is the likelihood that a person exposed to air toxic concentrations over a 70-year lifetime will contract cancer, based on the use of standard risk-assessment methodology. The maximally exposed individual represents the worst–case risk estimate, based on a theoretical person continuously exposed for a lifetime at the point of highest compound concentration in the air. This is a highly conservative assumption, since most people do not remain at home all day and on average residents change residences every 11 to 12 years. In addition, this assumption assumes that residents are experiencing outdoor concentrations for the entire exposure period.

This HRA analyzes the incremental cancer risks to sensitive receptors in the vicinity of the proposed project, using emission rates (in pounds per hour) from USEPA AP-42, *Compilation of Air Pollutant Emission Factors*, and vender specifications. DPM emission rates were input into the USEPA's AERMOD atmospheric dispersion model to calculate ambient air concentrations at receptors in the proposed project vicinity. This HRA is intended to provide a worst–case estimate of the increased exposure by employing a standard emission estimation program, an accepted pollutant dispersion model, approved toxicity factors, and conservative exposure parameters.

In accordance with OEHHA *Air Toxics Hot Spots Program Guidance Manual for Preparation of Health Risk Assessments,* this HRA was accomplished by applying the highest estimated concentrations of TAC at the receptors analyzed to the established cancer potency factors and acceptable reference concentrations for non-cancer health effects. Increased cancer risks were calculated using the modeled DPM concentrations and OEHHA-recommended methodologies for both a child exposure (3rd trimester through 2 years of age) and adult exposure. The cancer risk calculations were based on applying the OEHHA-recommended age sensitivity factors and breathing rates, as well as fraction of time at home and an exposure duration of 30 years, to the DPM concentration exposures. Age-sensitivity factors reflect the greater sensitivity of infants and small children to cancer causing air pollutants. The supporting methodology and assumptions used in this HRA are provided in **Attachment B: Health Risk Assessment Methodology, Assumptions, and Results**.

These conservative methodologies overestimate both non-carcinogenic and carcinogenic health risk, possibly by an order of magnitude or more. Therefore, for carcinogenic risks, the actual probabilities of cancer formation in the populations of concern due to exposure to carcinogenic pollutants are likely to be lower than the risks derived using the HRA methodology. The extrapolation of toxicity data in animals to humans, the estimation of concentration prediction methods within dispersion models; and the variability in lifestyles, fitness and other confounding factors of the human population also contribute to the overestimation of health impacts. Therefore, the results of this HRA are highly overstated.

The following describes the HRA results associated with existing receptors due to existing condition and proposed project activities. The maximum cancer risk from existing condition emissions for a residential-adult receptor would be 0.17 per million and for a residential-child receptor would be 1.35 per million. The maximum cancer risk from proposed project emissions for a residential-adult receptor would be 0.52 per million and for a residential-child receptor would be 1.91 per million.

Therefore, the incremental cancer risk for a residential-adult receptor would be 0.35 per million and for a residential-child receptor would be 0.56 per million. Thus, the cancer risk due to project operations would be below the significance threshold of 10 per million and would be a less-than-significant health impact. The HRA results reflect the increased DPM emissions as a result of the proposed project (greater annual usage of offroad equipment to extract additional aggregate materials (i.e., 200,000 vs 100,000 tons) but also the location in which that materials would be extracted (i.e., within the 78.6 acres which are located further from nearby sensitive receptors) and the additional 20 years of activities.

Non-Cancer Health Hazard

Both acute (short-term) and chronic (long-term) adverse health impacts unrelated to cancer are measured against a hazard index (HI), which is defined as the ratio of the predicted incremental DPM exposure concentration from the proposed project to a reference exposure level (REL) that could cause adverse health effects. The REL are published by OEHHA based on epidemiological research. The ratio (referred to as the Hazard Quotient [HQ]) of each non-carcinogenic substance that affects a certain organ system is added to produce an overall HI for that organ system. The overall HI is calculated for each organ system. The impact is considered to be significant if the overall HI for the highest-impacted organ system is greater than 1.0.

The chronic reference exposure level for DPM was established by the California OEHHA[19] as 5 $\mu g/m^3$. Thus, the proposed project-related annual concentration of DPM cannot exceed 5.0 $\mu g/m^3$; resulting in a chronic acute HI of greater than 1.0 (i.e., DPM annual concentration/5.0 $\mu g/m^3$). The chronic HI would be less than 0.01. The chronic HI would be below the significance threshold of 1 and the impact of the proposed project would therefore be less than significant.

Cumulative Health Impacts

As shown, project-related health impacts would be less than significant. Therefore, the proposed project would not contribute significantly to cumulative health impacts. Because there is no substantial evidence of a project-specific potentially significant health impact, it is reasonable to

[19] California Office of Environmental Health Hazards Assessment - Acute, 8-hour, and Chronic Reference Exposure Levels, June 2014, Accessed January 26, 2021, http://www.oehha.ca.gov/air/allrels.html

determine that the effects of the proposed project would be a less than significant cumulative impacts and no further analysis is required.

Odor Impacts

Though offensive odors from stationary and mobile sources rarely cause any physical harm, they still remain unpleasant and can lead to public distress, generating citizen complaints to local governments. The occurrence and severity of odor impacts depend on the nature, frequency, and intensity of the source; wind speed and direction; and the sensitivity of receptors.

Eight homes are located on parcels from 10 to 80 acres in size to the west and south along Ward Lake Road. The nearest residence is approximately 875 feet from the western property line of the Project Site. Shaffer Elementary School is located 2.4 miles to the southeast of the Project Site. There are approximately 24 residences abutting Highway 395 and Center Road. Traveling farther west along Center Road, toward the California State Correctional Center, there are approximately six additional residences.

Due to the subjective nature of odor impacts, the number of variables that can influence the potential for an odor impact, and the variety of odor sources, there are no quantitative or formulaic methodologies to determine the presence of a significant odor impact. Rather, often air districts recommend that odor analyses strive to fully disclose all pertinent information. The intensity of an odor source's operations and its proximity to sensitive receptors influences the potential significance of odor emissions. For example, San Joaquin Valley Unified Air Pollution Control District has identified some common types of facilities that have been known to produce odors.[20]

Land uses and industrial operations that typically are associated with odor complaints include agricultural uses, wastewater treatment plants, food processing plants, chemical plants, composting, refineries, landfills, solid waste transfer stations, rendering plants, dairies, and fiberglass molding. The proposed project would not fall into any of these categories. Operation of the proposed project would result in fugitive dust and combustion emissions, which would not be expected to generate odors.

Notably, the primary wind direction is from the west and south. Therefore, the primary wind direction is from the residences towards the project site. Odor emissions are highly dispersive, especially in areas with higher average wind speeds. However, odors disperse less quickly during inversions or during calm conditions, which hamper vertical mixing and dispersion.

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[20] San Joaquin Valley Unified Air Pollution Control District, Final Draft Guidance for Assessing and Mitigating Air Quality Impacts, March 19, 2015, https://www.valleyair.org/transportation/GAMAQI-2015/FINAL-DRAFT-GAMAQI.PDF

A majority of the proposed project operations would occur from April through October which is not typically the season associated with inversion conditions (i.e., occur during wintertime). Inversion conditions may also result in odor impacts due to air stagnation. Given that the proposed project would not operate during the months when inversion condition is more common, the likelihood of odor impacts due to the proposed project would be reduced.

Lastly, based on information obtained from the Lassen County APCD, no complaints were filed related to odor issues (including the existing asphalt plant) in the past five years. Given the previous information, odor impacts associated with the location of the proposed project would be less than significant.

6.0 GREENHOUSE GAS ANALYSIS

"Global warming" and "global climate change" are the terms used to describe the increase in the average temperature of the earth's near-surface air and oceans since the mid-20th century and its projected continuation. Warming of the climate system is now considered to be unequivocal, with global surface temperature increasing approximately 1.33 degrees Fahrenheit (°F) over the last 100 years. Continued warming is projected to increase global average temperature between 2 and 11°F over the next 100 years.

Natural processes and human actions have been identified as the causes of this warming. The International Panel on Climate Change (IPCC) concludes that variations in natural phenomena such as solar radiation and volcanoes produced most of the warming from pre-industrial times to 1950 and had a small cooling effect afterward.[21] After 1950, however, increasing GHG concentrations resulting from human activity such as fossil fuel burning and deforestation have been responsible for most of the observed temperature increase. These basic conclusions have been endorsed by more than 45 scientific societies and academies of science, including all of the national academies of science of the major industrialized countries. Since 2007, no scientific body of national or international standing has maintained a dissenting opinion.

Increases in GHG concentrations in the earth's atmosphere are thought to be the main cause of human-induced climate change. The IPCC is now 95 percent certain that humans are the main cause of current global warming.[22] GHG naturally trap heat by impeding the exit of solar radiation that has hit the earth and is reflected back into space. Some GHG occur naturally and

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[21] IPCC, *2014: Climate Change 2014: Synthesis Report. Contribution of Working Groups I, II and III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change*, Accessed January 26, 2021, https://www.ipcc.ch/site/assets/uploads/2018/05/SYR_AR5_FINAL_full_wcover.pdf

[22] IPCC, *2014: Climate Change 2014: Synthesis Report. Contribution of Working Groups I, II and III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change*, Accessed January 26, 2021, https://www.ipcc.ch/site/assets/uploads/2018/05/SYR_AR5_FINAL_full_wcover.pdf

are necessary for keeping the earth's surface inhabitable. However, increases in the concentrations of these gases in the atmosphere during the last 100 years have decreased the amount of solar radiation that is reflected back into space, intensifying the natural greenhouse effect and resulting in the increase of global average temperature.

Gases that trap heat in the atmosphere are referred to as GHG because they capture heat radiated from the sun as it is reflected back into the atmosphere, much like a greenhouse does. The accumulation of GHG has been implicated as the driving force for global climate change. The primary GHG are carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (N_2O), ozone, and water vapor.

While the presence of the primary GHG in the atmosphere are naturally occurring, CO_2, CH_4, and N_2O are also emitted from human activities, accelerating the rate at which these compounds occur within earth's atmosphere. Emissions of CO_2 are largely by-products of fossil fuel combustion, whereas methane results from off-gassing associated with agricultural practices, coal mines, and landfills. Other GHG include hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride, and are generated in certain industrial processes.

CO_2 is the reference gas for climate change because it is the predominant GHG emitted. The effect that each of the aforementioned gases can have on global warming is a combination of the mass of their emissions and their global warming potential (GWP). GWP indicates, on a pound-for-pound basis, how much a gas is predicted to contribute to global warming relative to how much warming would be predicted to be caused by the same mass of CO_2. CH_4 and N_2O are substantially more potent GHG than CO_2, with GWP of 28 and 265 times that of CO_2, respectively.[23]

In emissions inventories, GHG emissions are typically reported in terms of pounds or metric tons (MT) of CO_2 equivalents (CO_2e). CO_2e are calculated as the product of the mass emitted of a given GHG and its specific GWP. While CH_4 and N_2O have much higher GWP than CO_2, CO_2 is emitted in such vastly higher quantities that it accounts for the majority of GHG emissions in CO_2e.

Fossil fuel combustion, especially for the generation of electricity and powering of motor vehicles, has led to substantial increases in CO_2 emissions (and thus substantial increases in atmospheric concentrations of CO_2). In pre-industrial times (c. 1860), concentrations of atmospheric CO_2 were approximately 280 parts per million (ppm). By November 2020,

[23] IPCC, *2014: Climate Change 2014: Synthesis Report. Contribution of Working Groups I, II and III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change*, Accessed January 26, 2021, https://www.ipcc.ch/site/assets/uploads/2018/05/SYR_AR5_FINAL_full_wcover.pdf

atmospheric CO_2 concentrations had increased to 413 ppm, 48 percent above pre-industrial concentrations.[24]

There is international scientific consensus that human-caused increases in GHGs have and will continue to contribute to global warming. Potential global warming impacts in California may include, but are not limited to, loss in snow pack, sea level rise, more extreme heat days per year, more high ozone days, more large forest fires, and more drought years. Secondary effects are likely to include a global rise in sea level, impacts to agriculture, changes in disease vectors, and changes in habitat and biodiversity.[25]

Regulatory Setting

California Assembly Bill (AB) 32 establishes regulatory, reporting, and market mechanisms to achieve quantifiable reductions in GHG emissions and establishes a cap on statewide GHG emissions. AB 32 requires that statewide GHG emissions be reduced to 1990 levels by 2020. This reduction is in the process of being accomplished by enforcing a statewide cap on GHG emissions that was phased in starting in 2012. Towards this progress, in 2018, California emitted approximately 425 million metric tons of CO_2e, six million metric tons of CO_2e below the 2020 GHG limit of 431 million metric tons of CO_2e and two million metric tons of CO2e below the 1990 GHG limit of 427 million metric tons of CO_2e. To effectively implement the cap, CARB develops and implements regulations to reduce statewide GHG emissions from stationary sources. California has taken these measures, because no project individually could have a major impact (either positively or negatively) on the global concentration of GHG.

AB 32 required CARB to adopt a quantified cap on GHG emissions representing 1990 emissions levels and disclosed how it arrived at the cap; instituted a schedule to meet the emissions cap; and developed tracking, reporting, and enforcement mechanisms to ensure that the state reduced GHG emissions enough to meet the cap. AB 32 also included guidance on instituting emissions reductions in an economically efficient manner, along with conditions to ensure that businesses and consumers were not unfairly affected by the reductions. Using these criteria to reduce statewide GHG emissions to 1990 levels by 2020 represented an approximate 25 to 30 percent reduction in emissions levels. However, CARB had discretionary authority to seek greater reductions in more significant and growing GHG sectors, such as transportation, as compared to other sectors that were not anticipated to significantly increase emissions.

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[24] National Oceanographic and Atmospheric Administration - Earth System Research Laboratory, *Recent Monthly Mean CO2 at Mauna Loa*, Accessed January 26, 2021, www.esrl.noaa.gov/gmd/ccgg/trends/

[25] California Environmental Protection Agency, *Final Climate Action Team Report to the Governor and Legislature, March 2006*, Accessed January 26, 2021, http://documents.cityofdavis.org/Media/CityCouncil/Documents/PDF/CDD/Planning/Subdivisions/West-Davis-Active-Adult-Community/Reference-Documents/CalEPA_2006_Climate_Action_Team_Report_to_Gov-and_Leg.PDF

AB 32 required CARB to develop a Scoping Plan that describes the approach California will take to reduce GHGs to achieve the goal of reducing emissions to 1990 levels by 2020. The Scoping Plan was first approved by CARB in 2008 and must be updated every five years. The initial AB 32 Scoping Plan contained the main strategies for California to reduce the GHG. The initial Scoping Plan had a range of GHG reduction actions which included direct regulations, alternative compliance mechanisms, monetary and non-monetary incentives, voluntary actions, market-based mechanisms such as a cap-and-trade system, and an AB 32 program implementation fee regulation to fund the program. In August 2011, the initial Scoping Plan was approved by CARB.

The 2013 Scoping Plan Update built upon the initial Scoping Plan with new strategies and recommendations. The 2013 Update identified opportunities to leverage existing and new funds to further drive GHG emission reductions through strategic planning and targeted low carbon investments. The 2013 Update defined climate change priorities for the subsequent five years and set the groundwork to reach California's long-term climate goals set forth in Executive Order S-3-05.[26] The 2013 Scoping Plan Update highlighted California progress toward meeting the near-term 2020 GHG emission reduction goals defined in the initial Scoping Plan. In the 2013 Update, nine key focus areas were identified (energy, transportation, agriculture, water, waste management, and natural/working lands, along with short-lived climate pollutants, green buildings, and the cap-and-trade program). On May 22, 2014, the First Update to the Climate Change Scoping Plan was approved by CARB.

On April 29, 2015, Executive Order No. B-30-15 was issued to establish a California GHG reduction target of 40 percent below 1990 levels by 2030. The new plan, outlined in SB 32, involves increasing renewable energy use, putting more electric cars on the road, improving energy efficiency, and curbing emissions from key industries. It is designed so State agencies do not fall behind the pace of reductions necessary to reach the existing 2050 reduction goal. Executive Order No. B-30-15 orders "All State agencies with jurisdiction over sources of GHG emissions shall implement measures, pursuant to statutory authority, to achieve reductions of GHG emissions to meet the 2030 and 2050 targets." The Executive Order also states that "CARB shall update the Climate Change Scoping Plan to express the 2030 target in terms of million metric tons of carbon dioxide equivalent." On November 30, 2017, the Second Update to the Climate Change Scoping Plan was approved by the CARB.

[26] In 2005, in recognition of California's vulnerability to the effects of climate change, then-Governor Arnold Schwarzenegger established Executive Order S-3-05, which sets forth the following target dates by which statewide GHG emissions would be progressively reduced: by 2010, reduce GHG emissions to 2000 levels; by 2020, reduce GHG emissions to 1990 levels; and by 2050, reduce GHG emissions to 80 percent below 1990 levels.

Greenhouse Gas Regional Emission Estimates

Worldwide emissions of GHG in 2017 were estimated at 48.4 billion metric tons of CO_2e.[27] This value includes ongoing emissions from industrial and agricultural sources but excludes emissions from land use changes.

In 2018, the United States emitted about 6,677 million metric tons of CO_2. Emissions increased from 2017 to 2018 by 3.1 percent. The increase in 2018 was largely driven by an increase in emissions from fossil fuel combustion, which was a result of multiple factors, including more electricity use greater due to greater heating and cooling needs due to a colder winter and hotter summer in 2018 in comparison to 2017.[28] GHG emissions in 2018 (after accounting for sequestration from the land sector) were 10.2 percent below 2005 levels.

In 2018, California emitted approximately 425 million metric tons of CO_2e, 0.8 million metric tons of CO_2e higher than 2017 levels and six million metric tons of CO_2e below the 2020 GHG limit of 431 million metric tons of CO_2e).[29] Consistent with recent years, these reductions have occurred while California's economy has continued to grow and generate jobs. The transportation sector remains the largest source of GHG emissions in the state with 40 percent of the emissions in 2018 but saw a decrease in emissions compared to 2017.[30]

Emissions from the electricity sector account for 15 percent of the inventory and showed a slight increase in 2018 due to less hydropower. California in 2018 used more electricity from zero-GHG sources (for the purpose of the GHG inventory, these include hydro, solar, wind, and nuclear energy) than from GHG-emitting sources for both in-state generation and total (in-state plus imports) generation. The industrial sector has seen steady emissions in the past few years and remains at 21 percent of the inventory.[31]

Thresholds of Significance

At this time, neither the Lassen County APCD nor the County itself has adopted numerical thresholds of significance for GHG emissions that would apply to the proposed project. Lassen County recommends that all projects subject to CEQA review be considered in the context of GHG emissions and climate change impacts, and that CEQA documents include a

[27] World Resources Institute, *Climate Analysis Indicator Tool – Global Historical GHG Emissions*, Accessed January 26, 2021, https://www.climatewatchdata.org/ghg-emissions?end_year=2017&start_year=1990

[28] United States Environmental Protection Agency, *Inventory of U.S. Greenhouse Gas Emissions and Sinks*, April 13, 2020, Accessed January 26, 2021, https://www.epa.gov/ghgemissions/inventory-us-greenhouse-gas-emissions-and-sinks

[29] California Air Resources Board, *Emissions Trends Report 2000-2018 (2020 Edition)*, Accessed January 26, 2021, https://ww3.arb.ca.gov/cc/inventory/pubs/reports/2000_2018/ghg_inventory_trends_00-18.pdf

[30] California Air Resources Board, *Emissions Trends Report 2000-2018 (2020 Edition)*, Accessed January 26, 2021, https://ww3.arb.ca.gov/cc/inventory/pubs/reports/2000_2018/ghg_inventory_trends_00-18.pdf

[31] California Air Resources Board, *Emissions Trends Report 2000-2018 (2020 Edition)*, Accessed January 26, 2021, https://ww3.arb.ca.gov/cc/inventory/pubs/reports/2000_2018/ghg_inventory_trends_00-18.pdf

quantification of GHG emissions from all project sources, as well as minimize and mitigate GHG emissions as feasible. The proposed project would generate GHG emissions through long-term operational activities.

Considering the lack of established GHG emissions thresholds that would apply to the proposed project, CEQA allows lead agencies to identify thresholds of significance applicable to a project that are supported by substantial evidence. Substantial evidence is defined in the CEQA statute to mean "facts, reasonable assumptions predicated on facts, and expert opinion supported by facts" (14 CCR 15384(b)).[32] Substantial evidence can be in the form of technical studies, agency staff reports or opinions, expert opinions supported by facts, and prior CEQA assessments and planning documents. Therefore, to establish additional context in which to consider the order of magnitude of the proposed project's GHG emissions, this analysis accounts for the following considerations by other government agencies and associations about what levels of GHG emissions constitute a cumulatively considerable incremental contribution to climate change:

- Sacramento Metropolitan Air Quality Management District (SMAQMD) established thresholds, including 1,100 metric tons of CO_2e per year for the construction or operational phase of land use development projects, or 10,000 direct metric tons of CO_2e per year from stationary source projects.[33]
- Placer County Air Pollution Control District (PCAPCD) recommends a tiered approach to determine if a project's GHG emissions would result in a significant impact. First, project GHG emissions are compared to the de minimis level of 1,100 metric tons of CO_2e per year. If a project does not exceed this threshold, it does not have significant GHG emissions. If the project exceeds the de minimis level and does not exceed the 10,000 metric tons of CO_2e per year bright line threshold, then the project's GHG emissions can be compared to the efficiency thresholds. These thresholds are 4.5 metric tons of CO_2e per-capita for residential projects in an urban area, and 5.5 metric tons of CO_2e per-capita for residential projects in a rural area. For nonresidential development,

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[32] 14 CCR 15384 provides the following discussion: "Substantial evidence" as used in the Guidelines is the same as the standard of review used by courts in reviewing agency decisions. Some cases suggest that a higher standard, the so called "fair argument standard" applies when a court is reviewing an agency's decision whether or not to prepare an EIR. Public Resources Code section 21082.2 was amended in 1993 (Chapter 1131) to provide that substantial evidence shall include "facts, reasonable assumptions predicated upon facts, and expert opinion supported by facts." The statute further provides that "argument, speculation, unsubstantiated opinion or narrative, evidence which is clearly inaccurate or erroneous, or evidence of social or economic impacts which do not contribute to, or are not caused by, physical impacts on the environment, is not substantial evidence."

[33] Sacramento Metropolitan Air Quality Management District, Guide to Air Quality Assessment in Sacramento County, May 2018, Accessed January 26, 2021, http://www.airquality.org/Residents/CEQA-Land-Use-Planning/CEQA-Guidance-Tools

the thresholds are 26.5 metric tons of CO_2e per 1,000 square feet for projects in urban areas, and 27.3 metric tons of CO_2e per 1,000 square feet for projects in rural areas. The PCAPCD bright-line GHG threshold of 10,000 metric tons of CO_2e per year is also applied to land use projects' construction phase and stationary source projects' construction and operational phases. Generally, GHG emissions from a project that exceed 10,000 metric tons of CO_2e per year would be deemed to have a cumulatively considerable contribution to global climate change.[34]

- Bay Area Air Quality Management District (BAAQMD) has adopted 1,100 metric tons of CO_2e per year as a project-level bright-line GHG significance threshold that would apply to operational emissions from mixed land-use development projects, a threshold of 10,000 metric tons of CO_2e per year as the significance threshold for operational GHG emissions from stationary-source projects, and an efficiency threshold of 4.6 metric tons of CO_2e per service population per year.[35]
- South Coast Air Quality Management District (SCAQMD) formed a GHG CEQA Significance Threshold Working Group to work with SCAQMD staff on developing GHG CEQA significance thresholds until statewide significance thresholds or guidelines are established. The SCAQMD adopted an interim 10,000 metric tons of CO_2e per-year screening level threshold for stationary source/industrial projects for which the SCAQMD is the lead agency (SCAQMD Resolution No. 08-35, December 5, 2008).

As described, the 10,000 metric tons of CO_2e per year threshold is used by SMAQMD, PCAPCD, BAAQMD, and SCAQMD for industrial and/or stationary source GHG emissions. Since the proposed project is an industrial project that includes stationary sources (i.e., diesel generators), the proposed project's GHG emissions were compared to the 10,000 metric tons of CO_2e per year quantitative threshold. The substantial evidence for this GHG emissions threshold is based on the expert opinion of various California air districts, which have applied the 10,000 metric tons of CO_2e per year threshold in numerous CEQA documents where those air districts were the lead agency.

GHG Emission Estimates

The existing condition and proposed project's estimated operational GHG emissions are presented in **Table 7**. The estimated incremental GHG emissions would be approximately 416 metric tons of CO_2e, which is well below the significance threshold of 10,000 metric tons of

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[34] Placer County Air Pollution Control District, 2017 CEQA Handbook – Chapter 2, Thresholds of Significance, Accessed January 26, 2021, https://placerair.org/DocumentCenter/View/2047/Chapter-2-Thresholds-of-Significance-PDf

[35] Bay Area Air Quality Management District, CEQA Air Quality Guidelines, May 2017, Accessed January 26, 2021, http://www.baaqmd.gov/~/media/files/planning-and-research/ceqa/ceqa_guidelines_may2017-pdf.pdf?la=en

CO_2e. Therefore, the proposed project would have a less-than-significant impact on GHG emissions. Based on the GHG emission calculations and using standard fuel consumption estimates, existing conditions operational activities would require 385,520 gallons of diesel fuel and the proposed project operational activities would require 426,548 gallons of diesel fuel. The incremental increase in fuel usage would be 41,027 gallons of diesel fuel.[36]

TABLE 7
Annual Greenhouse Gas Emissions (metric tons)

Emission Source	Existing Condition	Proposed Project	Project Increment
Onsite Equipment	94	155	61
Generator - Crushing Plant	1,456	1,811	355
Generator - Portable Plant	914	914	-
Generator - Wash Plant	903	903	-
Haul Trucks	546	546	-
Total	**3,913**	**4,329**	**416**
Significance Threshold			10,000
Exceeds Threshold?			No

Source: RCH Group, 2021.

[36] Fuel usage is estimated using the CalEEMod output for CO2, and a 10.15 kg-CO2/gallon conversion factor, as cited in the *U.S. Energy Information Administration Voluntary Reporting of Greenhouse Gases Program*, https://www.eia.gov/environment/pdfpages/0608s(2009)index.php

Attachment A

Air Quality Calculations

The air quality analysis includes a review of criteria pollutant[1] emissions such as carbon monoxide (CO)[2], nitrogen oxides (NO_x)[3], sulfur dioxide (SO_2)[4], volatile organic compounds (VOC) as reactive organic gases (ROG)[5], particulate matter less than 10 micrometers (coarse or PM_{10}), particulate matter less than 2.5 micrometers (fine or $PM_{2.5}$).[6] Regulatory models used to estimate air quality impacts include:

- CARB EMFAC[7] emissions inventory model. EMFAC is the latest emission inventory model that calculates emission inventories and emission rates for motor vehicles operating on roads in California. This model reflects CARB's current understanding of how vehicles travel and how much they emit. EMFAC can be used to show how California motor vehicle emissions have changed over time and are projected to change in the future.

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1 Criteria air pollutants refer to those air pollutants for which the USEPA and CARB has established National Ambient Air Quality Standards (NAAQS) and California Ambient Air Quality Standards (CAAQS) under the Federal Clean Air Act (CAA).

2 CO is a non–reactive pollutant that is a product of incomplete combustion of organic material, and is mostly associated with motor vehicle traffic, and in wintertime, with wood–burning stoves and fireplaces.

3 When combustion temperatures are extremely high, as in aircraft, truck and automobile engines, atmospheric nitrogen combines with oxygen to form various oxides of nitrogen (NO_x). Nitric oxide (NO) and NO_2 are the most significant air pollutants generally referred to as NO_x. Nitric oxide is a colorless and odorless gas that is relatively harmless to humans, quickly converts to NO_2 and can be measured. Nitrogen dioxide has been found to be a lung irritant capable of producing pulmonary edema.

4 SO_2 is a combustion product of sulfur or sulfur–containing fuels such as coal and diesel. SO_2 is also a precursor to the formation of atmospheric sulfate and particulate matter, and contributes to potential atmospheric sulfuric acid formation that could precipitate downwind as acid rain.

5 VOC means any compound of carbon, excluding carbon monoxide, carbon dioxide, carbonic acid, metallic carbides or carbonates, and ammonium carbonate, which participates in atmospheric photochemical reactions and thus, a precursor of ozone formation. ROG are any reactive compounds of carbon, excluding methane, CO, CO_2 carbonic acid, metallic carbides or carbonates, ammonium carbonate, and other exempt compounds. The terms VOC and ROG are often used interchangeably.

6 PM_{10} and $PM_{2.5}$ consists of airborne particles that measure 10 microns or less in diameter and 2.5 microns or less in diameter, respectively. PM_{10} and $PM_{2.5}$ represent fractions of particulate matter that can be inhaled into the air passages and the lungs, causing adverse health effects.

7 California Air Resources Board, *EMFAC2017 User's Guide*, March 1, 2018, https://ww3.arb.ca.gov/msei/downloads/emfac2017-volume-i-users-guide.pdf and https://www.arb.ca.gov/emfac/2017/

- CARB OFFROAD[8] emissions inventory model. OFFROAD is the latest emission inventory model that calculates emission inventories and emission rates for off-road equipment such as loaders, excavators, and off-road haul trucks operating in California. This model reflects CARB's current understanding of how equipment operates and how much they emit. OFFROAD can be used to show how California off-road equipment emissions have changed over time and are projected to change in the future.
- USEPA Compilation of Air Pollutant Emission Factors (AP-42), has been published since 1972 as the primary compilation of USEPA's emission factor information. It contains emission factors and process information for more than 200 air pollution source categories. A source category is a specific industry sector or group of similar emitting sources. The emission factors have been developed and compiled from source test data, material balance studies, and engineering estimates.[9]

Air Emission Calculation Methodology

The proposed project could affect air quality during project operations (including aggregate processing plant and other processing equipment such as loaders, excavators, diesel generators, vehicular traffic on unpaved roads, basting operations, soil disturbance, and haul trucks).

On-Road Vehicles

Vehicular emissions were computed using the CARB's emission factor model, EMFAC, to estimate on-road emissions. Foreman pickup trucks used on-site were modeled as gasoline and diesel light heavy-duty trucks. Haul trucks were modeled using the diesel T7 single construction haul truck classification, which is a heavy-heavy duty truck emission factor for public vehicles. Criteria pollutant emissions associated with on-road vehicles were calculated by combining the activity information with emissions factors, in grams per mile, derived using the EMFAC emissions model. Emissions calculations were based on **Equation 1**. The EMFAC emissions factors were developed for employee vehicles and haul trucks. **Table A-1** displays the emission factors for haul trucks.

Haul truck volumes would not change as a result of the proposed project and is currently limited by the following condition of approval: haul trucks (loaded or empty) associated with the mining operation shall not exceed a daily average of 26 round trips (26 arriving and 26 departing) throughout the calendar year and shall not exceed a daily maximum of 275 round

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[8] California Air Resources Board, *Mobile Source Emissions Inventory Documentation – Off Road Diesel Equipment*, https://ww2.arb.ca.gov/our-work/programs/mobile-source-emissions-inventory/road-documentation/msei-documentation-road and https://ww3.arb.ca.gov/msei/ordiesel/ordas_ef_fcf_2017.pdf

[9] US Environmental Protection Agency, AP 42, Compilation of Air Pollutant Emission Factors, Fifth Edition, Volume I, https://www.epa.gov/air-emissions-factors-and-quantification/ap-42-compilation-air-emissions-factors

trips (275 arriving and 275 departing), with a maximum of 173 total trips occurring between the hours of 10:00 p.m. and 7:00 a.m., excluding personal employee vehicles and light-duty trucks assigned to employees. The maximum number of annual truck trips would continue to be 8,112. The number of employees would remain at 14.

Equation 1

*Emission Rate (tons/year) = Emission Factor (gram/mile) * trips per day * miles per trip * days/year * (453.59/2000 tons/gram)*

*Emission Rate (pounds/day) = Emission Factor (gram/mile) * trips per day * miles per trip * (1/453.59 pounds/gram)*

TABLE A-1
EMISSIONS FACTORS (g/mile) FOR ON-ROAD VEHICLES

Vehicle Type	Year	VOC	CO	NO_x	CO_2	SO_2	PM_{10}	$PM_{2.5}$
Haul Truck	2021	0.09	0.30	3.15	1,218	0.01	0.02	0.02
Haul Truck	2025	0.05	0.25	2.84	1,204	0.01	0.01	0.01
Haul Truck	2030	0.02	0.21	2.52	1,121	0.01	0.01	0.01
Haul Truck	2035	0.02	0.21	2.57	1,086	0.01	0.01	0.01
Haul Truck	2040	0.02	0.21	2.53	1,038	0.01	0.01	0.01
Haul Truck	2045	0.02	0.21	2.51	996	0.01	0.01	0.01
Haul Truck	2050	0.02	0.21	2.50	968	0.01	0.01	0.01

Source: CARB EMFAC Emissions Model.

Off-Road Equipment

Operation of the proposed project would require the use of heavy-duty equipment, such as loaders and excavators. This equipment would be used to load and unload material. Emission factors from the OFFROAD emissions model were used. Emissions from offroad equipment activities were estimated based on the projected activity schedule, the number of vehicles/pieces of equipment, the types of equipment/type of fuel used, vehicle/equipment utilization rates, equipment horsepower, and the calendar year.

This information was applied to criteria pollutant emissions factors, in grams per horsepower-hour, derived using the OFFROAD emissions model. **Equation 2** outlines how off-road construction equipment emissions were computed, and the emissions factors used in this assessment are summarized, by equipment type within **Table A-2.**

Onsite offroad equipment include four off-highway truck (376 horsepower), two excavator (337 horsepower), five front-end loaders (84 horsepower), and one dozer (365 horsepower) operating onsite to move materials. On average, for the existing condition, the loaders would operate 480 hours per year, the excavators would operate 450 hours per year, the onsite haul trucks would operate 350 hours per year, and the dozer would operate 500 hours per year. On average, for the proposed project, the loaders would operate 1,200 hours per year, the excavators would operate 675 hours per year, the onsite haul trucks would operate 525 hours per year, and the dozer would operate 750 hours per year.

Equation 2

*Emission Rate (tons/year) = Emission Factor (gram/hp-hour) * size (hp) * hours of operation per year * Load Factor * (453.59/2000 tons/gram)*
*Emission Rate (pounds/day) = Emission Factor (gram/hp-hour) * size (hp) * hours of operation per day * Load Factor * (1/453.59 pounds/gram)*

TABLE A-2
EMISSIONS FACTORS (g/hp-hour) FOR OFFROAD EQUIPMENT

Vehicle Type	VOC	CO	NO_x	CO_2	SO_2	PM_{10}	$PM_{2.5}$	CH_4
Diesel Excavator	0.04	0.40	0.20	201	<0.01	0.01	0.01	<0.01
Diesel Off-Highway Trucks	0.06	0.44	0.30	202	<0.01	0.01	0.01	<0.01
Diesel Dozer	0.13	1.06	1.10	210	<0.01	0.05	0.05	<0.01
Diesel Loaders	0.06	1.29	0.62	195	<0.01	0.01	0.01	<0.01

Source: CARB OFFROAD Emissions Model.

Handling and Storage

Fugitive particulate matter emissions are expected from the handling and storage of raw materials from aggregate processing. The methodology for the calculation of particulate emissions from the handling and storage of raw materials is described in Section 13.2.4 of USEPA's AP-42 for aggregate handling and storage piles. The quantity of dust emissions from aggregate handling and storage operations varies with the volume of aggregate passing through the storage cycle. The emission factor for the quantity of emissions per quantity of material was estimated using the following equation:

E = [0.00112*({[G/5]^1.3}/{[H/2]^1.4})]*[I/J]

where:

G = Mean wind speed in miles per hour, 13 mph

H = Moisture Content of soil, 2.0 (dry)

I = pounds of material handled

J = 2,000 (conversion factor, pounds to tons)

The emission factor used in the analysis for handling and storage activities was 0.00388 pounds of PM_{10} per ton of material processed (uncontrolled) and 0.00116 pounds of PM_{10} per ton of material processed (controlled). The $PM_{2.5}$ emissions were assumed to be 15 percent of the PM_{10} emissions (based on AP-42). To account for emission controls, a control efficiency of 80 percent (based on AP-42) from watering was also applied.

Unpaved Vehicle Movement

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. Additionally, the turbulent wake behind the vehicle continues to act on the road surface after the vehicle has passed. The following is the equation used to develop the emission factor is:

$$EF = k\,(S/30)^{a}\,(W/3)^{b}\,[(365-p)/365]\,(1-CE)$$

where:

k (PM_{10}) = 2.1 (empirical constant)

s = Silt content of 8.3 percent (use whole number value)

W = Mean vehicle weight, 33 tons unloaded and 69 tons loaded

p = Number of days with measurable precipitation (59 days)

a = 0.7 (empirical constant)

b = 0.45 (empirical constant)

CE = Control efficiency rate of 80 percent

The uncontrolled emission factor for unpaved roads was 5.6 and 4.0 pounds per vehicle mile for loaded and unloaded trucks, respectively. The controlled emission factor for unpaved roads was 1.0 and 0.8 pounds per vehicle mile for loaded and unloaded trucks, respectively. The $PM_{2.5}$ emissions were assumed to be 15 percent of the PM_{10} emissions (based on AP-42). To account for emission controls, a control efficiency of 80 percent (based on AP-42 Section 13.2.2) from watering was also applied. Finally, each vehicle was assumed to travel a distance of ¼ of a mile on unpaved area prior to the haul truck access road.

Aggregate Processing

In the general aggregate processing, rock and crushed stone are loosened by drilling and blasting, loaded by front-end loader into large haul trucks that transport the material to the processing operations. Processing operations include crushing, screening, size classification, conveyance, material handling and storage operations. Air emissions include PM_{10} and $PM_{2.5}$.

Fugitive dust sources include the transfer of aggregate, truck loading and unloading, and wind erosion from aggregate storage piles. The amount of fugitive emissions generated during the transfer of the aggregate depends primarily on the surface moisture content of these materials.

The air emission calculations accounted for the production level, the number, types, and size of equipment, the type of material processed, and emission controls. The emission factors were determined using the methodology found in Section 11.19 of USEPA's AP-42. **Table A-3** presents the emission factors for the aggregate processing operations. A ratio of 0.15 is applied to determine the amount of $PM_{2.5}$ per mass of PM_{10} based on AP-42. Emissions control is based on periodic watering.

The aggregate processing plant is rated at 250 tons per hour. The average daily production is 3,000 tons and the annual production is 100,000 tons for the existing condition. The aggregate processing plant has one jaw crusher, two cone crushers, two deck conveyors, and seven secondary conveyers. For the proposed project, the annual production would be 200,000 tons.

TABLE A-3
EMISSIONS FACTORS (pounds/tons or material) FOR AGGREGATE PROCESSING

	Uncontrolled	Controlled
Emission Point	**PM_{10}**	**PM_{10}**
Jaw Crusher	0.0024	0.00054
Cone Crusher	0.0024	0.00054
Primary Screening	0.0087	0.00074
Deck Conveyor	0.0011	0.000046
Secondary Crusher	0.0024	0.00054
Secondary Conveyor	0.0011	0.000046
Secondary Screen	0.072	0.0022

Source: Compilation of Air Pollutant Emission Factors, AP-42, Fifth Edition, Volume I: *Stationary Point and Area Sources*, Section 11.19.2 Crushed Stone Processing, November 2006.

The sand washing plant processes sand from its raw state into products that meet various specifications. The process requirements vary depending on the input and desired output, but the plant typically scrub, liberate, deslime, wash, classify, decontaminate and dewater the sand, as well as process the effluent stream that results. The wash plant has one feeder, one screen, and two conveyors. The sand plant has one feeder, three screens, and eight conveyors. The emission factors were determined using the methodology found in Section 11.19 of USEPA's AP-42. **Table A-4** presents the emission factors for the sand and wash plant operations. A ratio of 0.15 is applied to determine the amount of $PM_{2.5}$ per mass of PM_{10} based on AP-42. The lime plant and sand washing plant would not increase production levels as a result of the proposed project.

TABLE A-4
EMISSIONS FACTORS (pounds/tons of material) FOR SAND WASH PLANT

Emission Point	Uncontrolled PM_{10}	Controlled PM_{10}
Feeder	0.0024	0.00054
Primary Screening	0.0087	0.00074
Conveyor	0.0011	0.000046

Source: Compilation of Air Pollutant Emission Factors, AP-42, Fifth Edition, Volume I: *Stationary Point and Area Sources*, Section 11.19.2 Crushed Stone Processing, November 2006.

Blasting Operations

Air emissions from blasting include PM_{10} and $PM_{2.5}$. The emission factor for the quantity of emissions (in pounds) per blast event was estimated using the following equation from Section 11.9 of USEPA's AP-42:

$$EF = 0.000014 * (A)^{1.5}$$

where:

EF = PM_{30} emission factor (pounds/blast)

A = blast area (6,750 or 10,125 square feet)

A ratio of 0.52 was applied to determine the amount of PM_{10} per PM_{30} based on AP-42. A ratio of 0.15 was applied to determine the amount of $PM_{2.5}$ per mass PM_{10} based on AP-42. The PM_{10} emission factor used in the analysis was 4.0 pounds per blast event. Currently, the project site conducts blasting operations about three to seven times per year. The proposed project would conduct the same number of blasting operations, but the basting operations would be larger. Blasting operations only during daylight hours, normally middle of the day. During the existing conditions, approximately ½ acre is blasted annually (approximately 6,750 square feet per blasting event). Under the proposed project, approximately one acre would be blasted annually (approximately 10,125 square feet per blasting event).

Diesel Generators

The Lassen County APCD requires permits for proposed construction, alteration or replacement of equipment or facilities which may cause the issuance of air contaminants. The Ward Lake Pit maintains a permit to operate (PTO-19-140: expiration date March 31, 2024) for onsite equipment such as a hot mix asphalt plant, a lime slurry mix plant, a concrete plant, a crushing plant, and a sand wash plant. As of the permit issuance, the facility has five diesel generators with the following upgrades or replacements planned:

- One 750 horsepower (hp) diesel generator associated with the asphalt plant, which has been switched to line power.
- One 750 hp diesel generator associated with the aggregate plant, which will be switched to line power by January of 2022.
- One 755 hp diesel generator associated with the aggregate plant, which will be updated with Air District approved Tier 4 engine[10] or switched to line power by January of 2023.
- One 475 hp diesel generator associated with the lime plant, which will be updated with Air District approved Tier 4 engine or switched to line power by January of 2024.
- One 470 hp diesel generator associated with the wash plant, which will be updated with Air District approved Tier 4 engine or switched to line power by January of 2025.

All reciprocating internal combustion engines operate by the same basic process. A combustible mixture is first compressed in a small volume between the head of a piston and its surrounding cylinder. The mixture is then ignited, and the resulting high-pressure products of combustion push the piston through the cylinder. This movement is converted from linear to rotary motion by a crankshaft. The piston returns, pushing out exhaust gases, and the cycle is repeated. The emission factors were based on information contained within the manufacturer's specification sheet and USEPA's AP-42 Section 3.4 and Ward Lake Facility Permit to Operate from Lassen County APCD (PTO-19-140). **Table A-5** presents the emission factors for the diesel generators.

TABLE A-5
EMISSIONS FACTORS (pounds/hp-hour) FOR DIESEL GENERATORS

Pollutant	470&475 hp	750&755 hp
NOx	0.01	0.02
CO	2.03E-03	1.46E-03
SOx	2.05E-03	0.01
PM10/PM2.5	2.34E-04	1.72E-04
CO_2	1.15	1.16
TOC (ROG)	1.10E-04	1.32E-04

Source: Compilation of Air Pollutant Emission Factors, AP-42, Fifth Edition, Volume I: *Stationary Point and Area Sources*, Section 3.4, Large Stationary Diesel And All Stationary Dual-fuel Engines, October 1996 and Ward Lake Facility Permit to Operate from Lassen County APCD (PTO-19-140.

10 USEPA has implemented regulations and a tiering system to reduce emissions from off-road equipment with increasing combustion efficiency (i.e., decreasing emissions) where Tier 1 is the least efficient (greatest emissions) and Tier 4 is the most efficient (least emissions). The regulations have been implemented over time such that Tier 1 was phased out in the 1990's and Tier 2 was required, followed by implementation of Tier 3 and Tier 4 by 2015 with a phase out of Tier 2.

Attachment A

Emission Calculations

- Diesel Generators – Existing Condition
- Diesel Generators – Proposed Project
- Onsite Offroad Equipment – Existing Condition
- Onsite Offroad Equipment – Proposed Project
- Aggregate Processing Plant - Existing Condition
- Aggregate Processing Plant - Proposed Project
- Wash Plant - Existing Condition
- Wash Plant - Proposed Project
- Sand Plant - Existing Condition
- Sand Plant - Proposed Project
- Fugitive Dust Emissions - Existing Condition
- Fugitive Dust Emissions - Proposed Project

District-Approved Emissions for Diesel Generators - Existing Condition

Pollutants	EF (lb/hp-hr)	HP	Annual Emissions (tons)	Daily Emissions (lbs)
NOx	0.02	750	27.2	200
CO	1.46E-03	750	2.01	14.8
SOx	0.01	750	16.8	123
PM10/PM2.5	1.72E-04	750	0.24	1.75
CO2	1.16	750	1,605	11,778
TOC (ROG)	1.32E-04	750	0.18	1.34

Pollutants	EF (lb/hp-hr)	HP	Annual Emissions (tons)	Daily Emissions (lbs)
NOx	0.01	475	11.9	87.5
CO	2.03E-03	475	1.78	13.0
SOx	2.05E-03	475	1.80	13.2
PM10/PM2.5	2.34E-04	475	0.20	1.50
CO2	1.15	475	1,008	7,395
TOC (ROG)	1.10E-04	475	0.10	0.71

Pollutants	EF (lb/hp-hr)	HP	Annual Emissions (tons)	Daily Emissions (lbs)
NOx	0.01	469	11.8	86.4
CO	2.03E-03	469	1.76	12.9
SOx	2.05E-03	469	1.78	13.0
PM10/PM2.5	2.34E-04	469	0.20	1.48
CO2	1.15	469	996	7,308
TOC (ROG)	1.10E-04	469	0.10	0.70

Pollutants	Annual Emissions (tons)	Daily Emissions (lbs)
NOx	50.9	374
CO	5.55	40.7
SOx	20.4	149
PM10/PM2.5	0.65	4.73
CO2	3,609	26,481
TOC (ROG)	0.38	2.75

District-Approved Emissions for Diesel Generators - Proposed Project

Pollutants	EF (lb/hp-hr)	HP	Annual Emissions (tons)	Daily Emissions (lbs)
NOx	0.02	750	33.9	200
CO	1.46E-03	750	2.50	14.8
SOx	0.01	750	20.9	123
PM10/PM2.5	1.72E-04	750	0.30	1.75
CO2	1.16	750	1,997	11,778
TOC (ROG)	1.32E-04	750	0.23	1.34

Pollutants	EF (lb/hp-hr)	HP	Annual Emissions (tons)	Daily Emissions (lbs)
NOx	0.01	475	11.9	87.5
CO	2.03E-03	475	1.78	13.0
SOx	2.05E-03	475	1.80	13.2
PM10/PM2.5	2.34E-04	475	0.20	1.50
CO2	1.15	475	1,008	7,395
TOC (ROG)	1.10E-04	475	0.10	0.71

Pollutants	EF (lb/hp-hr)	HP	Annual Emissions (tons)	Daily Emissions (lbs)
NOx	0.01	469	11.8	86.4
CO	2.03E-03	469	1.76	12.9
SOx	2.05E-03	469	1.78	13.0
PM10/PM2.5	2.34E-04	469	0.20	1.48
CO2	1.15	469	996	7,308
TOC (ROG)	1.10E-04	469	0.10	0.70

Pollutants	Annual Emissions (tons)	Daily Emissions (lbs)
NOx	57.6	374
CO	6.04	40.7
SOx	24.5	149
PM10/PM2.5	0.70	4.73
CO2	4,000	26,481
TOC (ROG)	0.42	2.75

Onsite Offroad Equipment - Existing Conditions

Source Type	Emission Factor (g/hp-hr)													Daily Emissions (lbs/day)						Annual Emissions (tons/year)							
	ROG	CO	NOx	CO2	SOx	PM10	PM2.5	CH4	HP	Number of Equipment	Load Factor	Daily Hours	Annual Hours	ROG	CO	NOx	SOx	PM10	PM2.5	ROG	CO	NOx	CO2	SOx	PM10	PM2.5	CH4
Diesel Excavator	0.04	0.40	0.20	201	0.00	0.01	0.01	0.00	337	2	0.38	6	450	0.14	1.35	0.67	0.01	0.02	0.02	0.01	0.05	0.03	25.6	0.00	0.00	0.00	0.00
Diesel Off-Highway Trucks	0.06	0.44	0.30	202	0.00	0.01	0.01	0.00	376	4	0.38	5	350	0.41	2.77	1.87	0.01	0.07	0.06	0.01	0.10	0.07	44.6	0.00	0.00	0.00	0.00
Diesel Dozer	0.13	1.06	1.10	210	0.00	0.05	0.05	0.00	365	1	0.40	6	500	0.25	2.04	2.12	0.00	0.10	0.09	0.01	0.09	0.09	17.0	0.00	0.00	0.00	0.00
Diesel Loaders	0.06	1.29	0.62	195	0.00	0.01	0.01	0.00	84	5	0.37	7	480	0.15	3.08	1.47	0.00	0.04	0.03	0.01	0.11	0.05	16.0	0.00	0.00	0.00	0.00
												24	450	0.94	9.23	6.13	0.03	0.22	0.21	0.03	0.34	0.23	103	0.00	0.01	0.01	0.00

Onsite Offroad Equipment - Proposed Project

Source Type	Emission Factor (g/hp-hr) ROG	CO	NOx	CO2	SOx	PM10	PM2.5	CH4	HP	Number of Equipment	Load Factor	Daily Hours	Annual Hours	Daily Emissions (lbs/day) ROG	CO	NOx	SOx	PM10	PM2.5	Annual Emissions (tons/year) ROG	CO	NOx	CO2	SOx	PM10	PM2.5	CH4
Diesel Excavator	0.04	0.40	0.20	201	0.00	0.01	0.01	0.00	**337**	**2**	0.38	**6**	**675**	**0.14**	**1.35**	**0.67**	**0.01**	**0.02**	**0.02**	**0.01**	**0.08**	**0.04**	**38.4**	**0.00**	**0.00**	**0.00**	**0.00**
Diesel Off-Highway Trucks	0.06	0.44	0.30	202	0.00	0.01	0.01	0.00	**376**	**4**	0.38	**5**	**525**	**0.41**	**2.77**	**1.87**	**0.01**	**0.07**	**0.06**	**0.02**	**0.15**	**0.10**	**66.9**	**0.00**	**0.00**	**0.00**	**0.00**
Diesel Dozer	0.13	1.06	1.10	210	0.00	0.05	0.05	0.00	**365**	**1**	0.40	**6**	**750**	**0.25**	**2.04**	**2.12**	**0.00**	**0.10**	**0.09**	**0.02**	**0.13**	**0.13**	**25.4**	**0.00**	**0.01**	**0.01**	**0.00**
Diesel Loaders	0.06	1.29	0.62	195	0.00	0.01	0.01	0.00	**84**	**5**	0.37	**7**	**1,200**	**0.15**	**3.08**	**1.47**	**0.00**	**0.04**	**0.03**	**0.01**	**0.26**	**0.13**	**39.9**	**0.00**	**0.00**	**0.00**	**0.00**
												24	816	0.94	9.23	6.13	0.03	0.22	0.21	0.06	0.61	0.39	171	0.00	0.01	0.01	0.00

Aggregate Procesing Plant - Existing Conditions

Operating Assumptions

Hourly Process Rate (ton)	250		
Daily Process Rate (ton)	3,000		
Annual Process Rate (ton)	100,000	1,440	hours/year

Equipment	Process Rate (ton/hr)	Number of Transfers	Daily Operation (hours)	Uncontrolled Emission Factor (lb/ton)	Controlled Emission Factor (lb/ton)	Controlled PM10 Daily (lb/day)	Controlled PM10 Annual (ton/yr)	Controlled PM2.5 Daily (lb/day)	Controlled PM2.5 Annual (ton/yr)	Uncontrolled PM10 Daily (lb/day)	Uncontrolled PM10 Annual (ton/yr)	Uncontrolled PM2.5 Daily (lb/day)	Uncontrolled PM2.5 Annual (ton/yr)
Jaw Crusher	250	1	12	0.0024	0.00054	1.62	0.03	0.24	0.00	7.20	0.12	1.08	0.02
Cone Crusher	250	2	12	0.0024	0.00054	3.24	0.03	0.49	0.00	14.4	0.12	2.16	0.02
Primary Screening	250	1	12	0.0087	0.00074	2.22	0.04	0.33	0.01	26.1	0.44	3.92	0.07
Deck Conveyor	250	2	12	0.0011	0.000046	0.28	0.00	0.04	0.00	6.60	0.06	0.99	0.01
Secondary Crusher	250	1	12	0.0024	0.00054	1.62	0.03	0.24	0.00	7.20	0.12	1.08	0.02
Secondary Conveyor	250	7	12	0.0011	0.000046	0.97	0.00	0.14	0.00	23.1	0.06	3.47	0.01
Secondary Screen	250	1	12	0.072	0.0022	6.60	0.11	0.99	0.02	216	3.60	32.4	0.54
Total Aggregate Processing Plant Emissions						***16.5***	***0.23***	***2.48***	***0.03***	***301***	***4.51***	***45.1***	***0.68***

Wash Plant - Existing Conditions

Operating Assumptions

Hourly Process Rate (ton)	250		
Daily Process Rate (ton)	3,000		
Annual Process Rate (ton)	100,000	1,440	hours/year

						Controlled				Uncontrolled			
Equipment	Process Rate (ton/hr)	Number of Transfers	Daily Operation (hours)	Uncontrolled Emission Factor (lb/ton)	Controlled Emission Factor (lb/ton)	PM10 Daily (lb/day)	PM10 Annual (ton/yr)	PM2.5 Daily (lb/day)	PM2.5 Annual (ton/yr)	PM10 Daily (lb/day)	PM10 Annual (ton/yr)	PM2.5 Daily (lb/day)	PM2.5 Annual (ton/yr)
Feeder	250	1	12	0.0024	0.00054	1.62	0.03	0.24	0.00	7.20	0.12	1.08	0.02
Primary Screening	250	1	12	0.0087	0.00074	2.22	0.04	0.33	0.01	26.1	0.44	3.92	0.07
Conveyor	250	2	12	0.0011	0.000046	0.28	0.00	0.04	0.00	6.60	0.06	0.99	0.01
Total Wash Plant Emissions						***4.12***	***0.07***	***0.62***	***0.01***	***39.9***	***0.61***	***5.99***	***0.09***

Sand Plant - Existing Conditions

Operating Assumptions

Hourly Process Rate (ton)	250		
Daily Process Rate (ton)	3,000		
Annual Process Rate (ton)	100,000	1,440	hours/year

						Controlled				Uncontrolled			
Equipment	**Process Rate (ton/hr)**	**Number of Transfers**	**Daily Operation (hours)**	**Uncontrolled Emission Factor (lb/ton)**	**Controlled Emission Factor (lb/ton)**	**PM10 Daily (lb/day)**	**PM10 Annual (ton/yr)**	**PM2.5 Daily (lb/day)**	**PM2.5 Annual (ton/yr)**	**PM10 Daily (lb/day)**	**PM10 Annual (ton/yr)**	**PM2.5 Daily (lb/day)**	**PM2.5 Annual (ton/yr)**
Feeder	250	1	12	0.0024	0.00054	1.62	0.03	0.24	0.00	7.2	0.12	1.08	0.02
Primary Screening	250	3	12	0.0087	0.00074	6.66	0.04	1.00	0.01	78.3	0.44	11.7	0.07
Conveyor	250	8	12	0.0011	0.000046	1.10	0.00	0.17	0.00	26.4	0.06	3.96	0.01
Total Sand Plant Emissions						***9.38***	***0.07***	***1.41***	***0.01***	***112***	***0.61***	***16.8***	***0.09***

Aggregate Procesing Plant - Proposed Project

Operating Assumptions

Hourly Process Rate (ton)	250		
Daily Process Rate (ton)	3,000		
Annual Process Rate (ton)	200,000	2,160	hours/year

						Controlled				Uncontrolled			
Equipment	Process Rate (ton/hr)	Number of Transfers	Daily Operation (hours)	Uncontrolled Emission Factor (lb/ton)	Controlled Emission Factor (lb/ton)	PM10 Daily (lb/day)	PM10 Annual (ton/yr)	PM2.5 Daily (lb/day)	PM2.5 Annual (ton/yr)	PM10 Daily (lb/day)	PM10 Annual (ton/yr)	PM2.5 Daily (lb/day)	PM2.5 Annual (ton/yr)
Jaw Crusher	250	1	12	0.0024	0.00054	1.62	0.05	0.24	0.01	7.20	0.24	1.08	0.04
Cone Crusher	250	2	12	0.0024	0.00054	3.24	0.05	0.49	0.01	14.4	0.24	2.16	0.04
Primary Screening	250	1	12	0.0087	0.00074	2.22	0.07	0.33	0.01	26.1	0.87	3.92	0.13
Deck Conveyor	250	2	12	0.0011	0.000046	0.28	0.00	0.04	0.00	6.60	0.11	0.99	0.02
Secondary Crusher	250	1	12	0.0024	0.00054	1.62	0.05	0.24	0.01	7.20	0.24	1.08	0.04
Secondary Conveyor	250	7	12	0.0011	0.000046	0.97	0.00	0.14	0.00	23.1	0.11	3.47	0.02
Secondary Screen	250	1	12	0.072	0.0022	6.60	0.22	0.99	0.03	216	7.20	32.4	1.08
Total Aggregate Processing Plant Emissions						***16.5***	***0.47***	***2.48***	***0.07***	***301***	***9.01***	***45.1***	***1.35***

Wash Plant - Proposed Project

Operating Assumptions

Hourly Process Rate (ton)	250		
Daily Process Rate (ton)	3,000		
Annual Process Rate (ton)	100,000	2,160	hours/year

						Controlled				Uncontrolled			
Equipment	Process Rate (ton/hr)	Number of Transfers	Daily Operation (hours)	Uncontrolled Emission Factor (lb/ton)	Controlled Emission Factor (lb/ton)	PM10 Daily (lb/day)	PM10 Annual (ton/yr)	PM2.5 Daily (lb/day)	PM2.5 Annual (ton/yr)	PM10 Daily (lb/day)	PM10 Annual (ton/yr)	PM2.5 Daily (lb/day)	PM2.5 Annual (ton/yr)
Feeder	250	1	12	0.0024	0.00054	1.62	0.03	0.24	0.00	7.20	0.12	1.08	0.02
Primary Screening	250	1	12	0.0087	0.00074	2.22	0.04	0.33	0.01	26.1	0.44	3.92	0.07
Conveyor	250	2	12	0.0011	0.000046	0.28	0.00	0.04	0.00	6.60	0.06	0.99	0.01
Total Wash Plant Emissions						***4.12***	***0.07***	***0.62***	***0.01***	***39.9***	***0.61***	***5.99***	***0.09***

Sand Plant - Proposed Project

Operating Assumptions

Hourly Process Rate (ton)	250		
Daily Process Rate (ton)	3,000		
Annual Process Rate (ton)	100,000	2,160	hours/year

						Controlled				Uncontrolled			
Equipment	**Process Rate (ton/hr)**	**Number of Transfers**	**Daily Operation (hours)**	**Uncontrolled Emission Factor (lb/ton)**	**Controlled Emission Factor (lb/ton)**	**PM10 Daily (lb/day)**	**PM10 Annual (ton/yr)**	**PM2.5 Daily (lb/day)**	**PM2.5 Annual (ton/yr)**	**PM10 Daily (lb/day)**	**PM10 Annual (ton/yr)**	**PM2.5 Daily (lb/day)**	**PM2.5 Annual (ton/yr)**
Feeder	250	1	12	0.0024	0.00054	1.62	0.03	0.24	0.00	7.20	0.12	1.08	0.02
Primary Screening	250	3	12	0.0087	0.00074	6.66	0.04	1.00	0.01	78.3	0.44	11.7	0.07
Conveyor	250	8	12	0.0011	0.000046	1.10	0.00	0.17	0.00	26.4	0.06	3.96	0.01
Total Sand Plant Emissions						***9.38***	***0.07***	***1.41***	***0.01***	***112***	***0.61***	***16.8***	***0.09***

Fugitive PM Emissions - Existing Conditions

Fugitive PM from Trucks on Unpaved Surfaces

Operating Assumptions

Haul road length =	0.25	mile	3,000	tons/day		
Trucks/day =	23		2,000	cy/day		
VMT =	12	miles/day	100,000	tons/year		
Days/year	120	days	66,667	cy/year	1,440	hours/year

Calculated Emission Factor for travel on unpaved roads

PM10 EF = 2.1*(S/12)^0.7*(W/3)^0.45*[(365-K)/365]

S = Silt content, 8.3%

W = Mean vehicle weight, 33 tons unloaded, 69 tons loaded

K = Mean # of days with rain above 0.01 inches, 59

Loaded Emission Factor = 5.58 pounds pm10/vmt

Unloaded Emission Factor = 4.00 pounds pm10/vmt

	PM10 Uncontrolled	PM10 Controlled	PM2.5 Uncontrolled	PM2.5 Controlled
Unpaved Fugitive Emissions (pounds/day)	111	22.2	16.6	3.33
Unpaved Fugitive Emissions (tons/year)	6.65	1.33	1.00	0.20

Fugitive PM Eissions from Material Handling

E = [0.00112*({[G/5]^1.3}/{[H/2]^1.4})]*[I/J]

G = Mean wind speed in miles per hour, 13 mph

H = Moisture Content of soil, 2.0 (dry)

I = lbs of material handled

J = 2,000 (conversion factor, lbs to tons)

	PM10 Uncontrolled	PM10 Controlled	PM2.5 Uncontrolled	PM2.5 Controlled
Material Handling Fugitive Emissions (pounds/day)	11.6	2.33	1.75	0.35
Material Handling Fugitive Emissions (tons/year)	0.70	0.14	0.10	0.02

Blasting

E = 0.000014 (A)^1.5 from AP-42 11.9

E= PM30 emissions

A = horizontal area

PM -10 emissions = 0.52 x E

Two areas of adjacent benches with shots 15' apart

Approx area = 6,750 sf

E=	7.76 pounds of TSP/blast		
PM10 =	**4.04 pounds/blast**		
	28.3 pounds/year	7	blasts/year
PM2.5 =	**0.61 pounds/blast**		
	4.24 pounds/year		

Fugitive PM Emissions - Proposed Project

Fugitive PM from Trucks on Unpaved Surfaces

Operating Assumptions

Haul road length =	0.25	mile	3,000	tons/day		
Trucks/day =	23		2,000	cy/day		
VMT =	12	miles/day	200,000	tons/year		
Days/year	180	days	133,333	cy/year	2,160	hours/year

Calculated Emission Factor for travel on unpaved roads
PM10 EF = 2.1*(S/12)^0.7*(W/3)^0.45*[(365-K)/365]
S = Silt content, 8.3%
W = Mean vehicle weight, 33 tons unloaded, 69 tons loaded
K = Mean # of days with rain above 0.01 inches, 59

Loaded Emission Factor = 5.58 pounds pm10/vmt
Unloaded Emission Factor = 4.00 pounds pm10/vmt

	PM10 Uncontrolled	PM10 Controlled	PM2.5 Uncontrolled	PM2.5 Controlled
Unpaved Fugitive Emissions (pounds/day)	111	22.2	16.6	3.33
Unpaved Fugitive Emissions (tons/year)	9.98	2.00	1.50	0.30

Fugitive PM Eissions from Material Handling

E = [0.00112*({[G/5]^1.3}/{[H/2]^1.4})]*[I/J]

G = Mean wind speed in miles per hour, 13 mph
H = Moisture Content of soil, 2.0 (dry)
I = lbs of material handled
J = 2,000 (conversion factor, lbs to tons)

	PM10 Uncontrolled	PM10 Controlled	PM2.5 Uncontrolled	PM2.5 Controlled
Material Handling Fugitive Emissions (pounds/day)	11.6	2.33	1.75	0.35
Material Handling Fugitive Emissions (tons/year)	1.05	0.21	0.16	0.03

Blasting

E = 0.000014 (A)^1.5 from AP-42 11.9

E= PM30 emissions
A = horizontal area

PM -10 emissions = 0.52 x E

Two areas of adjacent benches with shots 15' apart
Approx area = 10,125 sf

E=	14.3	pounds of TSP/blast	
PM10 =	**7.42**	**pounds/blast**	
	51.9	pounds/year	7 blasts/year
PM2.5 =	**1.11**	**pounds/blast**	
	7.79	pounds/year	

Attachment B

Health Risk Assessment Methodology, Assumptions, and Results

A health risk assessment (HRA) is accomplished in four steps: 1) hazards identification, 2) exposure assessment, 3) toxicity assessment, and 4) risk characterization. These steps cover the estimation of air emissions, the estimation of the air concentrations resulting from a dispersion analysis, the incorporation of the toxicity of the pollutants emitted, and the characterization of the risk based on exposure parameters such as breathing rate, age adjustment factors, and exposure duration; each depending on receptor type (i.e., residence, school, daycare centers, hospitals, senior care facilities, recreational areas, adult, infant, child).

This HRA was conducted in accordance with technical guidelines developed by federal, state, and regional agencies, including U.S. Environmental Protection Agency (USEPA), California Environmental Protection Agency (CalEPA), and California Office of Environmental Health Hazard Assessment (OEHHA) *Air Toxics Hot Spots Program Guidance Manual for Preparation of Health Risk Assessments*.[1] This HRA addresses the diesel particulate matter (DPM) emissions from generators and haul trucks.

According to CalEPA, a HRA should not be interpreted as the expected rates of cancer or other potential human health effects, but rather as estimates of potential risk or likelihood of adverse effects based on current knowledge, under a number of highly conservative assumptions and the best assessment tools currently available.

TERMS AND DEFINITIONS

As the practice of conducting a HRA is particularly complex and involves concepts that are not altogether familiar to most people, several terms and definitions are provided that are considered essential to the understanding of the approach, methodology and results:

> *Acute effect* – a health effect (non-cancer) produced within a short period of time (few minutes to several days) following an exposure to toxic air contaminants (TAC).
>
> *Cancer risk* – the probability of an individual contracting cancer from a lifetime (i.e., 70 year) exposure to TAC such as DPM in the ambient air.
>
> *Chronic effect* – a health effect (non-cancer) produced from a continuous exposure occurring over an extended period of time (weeks, months, years).

[1] Office of Environmental Health Hazard Assessment, *Air Toxics Hot Spots Program Guidance Manual for Preparation of Health Risk Assessments*, March 6, 2015, http://oehha.ca.gov/air/hot_spots/hotspots2015.html.

Hazard Index (HI) – the unitless ratio of an exposure level over the acceptable reference dose. The HI can be applied to multiple compounds in an additive manner.

Hazard Quotient (HQ) – the unitless ratio of an exposure level over the acceptable reference dose. The HQ is applied to individual compounds.

Toxic Air Contaminants – any air pollutant that is capable of causing short-term (acute) and/or long-term (chronic or carcinogenic, i.e., cancer causing) adverse human health effects (i.e., injury or illness). The current California list of TAC lists approximately 200 compounds, including particulate emissions from diesel-fueled engines.

Human Health Effects - comprise disorders such as eye watering, respiratory or heart ailments, and other (i.e., non-cancer) related diseases.

Health Risk Assessment – an analysis designed to predict the generation and dispersion of TAC in the outdoor environment, evaluate the potential for exposure of human populations, and to assess and quantify both the individual and population-wide health risks associated with those levels of exposure.

Incremental – under CEQA, the net difference (or change) in conditions or impacts when comparing the baseline to future year project conditions.

Maximum exposed individual (MEI) – an individual assumed to be located at the point where the highest concentrations of TAC, and therefore, health risks are predicted to occur.

Non-cancer risks – health risks such as eye watering, respiratory or heart ailments, and other non-cancer related diseases.

Receptors – the locations where potential health impacts or risks are predicted (i.e., schools, residences, and recreational sites).

LIMITATIONS AND UNCERTAINTIES

There are a number of important limitations and uncertainties commonly associated with a HRA due to the wide variability of human exposures to TAC, the extended timeframes over which the exposures are evaluated, and the inability to verify the results. Limitations and uncertainties associated with the HRA and identified by the CalEPA include: (a.) lack of reliable monitoring data; (b.) extrapolation of toxicity data in animals to humans; (c.) estimation errors in calculating TAC emissions; (d.) concentration prediction errors with dispersion models; and (e.) the variability in lifestyles, fitness and other confounding factors of the human population. This HRA was performed using the best available data and methodologies, notwithstanding the following uncertainties:

- There are uncertainties associated with the estimation of emissions from project activities. Where project-specific data, such as emission factors, are not available, default assumptions in emission models were used.
- The limitations of the air dispersion model provide a source of uncertainty in the estimation of exposure concentrations. According to USEPA, errors due to the limitation of the algorithms implemented in the air dispersion model in the highest estimated concentrations of +/- 10 percent to 40 percent are typical.[2]
- The source parameters used to model emission sources add uncertainty. For all emission sources, the source parameters used source-specific, recommended as defaults, or expected to produce more conservative results. Discrepancies might exist in actual emissions characteristics of an emission source and its representation in the dispersion model.
- The exposure duration estimates do not take into account that people do not usually reside at the same location for 30 years and that other exposures (i.e., school children) are also of much shorter durations than was assumed in this HRA. This exposure duration is a highly conservative assumption, since most people do not remain at home all day and on average residents change residences every 11 to 12 years. In addition, this assumption adopts that residents are experiencing outdoor concentrations for the entire exposure period.
- For the risk and hazards calculations as well as the cumulative health impact, numerous assumptions must be made in order to estimate human exposure to pollutants. These assumptions include parameters such as breathing rates, exposure time and frequency, exposure duration, and human activity patterns. While a mean value derived from scientifically defensible studies is the best estimate of central tendency, most of the exposure variables used in this HRA are high-end estimates. The combination of several high-end estimates used as exposure parameters may substantially overestimate pollutant intake. The excess lifetime cancer risks calculated in this HRA are therefore likely to be higher than may be required to be protective of public health.
- The Cal/EPA cancer potency factor for DPM was used to estimate cancer risks associated with exposure to DPM emissions from construction activities. However, the cancer potency factor derived by Cal/EPA for DPM is highly uncertain in both the estimation of response and dose. In the past, due to inadequate animal test data and epidemiology data on diesel exhaust, the International Agency for Research on Cancer (IARC), a branch of the World Health Organization, had classified DPM as Probably Carcinogenic

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[2] United States Environmental Protection Agency, *Guideline on Air Quality Models (Revised), 40 Code of Federal Regulations, Part 51, Appendix W*, November 2005, https://www3.epa.gov/scram001/guidance/guide/appw_05.pdf

to Humans (Group 2); the USEPA had also concluded that the existing data did not provide an adequate basis for quantitative risk assessment.[3] However, based on two recent scientific studies,[4] IARC recently re-classified DPM as Carcinogenic to Humans to Group 1,[5] which means that the agency has determined that there is "sufficient evidence of carcinogenicity" of a substance in humans and represents the strongest weight-of-evidence rating in IARC's carcinogen classification scheme. This determination by the IARC may provide additional impetus for the USEPA to identify a quantitative dose-response relationship between exposure to DPM and cancer.

In summary, the estimated health impacts are based primarily on a series of conservative assumptions related to predicted environmental concentrations, exposure, and chemical toxicity. The use of conservative assumptions tends to produce upper-bound estimates of risk. USEPA acknowledges this uncertainty by stating: "the methods used [to estimate risk] are conservative, meaning that the real risks from the source may be lower than the calculations, but it is unlikely that they will be higher." The USEPA notes that the conservative assumptions used in a HRA are intended to assure that the estimated risks do not underestimate the actual risks posed by a site and that the estimated risks do not necessarily represent actual risks experienced by populations at or near a site.[6]

HAZARDS IDENTIFICATION

California Air Resources Board (CARB) has developed a list of TAC, where a TAC is "an air pollutant which may cause or contribute to an increase in mortality or in serious illness, or which may pose a present or potential hazard to human health (California Health and Safety Code Section 39655). All USEPA hazardous air pollutants are TAC. CARB administers the Air Toxics "Hot Spots" program under Assembly Bill 2588 "Hot Spots" Information and Assessment Act, which requires periodic local review of facilities which emit TAC. Local air agencies periodically must prioritize stationary sources of TAC and prepare health risk assessments for high-priority sources.

Diesel exhaust is a complex mixture of numerous individual gaseous and particulate compounds emitted from diesel-fueled combustion engines. Diesel particulate matter is formed

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[3] United States Environmental Protection Agency, *Health Assessment Document for Diesel Engine Exhaust*, May 2002, https://cfpub.epa.gov/si/si_public_record_report.cfm?dirEntryId=29060

[4] Attfield MD, Schleiff PL, Lubin JH, Blair A, Stewart PA, Vermeulen R, Coble JB, Silverman DT, *The Diesel Exhaust in Miners Study: A Nested Case-Control Study of Lung Cancer and Diesel Exhaust*, June 2012, https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3369553/

[5] International Agency for Research on Cancer, *Diesel Engine Exhaust Carcinogenic*, June 2012, https://www.iarc.fr/en/media-centre/pr/2012/pdfs/pr213_E.pdf

[6] United States Environmental Protection Agency, *Risk Assessment Guidance for Superfund Human Health Risk Assessment*, December 1989, https://www.epa.gov/sites/production/files/2015-09/documents/rags_a.pdf

primarily through the incomplete combustion of diesel fuel. DPM is removed from the atmosphere through physical processes including atmospheric fall-out and washout by rain. Humans can be exposed to airborne DPM by deposition on water, soil, and vegetation; although the main pathway of exposure is inhalation. Cal/EPA has concluded that potential cancer risk from inhalation exposure to whole diesel exhaust outweigh the multi-pathway cancer risk from the speciated components.

In August 1998, the CARB identified DPM as an air toxic. CARB developed the *Risk Reduction Plan to Reduce Particulate Matter Emissions from Diesel- Fueled Engines and Vehicles* and *Risk Management Guidance for the Permitting of New Stationary Diesel-Fueled Engines* and approved these documents on September 28, 2000.[7,8] The documents represent proposals to reduce DPM emissions, with the goal of reducing emissions and the associated health risk by 75 percent in 2010 and by 85 percent in 2020. The program aimed to require the use of state-of-the-art catalyzed DPM filters and ultra-low-sulfur diesel fuel.

In 2001, CARB assessed the state-wide health risks from exposure to diesel exhaust and to other toxic air contaminants. It is difficult to distinguish the health risks of diesel emissions from those of other air toxics, since diesel exhaust contains approximately 40 different TAC. The CARB study detected diesel exhaust by using ambient air carbon soot measurements as a surrogate for diesel emissions. The study reported that the state-wide cancer risk from exposure to diesel exhaust was about 540 per million population as compared to a total risk for exposure to all ambient air toxics of 760 per million. This estimate, which accounts for about 70 percent of the total risk from TAC, included both urban and rural areas in the state. The estimate can also be considered an average worst-case for the state, since it assumes constant exposure to outdoor concentrations of diesel exhaust and does not account for expected lower concentrations indoors, where most of time is spent. Based on 2012 estimates of California statewide exposure, DPM is estimated to increase statewide cancer risk by 520 cancers per million residents exposed over a lifetime.[9]

Exposure to DPM results in a greater incidence of chronic non-cancer health effects, such as cough, labored breathing, chest tightness, wheezing, and bronchitis. Individuals particularly vulnerable to DPM are children, whose lung tissue is still developing, the elderly and people with illnesses who may have other serious health problems that can be aggravated by exposure to DPM. In general, children are more vulnerable than adults to air pollutants because they

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[7] California Air Resources Board, *Risk Reduction Plan to Reduce Particulate Matter Emissions from Diesel-Fueled Engines and Vehicles*, October 2000, http://www.arb.ca.gov/diesel/documents/rrpfinal.pdf

[8] California Air Resources Board, *Risk Management Guidance for the Permitting of New Stationary Diesel-Fueled Engines*, October 2000, https://www.arb.ca.gov/diesel/documents/rmgFinal.pdf

[9] California Air Resources Board, *Summary: Diesel Particulate Matter Health Impacts*, April 12, 2016, https://www.arb.ca.gov/research/diesel/diesel-health_summ.htm

have higher inhalation rates, narrower airways, and less mature immune systems. In addition, children with allergies may have an enhanced allergic response when exposed to diesel exhaust).

EXPOSURE ASSESSMENT

Dispersion is the process by which atmospheric pollutants disseminate due to wind and vertical stability. The results of a dispersion analysis are used to assess pollutant concentrations at or near an emission source. The results of an analysis allow predicted concentrations of pollutants to be compared directly to air quality standards and other criteria such as health risks based on modeled concentrations.

A rising pollutant plume reacts with the environment in several ways before it levels off. First, the plume's own turbulence interacts with atmospheric turbulence to entrain ambient air. This mixing process reduces and eventually eliminates the density and momentum differences that cause the plume to rise. Second, the wind transports the plume during its rise and entrainment process. Higher winds mix the plume more rapidly, resulting in a lower final rise. Third, the plume interacts with the vertical temperature stratification of the atmosphere, rising as a result of buoyancy in the unstable-to-neutrally stratified mixed layer. However, after the plume encounters the mixing lid and the stably stratified air above, its vertical motion is dampened.

Molecules of gas or small particles injected into the atmosphere will separate from each other as they are acted on by turbulent eddies. The Gaussian mathematical model such as AERMOD simulates the dispersion of the gas or particles within the atmosphere. The formulation of the Gaussian model is based on the following assumptions:

- The predictions are not time-dependent (all conditions remain unchanged with time)
- The wind speed and direction are uniform, both horizontally and vertically, throughout the region of concern
- The rate of diffusion is not a function of position
- Diffusion in the direction of the transporting wind is negligible when compared to the transport flow

Dispersion Modeling Approach

Air dispersion modeling was performed to estimate the downwind dispersion of DPM exhaust emissions resulting from construction activities. The following sections present the fundamental components of an air dispersion modeling analysis including air dispersion model selection and options, receptor locations, meteorological data, and source exhaust parameters.

Model Selection and Options

AERMOD (Version 19191)[10] was used for the dispersion analysis. AERMOD is the USEPA preferred atmospheric dispersion modeling system for general industrial sources. The model can simulate point, area, volume, and line sources. AERMOD is the appropriate model for this analysis based on the coverage of simple, intermediate, and complex terrain. It also predicts both short-term and long-term (annual) average concentrations. The model was executed using the regulatory default options (stack-tip downwash, buoyancy-induced dispersion, and final plume rise), default wind speed profile categories, default potential temperature gradients, and assuming no pollutant decay.

The selection of the appropriate dispersion coefficients depends on the land use within three kilometers (km) of the project site. The types of land use were based on the classification method defined by Auer (1978); using pertinent United States Geological Survey (USGS) 1:24,000 scale (7.5 minute) topographic maps of the area. If the Auer land use types of heavy industrial, light-to-moderate industrial, commercial, and compact residential account for 50 percent or more of the total area, the USEPA *Guideline on Air Quality Models* recommends using urban dispersion coefficients; otherwise, the appropriate rural coefficients can be used. Based on observation of the area surrounding the project site, rural (urban is only designated within dense city centers such as downtown San Francisco) dispersion coefficients were applied within AERMOD.

Receptor Locations

Some receptors are considered more sensitive to air pollutants than others, because of preexisting health problems, proximity to the emissions source, or duration of exposure to air pollutants. Land uses such as primary and secondary schools, hospitals, and convalescent homes are considered to be relatively sensitive to poor air quality because the very young, the old, and the infirm are more susceptible to respiratory infections and other air quality-related health problems than the general public. Residential areas are also considered sensitive to poor air quality because people in residential areas are often at home for extended periods. Recreational land uses are moderately sensitive to air pollution because vigorous exercise associated with recreation places having a high demand on respiratory system function.

Sensitive receptors were placed at existing residences to estimate health impacts due to proposed project construction on existing receptors. The Project Site is surrounded by open grazing lands. Immediate adjacent to and south of the site, a smaller aggregate mine is located on Bureau of Land management (BLM)-administered land. Other BLM land is located to the east and south and the Wells Ranch is located directly to the north. The character of the area surrounding

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[10] United States Environmental Protection Agency, AERMOD Modeling System, https://www.epa.gov/scram/air-quality-dispersion-modeling-preferred-and-recommended-models

the Project site is rural residential with homes on large, agricultural-sized parcels. Eight homes are located on parcels from 10 to 80 acres in size to the west and south along Ward Lake Road. The nearest residence is approximately 875 feet from the western property line of the Project Site. Shaffer Elementary School is located 2.4 miles to the southeast of the Project Site. There are approximately 24 residences abutting Highway 395 and Center Road. Traveling farther west along Center Road, toward the California State Correctional Center, there are approximately six additional residences. **Figure 1** displays the location of the sensitive receptors used in this HRA. Receptors were placed at a height of 1.8 meters (typical breathing height). Terrain elevations for receptor locations were used based on available USGS information for the area.

Meteorological Data

Hourly meteorological data from Alturas Municipal Airport, located approximately 100 miles to the north the proposed project, were used in the dispersion modeling analysis.[11] Meteorological data from 2009 through 2013 were used.[12] **Figure 2** displays the annual wind rose. Wind directions are predominately from the west or south with a high frequency of calm wind speed conditions (over 40 percent), as shown in **Figure 3**. The average annual wind speed is 5.44 miles per hour.

Source Release Characteristics

Offroad equipment was treated as area sources located within the boundary of the mining operations. These sources were assigned a release height of 3.05 meters and an initial vertical dimension of 4.15 meters, which reflects the height of the equipment plus an additional height of the exhaust plume above the exhaust point to account for plume rise due to buoyancy and momentum. Haul trucks were treated as a line source (i.e., volume sources placed at regular intervals) located along an access road. The haul trucks were assigned a release height of 3.05 meters and an initial vertical dimension of 4.15 meters, which accounts for dispersion from the movement of vehicles.[13]

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[11] Redding is located approximately 110 miles to the west of the Project Site. However, the meteorological conditions at Redding would not be representative of the Project Site given the elevation and proximity to mountainous terrain. The Project Site is at 4,365 feet in elevation, Alturas is at 4,375 feet, while Redding is at 500 feet. Redding's wind rose exhibit a south-north wind direction familiar to wide valley flow. Therefore, the Alturas is the most representative meteorological data readily available.

[12] California Air Resources Board, Air Quality Planning and Science Division, Meteorological Files, October 5, 2015, https://www.arb.ca.gov/toxics/harp/metfiles2.htm

[13] While haul truck emissions contribute substantially to overall project emissions, they are spread over many miles. Hence, the portion of trucking emissions that would impact one receptor is much smaller than the emissions that the generator activity at the project site would impact a receptor near the site.

FIGURE 1
HEALTH RISK ASSESSMENT RECEPTORS

FIGURE 2
ANNUAL WINDROSE

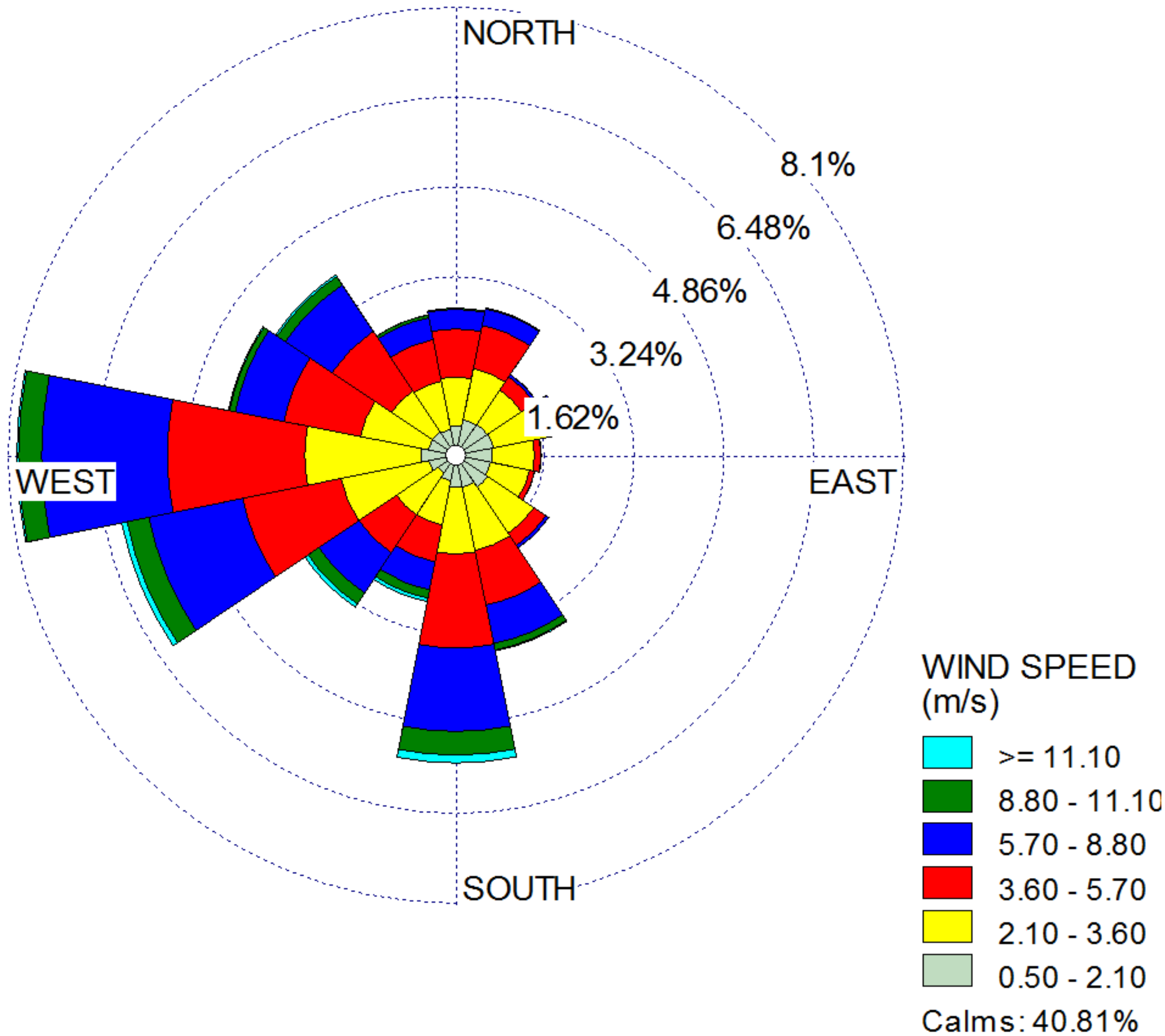
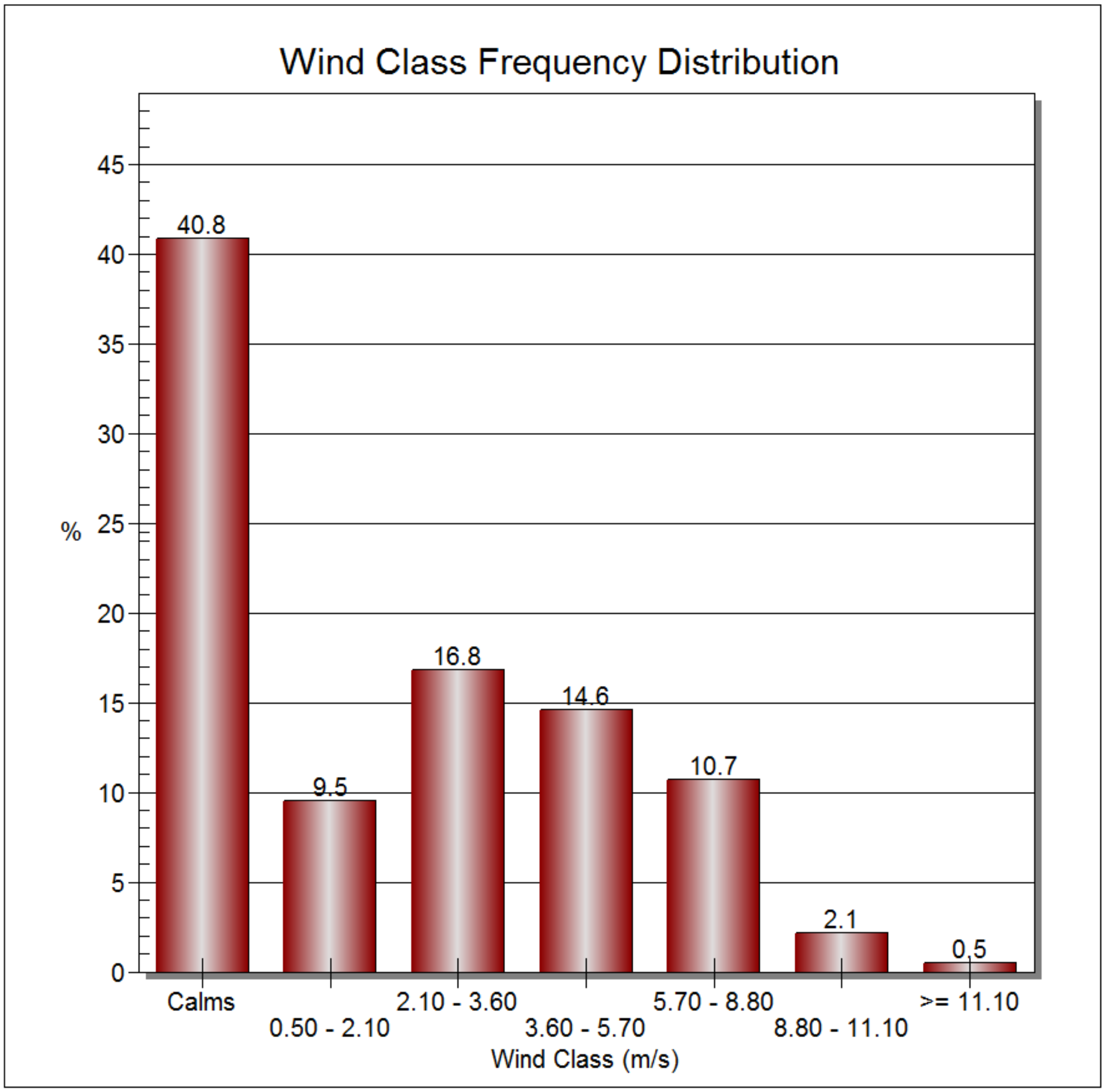


FIGURE 3
ANNUAL WIND SPEED DISTRIBUTION



The Ward Lake Pit maintains a permit to operate (PTO-19-140: expiration date March 31, 2024) for onsite equipment such as a hot mix asphalt plant, a lime slurry mix plant, a concrete plant, a crushing plant, a wash plant, a sand plant, and five diesel generators (one 750 horsepower [hp] generator associated with the crushing plant[14], one 475 hp generator associated with the portable plant[15], and one 469 hp generator associated with the wash plant.[16]. The release height of the generators was assumed to be 3.05 meters (10 feet), while the exhaust temperature, exit diameter, exhaust flow rate were based on manufacturer specifications.[17]

Terrain elevations for emission source locations were used based on available USGS information for the area. AERMAP (Version 18081)[18] was used to develop the terrain elevations.

EXPOSURE PARAMETERS

This HRA was conducted following methodologies in OEHHA's *Air Toxics Hot Spots Program Guidance Manual for Preparation of Health Risk Assessments*.[19] This was accomplished by applying the estimated concentrations at the receptors analyzed to the established cancer risk estimates and acceptable reference concentrations for non-cancer health effects.

OEHHA's revisions to its *Guidance Manual* were primarily designed to ensure that the greater sensitivity of children to cancer and other health risks is reflected in HRAs. For example, OEHHA now recommends that risks be analyzed separately for multiple age groups, focusing especially on young children and teenagers, rather than the past practice of analyzing risks to the general population, without distinction by age. OEHHA also now recommends that statistical "age sensitivity factors" be incorporated into a HRA, and that children's relatively high breathing rates be accounted for. On the other hand, the *Guidance Manual* revisions also include some changes that would reduce calculated health risks. For example, under the former guidance, OEHHA recommended that residential cancer risks be assessed by assuming 70 years of exposure at a residential receptor; under the *Guidance Manual*, this assumption is lessened to 30 years.

OEHHA has developed exposure factors (e.g., daily breathing rates) for six age groups including the last trimester to birth, birth to 2 years, 2 to 9 years, 2 to 16 years, 16 to 30 years,

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[14] To be removed or replaced by January 2023 with Air District approved engine.

[15] To be removed or replaced by January 2024 with Air District approved engine.

[16] To be removed or replaced by January 2025 with Air District approved engine.

[17] Caterpillar 3412 Generator Specification Sheets, https://www.cat.com/en_US/articles/configurations/ep-genset-ratings/3516b1.html and Caterpillar 3406 Generator Specification Sheets, https://www.cat.com/en_IN/articles/configurations/ep-genset-ratings/3406c.html

[18] US Environmental Protection Agency, AERMAP, https://www.epa.gov/scram/air-quality-dispersion-modeling-preferred-and-recommended-models

[19] Office of Environmental Health Hazard Assessment, *Air Toxics Hot Spots Program Guidance Manual for Preparation of Health Risk Assessments*, March 6, 2015, http://oehha.ca.gov/air/hot_spots/hotspots2015.html

and 16 to 70 years. These age bins allow for more refined exposure information to be used when estimating exposure and the potential for developing cancer over a lifetime. This means that exposure variates are needed for the third trimester, ages zero to less than two, ages two to less than nine, ages two to less than 16, ages 16 to less than 30, and ages 16 to 70. Residential receptors utilize the 95th percentile breathing rate values. The breathing rates are age-specific and are 1,090 liters per kilogram-day for ages less than 2 years, 745 liters per kilogram-day for ages 2 to 16 years, 335 liters per kilogram-day for ages 16 to 30 years, and 290 liters per kilogram-day for ages 30 to 70 years. A school child breathing rate is 520 liters per kilogram-day and an off-site worker breathing rate is 230 liters per kilogram-day.

OEHHA developed age sensitivity factors (ASF) to take into account the increased sensitivity to carcinogens during early-in-life exposures. OEHHA recommends that cancer risks be weighted by a factor of 10 for exposures that occur from the third trimester of pregnancy to 2 years of age, and by a factor of 3 for exposures from 2 years through 15 years of age.

Based on OEHHA recommendations, the cancer risk to residential receptors assumes exposure occurs 24 hours per day for 350 days per year while accounting for a percentage of time at home. OEHHA evaluated information from activity pattern databases to estimate the fraction of time at home (FAH) during the day. This information was used to adjust exposure duration and cancer risk based on the assumption that a person is not present at home continuously for 24 hours and therefore exposure to emissions is not occurring when a person is away from their home. In general, the FAH factors are age-specific and are 0.85 for ages less than 2 years, 0.72 for ages 2 to 16 years, and 0.73 for ages 30 to 70 years.

OEHHA has decreased the exposure duration currently being used for estimating cancer risk at the maximum exposed individual resident from 70 years to 30 years. This is based on studies showing that 30 years is a reasonable estimate of the 90th to 95th percentile of residency duration in the population. Additionally, OEHHA recommends using the 9 and 70-year exposure duration to represent the potential impacts over the range of residency periods.

Given the exposure durations of less than 24 hours, sensitive recreational receptors were evaluated for acute impacts only. Based on OEHHA recommendations, for children at school sites, exposure is assumed to occur 10 hours per day for 180 days (or 36 weeks) per year. Cancer risk estimates for children at school sites are calculated based on 9 year exposure duration. School sites also include teachers and other adult staff which are treated as off-site workers.

RISK CHARACTERIZATION

Cancer risk is defined as the lifetime probability of developing cancer from exposure to carcinogenic substances. Cancer risks are expressed as the chance in one million of getting cancer (i.e., number of cancer cases among one million people exposed). The cancer risks are assumed to occur exclusively through the inhalation pathway. The cancer risk can be estimated by using the cancer potency factor (milligrams per kilogram of body weight per day [mg/kg-day]), the 30-year annual average concentration (microgram per cubic meter [μg/m^3]), and the lifetime exposure adjustment.

Following guidelines established by OEHHA, the incremental cancer risks attributable to the proposed project were calculated by applying exposure parameters to modeled DPM concentrations in order to determine the inhalation dose (mg/kg-day) or the amount of pollutants inhaled per body weight mass per day. The cancer risks occur exclusively through the inhalation pathway; therefore, the cancer risks can be estimated from the following equation:

$$\text{Dose-inh} = \frac{C_{air} * \{DBR\} * A * ASF * FAH * EF * ED * 10^{-6}}{AT}$$

where:

Dose-inh	= Dose of the toxic substance through inhalation in mg/kg-day
10^{-6}	= Micrograms to milligrams conversion, Liters to cubic meters conversion
C_{air}	= Concentration in air in microgram (μg)/cubic meter (m^3)
{DBR}	= Daily breathing rate in liter (L)/kg body weight – day
A	= Inhalation absorption factor, 1.0
ASF	= Age Sensitivity Factor
EF	= Exposure frequency (days/year)
ED	= Exposure duration (years)
FAH	= Fraction of Time at Home
AT	= Averaging time period over which exposure is averaged in days (25,550 days for a 70 year cancer risk)

To determine incremental cancer risk, the estimated inhalation dose attributed to the proposed project was multiplied by the cancer potency slope factor (cancer risk per mg/kg-day). The cancer potency slope factor is the upper bound on the increased cancer risk from a lifetime exposure to a pollutant. These slope factors are based on epidemiological studies and are different values for different pollutants. This allows the estimated inhalation dose to be equated to a cancer risk.

Non-cancer adverse health impacts, acute (short-term) and chronic (long-term), are measured against a hazard index (HI), which is defined as the ratio of the predicted incremental exposure concentration from the proposed project to a published reference exposure level (REL) that could cause adverse health effects as established by OEHHA. The ratio (referred to as the

Hazard Quotient [HQ]) of each non-carcinogenic substance that affects a certain organ system is added to produce an overall HI for that organ system. The overall HI is calculated for each organ system. If the overall HI for the highest-impacted organ system is greater than one, then the impact is considered to be significant.

The HI is an expression used for the potential for non-cancer health effects. The relationship for the non-cancer health effects is given by the annual concentration (in $\mu g/m^3$) and the REL (in $\mu g/m^3$). The acute hazard index was determined using the "simple" concurrent maximum approach, which tends to be conservative (i.e., overpredicts).

The relationship for the non-cancer health effects is given by the following equation:

$$HI = C/REL$$

Where:

HI	= Hazard index; an expression of the potential for non-cancer health effects.
C	= Annual average concentration ($\mu g/m^3$) during the 70 year exposure period.
REL	= Concentration at which no adverse health effects are anticipated.

The chronic REL for DPM was established by the California OEHHA as 5 $\mu g/m^3$.[20]

[20] Office of Environmental Health Hazards Assessment - Acute, 8-hour, and Chronic Reference Exposure Levels, November 4, 2019, http://www.oehha.ca.gov/air/allrels.html

Health Risk Assessment Assumptions

5	Chronic Reference Exposure Level (ug/m3) for DPM
1.1	Cancer Potency Slope Factor (cancer risk per mg/kg-day) for DPM
350	days per year
25,550	days per lifetime
1090	95th Percentile Daily Breathing Rates (0<2 Years
861	95th Percentile Daily Breathing Rates (2<9 Years
745	95th Percentile Daily Breathing Rates (2<16 Years
335	95th Percentile Daily Breathing Rates (16<30 Years
290	95th Percentile Daily Breathing Rates (30<70 Years
0.85	fraction of 0<2 Years
0.72	fraction of 2<16 Years
0.73	fraction of 16<70 Years

Project: Ward Lake Pit Expansion
Date: January 25, 2021
Condition: Proposed Project
Receptor: Existing Residence

Exposure Year	Calender Year	Annual PM2.5 Concentration (ug/m3)	Daily Breathing Rates (L/kg-day)	Exposure Factor	fraction of time at home	Cancer Risk
1	2021	2.77E-03	1,090	10.0	0.85	0.39
2	2022	2.77E-03	1,090	10.0	0.85	0.39
3	2023	2.77E-03	745	4.75	0.72	0.11
4	2024	2.77E-03	745	3.00	0.72	0.07
5	2025	2.77E-03	745	3.00	0.72	0.07
6	2026	2.77E-03	745	3.00	0.72	0.07
7	2027	2.77E-03	745	3.00	0.72	0.07
8	2028	2.77E-03	745	3.00	0.72	0.07
9	2029	2.77E-03	745	3.00	0.72	0.07
10	2030	2.77E-03	745	3.00	0.72	0.07

0.00	Chronic Hazard Impact
1	Significance Threshold
No	Significant?
1.35	Cancer Risk (Child)
10	Significance Threshold
No	Significant?
0.17	Cancer Risk (Adult)
10	Significance Threshold
No	Significant?

Health Risk Assessment Assumptions

5	Chronic Reference Exposure Level (ug/m3) for DPM
1.1	Cancer Potency Slope Factor (cancer risk per mg/kg-day) for DPM
350	days per year
25,550	days per lifetime
1090	95th Percentile Daily Breathing Rates (0<2 Years
861	95th Percentile Daily Breathing Rates (2<9 Years
745	95th Percentile Daily Breathing Rates (2<16 Years
335	95th Percentile Daily Breathing Rates (16<30 Years
290	95th Percentile Daily Breathing Rates (30<70 Years
0.85	fraction of 0<2 Years
0.72	fraction of 2<16 Years
0.73	fraction of 16<70 Years

Project: Ward Lake Pit Expansion
Date: August 27, 2021
Condition: Proposed Project
Receptor: Existing Residence

Exposure Year	Calender Year	Annual PM2.5 Concentration (ug/m3)	Daily Breathing Rates (L/kg-day)	Exposure Factor	fraction of time at home	Cancer Risk
1	2021	2.78E-03	1,090	10.0	0.85	0.39
2	2022	2.78E-03	1,090	10.0	0.85	0.39
3	2023	2.78E-03	745	4.75	0.72	0.11
4	2024	2.78E-03	745	3.00	0.72	0.07
5	2025	2.78E-03	745	3.00	0.72	0.07
6	2026	2.78E-03	745	3.00	0.72	0.07
7	2027	2.78E-03	745	3.00	0.72	0.07
8	2028	2.78E-03	745	3.00	0.72	0.07
9	2029	2.78E-03	745	3.00	0.72	0.07
10	2030	2.78E-03	745	3.00	0.72	0.07
11	2031	2.78E-03	745	3.00	0.72	0.07
12	2032	2.78E-03	745	3.00	0.72	0.07
13	2033	2.78E-03	745	3.00	0.72	0.07
14	2034	2.78E-03	745	3.00	0.72	0.07
15	2035	2.78E-03	745	3.00	0.72	0.07
16	2036	2.78E-03	745	3.00	0.72	0.07
17	2037	2.78E-03	335	1.70	0.73	0.02
18	2038	2.78E-03	335	1.00	0.73	0.01
19	2039	2.78E-03	335	1.00	0.73	0.01
20	2040	2.78E-03	335	1.00	0.73	0.01
21	2041	2.78E-03	335	1.00	0.73	0.01
22	2042	2.78E-03	335	1.00	0.73	0.01
23	2043	2.78E-03	335	1.00	0.73	0.01
24	2044	2.78E-03	335	1.00	0.73	0.01
25	2045	2.78E-03	335	1.00	0.73	0.01
26	2046	2.78E-03	335	1.00	0.73	0.01
27	2047	2.78E-03	335	1.00	0.73	0.01
28	2048	2.78E-03	335	1.00	0.73	0.01
29	2049	2.78E-03	335	1.00	0.73	0.01
30	2050	2.78E-03	335	1.00	0.73	0.01

0.00	Chronic Hazard Impact
1	Significance Threshold
No	Significant?
1.91	Cancer Risk (Child)
10	Significance Threshold
No	Significant?
0.52	Cancer Risk (Adult)
10	Significance Threshold
No	Significant?