Air Quality/Greenhouse Gas Report

Big Rock Cluster Solar Project

Imperial County

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Acronyms and Abbreviations

µg/m^3	micrograms per cubic meter
AAQS	ambient air quality standard
AB	Assembly Bill
AQMP	Imperial County Air Quality Management Plan
AQR	Air Quality Report
AR4	IPCC's Fourth Assessment Report
AVTD	average vehicle trips per day
BACM	Best Available Control Measure
BACT	Best Available Control Technology
BAU	business as usual
BR-1	Big Rock 1 Solar Farm
CAAQS	California Ambient Air Quality Standards
CalEEMod™	California Emissions Estimator Model
CAQAR	Comprehensive Air Quality Analysis Report
CARB	California Air Resources Control Board
CAT	Climate Action Team
CEC	California Energy Commission
CEQA	California Environmental Quality Act
CFC	chlorofluorocarbon
CH_4	methane
CNRA	California Natural Resources Agency
CO	carbon monoxide
CO_2	carbon dioxide
CO_2e	carbon dioxide equivalent
CTI	California Toxic Inventory
DPM	diesel particulate matter
EI	emission inventory
EIR	Environmental Impact Report
EMFAC	Emission Factors model for on-road mobile sources
EO	Executive Order
EPA	United States Environmental Protection Agency
FCAA	Federal Clean Air Act
gen-tie	generator tie-ins
GHG	greenhouse gas
GWP	global warming potential
HFC	hydrofluorocarbon
HRA	Health Risk Assessment
ICAPCD	Imperial County Air Pollution Control District
IPCC	International Panel on Climate Change
IRP	Integrated Resource Plan
kV	kilovolt
L-1	Laurel 1 Solar Farm

Acronyms and Abbreviations

L-2	Laurel 2 Solar Farm
L-3	Laurel 3 Solar Farm
M	million
$MtCO_2e$	million tonnes of carbon dioxide equivalents
MW-AC	megawatts of alternating current
N_2O	nitrous oxide
N	natural sources
NAAQS	National Ambient Air Quality Standards
NH_3	ammonia
NH_4NO_3	ammonium nitrate
NO	nitric oxide
NO_2	nitrogen dioxide
NO_X	nitrogen oxides
O&M	operations and maintenance
PFC	perfluorocarbon
PM	particulate matter
PM_{10}	respirable particulate matter of 10 micrometers or less in size
$PM_{2.5}$	fine particulate matter of 2.5 micrometers or less in size
ppb	parts per billion
ppm	parts per million
Project	Big Rock Cluster Solar Project
PV	photovoltaic
ROG	reactive organic gases
RPS	Renewables Portfolio Standard
SB	Senate Bill
SCAQMD	South Coast Air Quality Management District
SF_6	sulfur hexafluoride
SIP	State Implementation Plan
SSAB	Salton Sea Air Basin
t	abbreviation for tonne (or metric ton)
TAC	toxic air contaminants
tCO_2e	tonne of carbon dioxide equivalents
TIA	Traffic Impact Analysis
UNFCCC	United Nations Framework Convention on Climate Change
URBEMIS	Urban Emissions computer model
VDE	Visible Dust Emissions
WRI	World Resources Institute

SECTION 1.0 – INTRODUCTION

1.1. Report Purpose

The purpose of this Air Quality Report (AQR) is to analyze the potential air quality and climate change impacts that could occur with the construction and operation of the Big Rock Cluster Solar Project (Project), in Imperial County, California. This assessment was conducted within the context of the California Environmental Quality Act (CEQA, California Public Resources Code Sections 21000 et seq.). The methodology follows the CEQA Air Quality Handbook[1] prepared by the Imperial County Air Pollution Control District (ICAPCD) for quantification of emissions and evaluation of potential impacts to air resources.

1.2. Project Location

The Project sites will be approximately 9 miles west southwest of the City of El Centro, California in southern Imperial County (see Figure 1). The Project site is adjacent to the Campo Verde Solar Farm. The Project site is generally south of Interstate 8, west of Drew Road and Vogel Road, north of Mandrapa Road, and east of Hyde Road in the Imperial Irrigation District. The Project Sites are approximately eight miles southwest of the City of El Centro and three miles south of Seeley, a census-designated place, in the unincorporated area of Imperial County. Agricultural uses lie to the north and east, and solar farms are planned or completed/constructed to the west and to the south.

Figure 1 – Project Vicinity

1.3. Project Description

92JT 8me, LLC, known herein as the "Big Rock Applicant", is proposing the development a single utility-scale solar farm and 90FI 8me, LLC, known herein as the "Laurel Applicant" is proposing to construct three utility-scale solar farms. These four projects together are known as the Big Rock

[1] CEQA Air Quality Handbook: Guidelines for the Implementation of the California Air Quality Act of 1970 as amended. Imperial County Air Pollution Control District, November 2007.

Cluster Solar Farm Project (Project). The four projects are as follows: Big Rock 1 Solar Farm (BR-1), Laurel 1 Solar Farm (L-1), Laurel 2 Solar Farm (L-2), and Laurel 3 Solar Farm (L-3) (see Figure 2). Gross acreage and proposed size in megawatts of alternative current (MW-AC) for each project is presented in Figure 2. Projects may cooperate if necessary to meet power production requirements. Each project is intended to have operations and maintenance (O&M) facilities and an on-site substation but may also utilize shared facilities.

Table 1 – Big Rock Cluster Components

Site Name	Abbr.	Gross Acreage	Size (MW)
Big Rock 1 Solar Farm	BR-1	342	75
Laurel 1 Solar Farm	L-1	171	40
Laurel 2 Solar Farm	L-2	280	70
Laurel 3 Solar Farm	L-3	587	140
TOTAL for Project		***1,380***	***325***

Each solar site will utilize photovoltaic (PV) panels or modules on mounting frameworks to convert sunlight directly into electricity. Individual panels will be installed on either fixed-tilt or tracker mount systems (single- or dual-axis, using galvanized steel or aluminum). If the panels are configured for fixed tilt, the panels will be oriented toward the south. For tracking configurations, the panels will rotate to follow the sun over the course of the day. The panels will stand up to 30 feet high, depending on mounting system used. All the sites have historically been used for agriculture and are relatively flat.

In addition to the PV panels, the sites will include inverter stations, energy storage units, substations, generator tie-in lines (gen-ties), above-ground water storage tanks, and O&M buildings. Sites near each other may share O&M, substations, and/or transmission facility areas with neighboring sites. For conservative estimates, this AQR assumes that each site will construct separate facilities.

Power generated by the Projects will be delivered from the Project sites via up to 230 kilovolt (kV) overhead and/or underground electrical transmission line(s) originating from an on-site substation(s)/ switchyard(s) and terminating at the proposed Imperial Irrigation District Fern Substation. In the alternative, power may be delivered to the San Diego Gas & Electric Imperial Valley Substation, Drew Switchyard, or Imperial Solar Energy Center West Substation.

The projects may include an energy storage system(s), located at or near the substation(s) (onsite or shared) and/or at the inverter stations, but possibly elsewhere onsite. The Projects may share an energy storage system with one another and/or nearby solar projects or may operate standalone energy storage facilities within the Project Sites.

After the useful life of each project (up to 40 years), the panels are easily disassembled from the steel mounting frames and the site restored to pre-development condition.

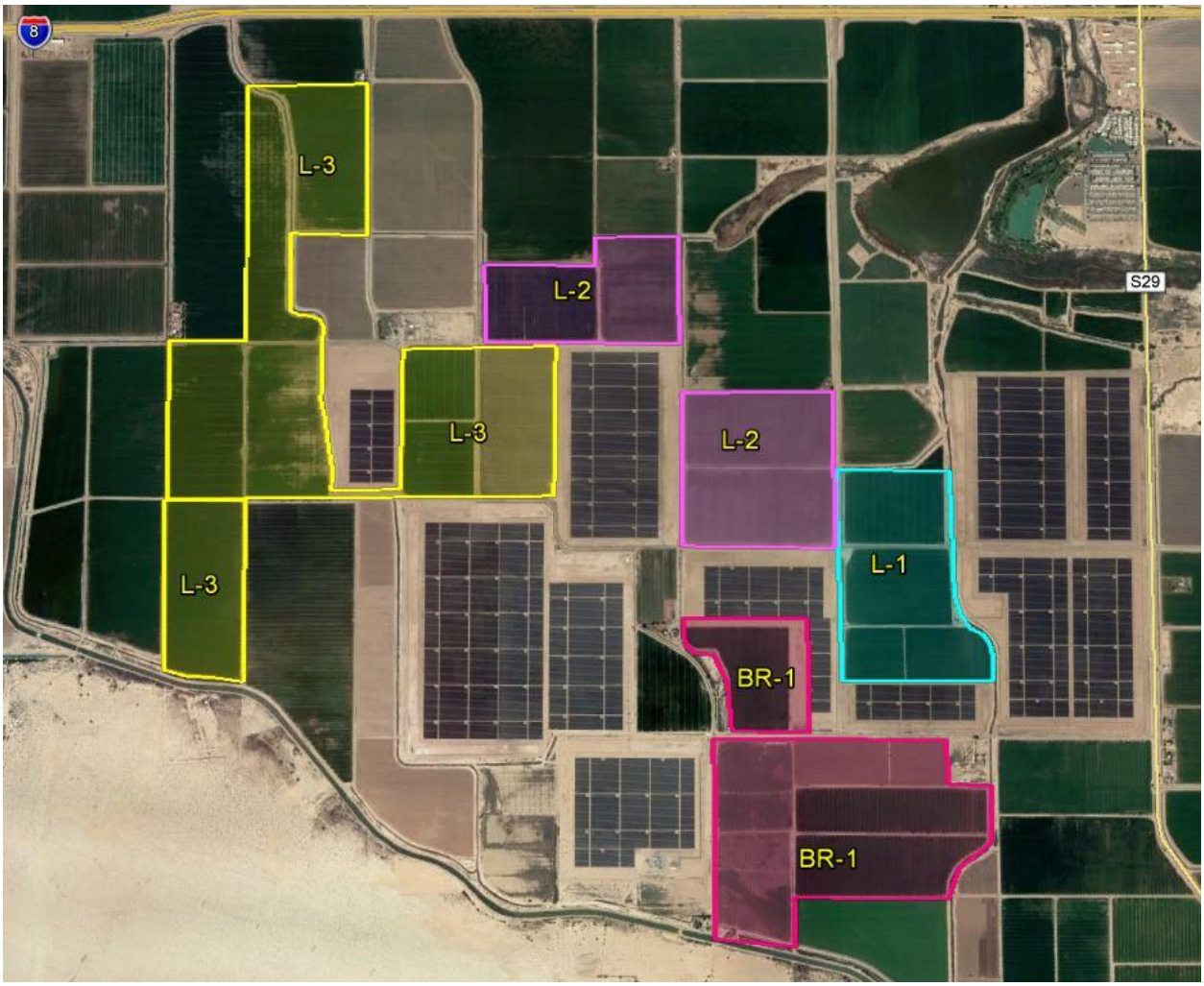

Figure 2 – Project Location

SECTION 2.0 – EXISTING CONDITIONS

Air quality is determined primarily by the type and quantity of contaminants emitted into the atmosphere, the size and topography of the air basin, and its meteorological conditions. Atmospheric conditions such as wind speed, wind direction, and air temperature gradients, along with local topography, provide the link between air pollution emissions and air quality.

2.1. Climatology/ Meteorology

Meteorology is the study of weather and climate. Weather refers to the state of the atmosphere at a given time and place regarding temperature, air pressure, humidity, cloudiness, and precipitation. The term "weather" refers to conditions over short periods; conditions over prolonged periods, generally at least 30 to 50 years, are referred to as climate. Climate, in a narrow sense, is usually defined as the "average weather," or more rigorously as the statistical description in terms of the mean and variability of relevant quantities over a period ranging from months to thousands or millions of years. These quantities are most often surface variables such as temperature, precipitation, and wind.

Climatic conditions in Imperial County are governed by the large-scale sinking and warming of air in the semi-permanent tropical high-pressure center of the Pacific Ocean. The high-pressure ridge blocks out most mid-latitude storms except in winter when the high is weakest and farthest south. The coastal mountains prevent the intrusion of any cool, damp air found in California coastal environs. Because of the weakened storms and barrier, Imperial County experiences clear skies, extremely hot summers, mild winters, and little rainfall. The flat terrain of the valley and the strong temperature differentials created by intense solar heating, produce moderate winds and deep thermal convection.

The combination of subsiding air, protective mountains, and distance from the ocean all combine to limit precipitation severely. Rainfall is highly variable with precipitation from a single heavy storm sometimes exceeding the entire annual total during a later drought condition.

Imperial County enjoys a year-round climate characterized by a temperate fall, winter, and spring and a harsh summer. Humidity often combines with the valley's normal elevated temperatures to produce a moist, tropical atmosphere that frequently seems hotter than the thermometer suggests. The sun shines, on the average, more in the Imperial County that anywhere else in the United States.

Temperature and Precipitation

The nearest National Weather Service Cooperative Observer Program weather station to the Project is the station in El Centro, called El Centro 2 SSW, which is located approximately 8.5 miles north-northeast of the Project. At the El Centro 2 SSW [2], average recorded rainfall during the Period of Record (1932 to 2016) measured 2.64 inches, with 93 percent of precipitation occurring between

[2] Western U.S. Climate Historical Summaries. Western Regional Climate Center. http://www.wrcc.dri.edu/Climsum.html. Accessed September 2017.

August and March and 45 percent in just December through February. Monthly average maximum temperatures at this station vary annually by 38.1 degrees Fahrenheit (ºF); 108.0 °F at the hottest to 69.9 ºF at the coldest and monthly average minimum temperatures vary by 36.2 °F annually; i.e. from 40.1 °F to 76.3 ºF. In fact, this station shows that the months of June, July, August, and September have monthly maximum temperatures greater than 100 ºF

Humidity

Humidity in Imperial County is typically low throughout the year, ranging from 28 percent in summer to 52 percent in winter. The large daily oscillation of temperature produces a corresponding large variation in the relative humidity. Nocturnal humidity rises to 50-60 percent, but drop to about 10 percent during the day. Summer weather patterns are dominated by intense heat induced low-pressure areas that form over the interior desert.

Wind

The wind direction follows two general patterns. The first pattern occurs seasonally from fall through spring, where prevailing winds are from the west and northwest. Most of these winds originate in the Los Angeles Basins. The Imperial County area occasionally experiences periods of high winds. Wind speeds exceeding 31 mph occur most frequently in April and May. On an annual basis, high winds, those exceeding 31 mph, are observed 0.6 percent of the time, where speeds of less than 6.8 miles per hour account for more than one-half of the observed winds. Wind statistics indicate prevailing winds are from the west-northwest through southwest; however, a secondary flow pattern from the southeast is also evident.

Inversions

Air pollutant concentrations are primarily determined by the amount of pollutant emissions in an area and the degree to which these pollutants are dispersed in the atmosphere. The stability of the atmosphere is one of the key factors affecting pollutant dispersion. Atmospheric stability regulates the amount of vertical and horizontal air exchange, or mixing, that can occur within a given air basin. Horizontal mixing is a result of winds, as discussed above, but vertical mixing also affects the degree of stability in the atmosphere. An interruption of vertical mixing is called inversions.

In the atmosphere, air temperatures normally decrease as altitude increases. At varying distances above the earth's surface, however, a reversal of this gradient can occur. This condition, termed an inversion, is simply a warm layer of air above a layer of cooler air, and it has the effect of limiting the vertical dispersion of pollutants. The height of the inversion determines the size of the vertical mixing volume trapped below. Inversion strength or intensity is measured by the thickness of the layer and the difference in temperature between the base and the top of the inversion. The strength of the inversion determines how easily it can be broken by winds or solar heating.

Imperial County experiences surface inversions almost every day of the year. Due to strong surface heating, these inversions are usually broken allowing pollutants to disperse more easily. Weak, surface inversions are caused by radiational cooling of air in contact with the cold surface of the earth at night. In valleys and low-lying areas, this condition is intensified by the addition of chilly air

flowing down slope from the hills and pooling on the valley floor.

The presence of the Pacific High-Pressure Cell can cause the air to warm to a temperature higher than the air below. This highly stable atmospheric condition, termed a subsidence inversion can act as a nearly impenetrable lid to the vertical mixing of pollutants. The strength of these inversions makes them difficult to disrupt. Consequently, they can persist for one or more days, causing air stagnation and the buildup of pollutants. Highest or worst-case ozone levels are often associated with the presence of this type of inversion.

2.2. Local Air Quality Conditions

Criteria Air Pollutants

As required by the Federal Clean Air Act (FCAA), the Environmental Protection Agency (EPA) has identified criteria pollutants and established National Ambient Air Quality Standards (NAAQS) to protect public health and welfare. NAAQS have been established for ozone, carbon monoxide (CO), nitrogen dioxide (NO_2), sulfur dioxide, suspended particulate matter (PM), and lead. Suspended PM has standards for both PM with an aerodynamic diameter of 10 micrometers or less (respirable PM, or PM_{10}) and PM with an aerodynamic diameter of 2.5 micrometers or less (fine PM, or $PM_{2.5}$). The California Air Resources Board (CARB) has established separate standards for the State, i.e. the California Ambient Air Quality Standards (CAAQS). CARB established CAAQS for all the federal pollutants and sulfates, hydrogen sulfide, and visibility-reducing particles.

For some of the pollutants, the identified air quality standards are expressed in more than one averaging time to address the typical exposures found in the environment. For example, CO is expressed as a one-hour averaging time and an eight-hour averaging time. Regulations have set NAAQS and CAAQS limits in parts per million (ppm), parts per billion (ppb), or micrograms per cubic meter ($\mu g/m^3$). The standards are presented in Table 2 and the following text provides descriptions and health effects of each.

2.2.1.1 Ozone

Ozone is not emitted directly to the atmosphere, but is formed by photochemical reactions between reactive organic gases (ROG) and oxides of nitrogen (NO_X) in the presence of sunlight. The long, hot, humid days of summer are particularly contributing to ozone formation; thus, ozone levels are of concern primarily during the months of May through September.

- **Reactive organic gases (ROG)** are defined as any compound of carbon, excluding CO, carbon dioxide (CO_2), carbonic acid, metallic carbides or carbonates, and ammonium carbonate, which participate in atmospheric photochemical reactions. It should be noted that there are no State or national ambient air quality standard for ROG because ROGs are not classified as criteria pollutants. They are regulated, however, because a reduction in ROG emissions reduces certain chemical reactions that contribute to the formulation of ozone. ROGs are also transformed into organic aerosols in the atmosphere, which contribute to higher PM_{10} and lower visibility.

Table 2 – National and State Ambient Air Quality Standards[3]

Air Pollutant	Averaging Time	California Standard	National Standard
Ozone (O_3)	1 hour 8 hour	0.09 ppm 0.070 ppm	— 0.070 ppm
Respirable particulate matter (PM_{10})	24 hour Mean	50 µg/m^3 20 µg/m^3	150 µg/m^3 —
Fine particulate matter ($PM_{2.5}$)	24 hour Mean	— 12 µg/m^3	35 µg/m^3 12.0 µg/m^3
Carbon monoxide (CO)	1 hour 8 hour	20 ppm 9.0 ppm	35 ppm 9 ppm
Nitrogen dioxide (NO_2)	1 hour Mean	0.18 ppm 0.030 ppm	100 ppb 0.053 ppm
Sulfur dioxide (SO_2)	1 hour 24 hour	0.25 ppm 0.04 ppm	75 ppb —
Lead	30-day Rolling 3-month	1.5 µg/m^3 —	— 0.15 µg/m^3
Sulfates	24 hour	25 µg/m^3	**No Federal Standard**
Hydrogen sulfide	1 hour	0.03 ppm	
Vinyl chloride	24 hour	0.01 ppm	
Visibility-reducing particles	8 hour	Extinction coefficient of 0.23 per kilometer, visibility of ten miles or more due to particles when relative humidity is less than 70%.	

Abbreviations:

ppm = parts per million *ppb = parts per billion* *30-day = 30-day average*
µg/m^3 = micrograms per cubic meter *Mean = Annual Arithmetic Mean*

- **Nitrogen oxides (NO_X)** serve as integral participants in the process of photochemical smog production. The two major forms of NO_X are nitric oxide (NO) and NO_2. NO is a colorless, odorless gas formed from atmospheric nitrogen and oxygen when combustion takes place under hot temperature and/or high pressure. NO_2 is a reddish-brown irritating gas formed by the combination of NO and oxygen. NO_X is an ozone precursor. A precursor is a directly emitted air contaminant that, when released into the atmosphere, forms, causes to be formed, or contributes to the formation of a secondary air contaminant for which an ambient air quality standard

[3] Ambient Air Quality Standards. California Air Resources Board. http://www.arb.ca.gov/research/aaqs/aaqs2.pdf. Accessed September 2017.

(AAQS) has been adopted, or whose presence in the atmosphere will contribute to the violation of one or more AAQSs. When NO_X and ROG are released in the atmosphere, they can chemically react with one another in the presence of sunlight to form ozone.

Ozone is a strong chemical oxidant that adversely impacts human health through effects on respiratory function. Ozone can also damage forests and crops. Ozone is not emitted directly by industrial sources or motor vehicles but instead, is formed in the lower atmosphere, the troposphere. Ozone is formed by a complex series of chemical reactions involving NO_X, the result of combustion processes and evaporative ROGs such as industrial solvents, toluene, xylene, and hexane as well as the various hydrocarbons that are evaporated from the gasoline used by motor vehicles or emitted through the tailpipe following combustion. Additionally, ROGs are emitted by natural sources such as trees and crops. Ozone formation is promoted by strong sunlight, warm temperatures, and winds. High concentrations tend to be a problem in the Imperial County only during the sizzling summer months when these conditions frequently occur.

2.2.1.2 Particulate matter (PM)

PM is a general term used to describe a complex group of airborne solid, liquid, or semi-volatile materials of various size and composition. Primary PM is emitted directly into the atmosphere from both human activities (including agricultural operations, industrial processes, construction and demolition activities, and entrainment of road dust into the air) and non-anthropogenic activities (such as windblown dust and ash resulting from forest fires). Secondary PM is formed in the atmosphere from predominantly gaseous combustion by-product precursors, such as sulfur oxides and NO_X, and ROGs. The overwhelming majority of airborne PM in Imperial County is primary PM. The major source of primary PM is fugitive windblown dust, with other contributions from entrained road dust, farming, and construction activities.

Particle size is a critical characteristic of PM that primarily determines the location of PM deposition along the respiratory system (and associated health effects) as well as the degradation of visibility through light scattering. In the United States, federal and state agencies have established two types of PM air quality standards as shown in Table 2. PM_{10} corresponds to the fraction of PM no greater than 10 microns in aerodynamic diameter and is commonly called respirable particulate matter, while $PM_{2.5}$ refers to the subset of PM_{10} of aerodynamic diameter smaller than 2.5 microns, which is commonly called fine particulate matter.

PM air pollution has undesirable and detrimental environmental effects. PM affects vegetation, both directly (e.g. deposition of nitrates and sulfates may cause direct foliar damage) and indirectly (e.g. coating of plants upon gravitational settling reduces light absorption). PM also accumulates to form regional haze, which reduces visibility due to scattering of light. Agencies concerned with haze include the National Park Service, the U.S. Forest Service, the Western Regional Air Partnership, and the Western States Air Resources Council.

PM_{10} is respirable, with fine and ultrafine particles reaching the alveoli deep in the lungs, and larger particles depositing principally in the nose and throat area. PM_{10} deposition in the lungs results in

irritation that triggers a range of inflammation responses, such as mucus secretion and bronchoconstriction, and exacerbates pulmonary dysfunctions, such as asthma, emphysema, and chronic bronchitis. Sufficiently small particles may penetrate the bloodstream and impact functions such as blood coagulation, cardiac autonomic control, and mobilization of inflammatory cells from the bone marrow. Individuals susceptible to higher health risks from exposure to PM_{10} airborne pollution include children, the elderly, smokers, and people of all ages with low pulmonary/ cardiovascular function. For these individuals, adverse health effects of PM_{10} pollution include coughing, wheezing, shortness of breath, phlegm, bronchitis, and aggravation of lung or heart disease, leading for example to increased risks of hospitalization and mortality from asthma attacks and heart attacks.

2.2.1.3 Other Criteria Pollutants

The standards for other criteria pollutants are either being met or are unclassified in the Salton Sea Air Basin (SSAB), and the latest pollutant trends suggest that these standards will not be exceeded in the foreseeable future.

Pollutant Transport

As stated above, ozone is a "secondary" pollutant, formed in the atmosphere by reactions between NO_X and ROG. These reactions are driven by sunlight and proceed at varying rates. Transport is the movement of ozone or the pollutants that form ozone from one area (known as the upwind area) to another area (known as the downwind area). Pollutant transport is a very complex phenomenon. Sometimes transport is a straightforward matter of wind blowing from one area to another at ground level, carrying ozone with it, but usually it is not that simple. Transport is three-dimensional; it can take place at the surface, or high above the ground. Meteorologists use the terms "surface" and "aloft" to distinguish these two cases. Often, winds can blow in different directions at different heights above the ground. To complicate matters further, winds can shift during the day, pushing a polluted air mass first one way, then another. Finally, because ozone and ozone forming emissions from an upwind area can mix with locally generated ozone and locally generated emissions, it is often difficult to determine the origin of the culpable emissions causing high pollution levels. Political boundaries do not prevent transport of pollutants. Transport over distances of several hundred miles has often been documented in California.

The accurate determination of the impacts of transport requires detailed technical analyses in conjunction with modeling studies. The Imperial County Air Quality Management Plan[4] (AQMP) identifies how the transport of emissions and pollutants from Mexico and other areas (South Coast and San Diego) impact ozone violations within Imperial County. Although the Imperial County is currently in attainment of the 1997 8-hour ozone NAAQS, it is important to note that any future analysis of air emissions impacting Imperial County must take into consideration the influence of transport from three distinct sources, that of the South Coast Air Basin via the Coachella Valley to

[4] Final 2009 1997 8-Hour Modified Air Quality Management Plan. Imperial County Air Pollution Control District. July 13, 2010.

the north, the San Diego Air Basin to the west and the international city of Mexicali, Mexico to the south.

Toxic Air Contaminants

In addition to the above-listed criteria pollutants, toxic air contaminants (TACs) are another group of pollutants of concern. AB 1807[5] sets forth a procedure for the identification and control of TAC in California defines a TAC as an air pollutant which may cause or contribute to an increase in mortality or an increase in serious illness, or which may pose a present or potential hazard to human health. There are almost 200 compounds that have been designated as TACs in California. The ten TACs posing the greatest known health risk in California, based primarily on ambient air quality data, are acetaldehyde, benzene, 1,3-butadiene, carbon tetrachloride, hexavalent chromium, formaldehyde, methylene chloride, para-dichlorobenzene, perchloroethylene, and diesel particulate matter (DPM).

TACs do not have ambient air quality standards. Since no safe levels of TACs can be determined, there are no air quality standards for TACs. Instead, TAC impacts are evaluated by calculating the health risks associated with a given exposure.

Since 2004, CARB has maintained the California Toxic Inventory (CTI), which provides emissions estimates by stationary and aggregated point; areawide; on-road gasoline and diesel; off-road mobile gasoline, diesel, and other; and natural sources. Stationary sources include point sources provided by facility operators and/or districts pursuant to the Air Toxics "Hot Spots" Program (Assembly Bill [AB] 2588), and aggregated point sources estimated by CARB and/or districts. Areawide sources are those that do not have specific locations and are spread out over large areas such as consumer products and unpaved roads. Mobile sources consist of on-road vehicles such as passenger cars and trucks, motorcycles, busses, and heavy-duty trucks. Off-road sources include trains, ships, and boats. Natural sources like wildfires are also included.

The top three contributors of the potential cancer risk come primarily from on road motor vehicles - DPM, 1,3 butadiene, and benzene. Cleaner motor vehicles and fuels are reducing the risks from these priority toxic air pollutants. The remaining toxic air pollutants, such as hexavalent chromium and perchloroethylene, while not appearing to contribute as much to the overall risks, can present high risks to people living close to a source. CARB has Air Toxic Control Measures that are either already on the books, in development, or under evaluation for most of the remaining top ten, where actions are suitable through our motor vehicle, consumer products, or industrial source programs. Of these top ten, carbon tetrachloride is unique in that most of the health risk from this toxic air pollutant is not attributable to specific sources, but rather to background concentrations. Emissions from the top ten[6] TACs in Imperial County in 2010 are presented in Table 3.

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[5] Enacted in September 1983. Health & Safety Code section 39650 et seq., Food & Agriculture Code Section 14021.

[6] Based on relative contributions to the estimated potential cancer risk from outdoor levels for the year

Table 3 – 2010 TAC Emissions[7] in Imperial County (tons per year)

Toxic Air Contaminant	SP	AP	A	OD	OG	OMG	OMD	OMO	N	Total
Diesel particulate matter (DPM)	7.608	3.906	0.000	136.542			17.299			165.356
1,3-Butadiene	0.000	0.022	7.835	0.322	6.523	5.025	0.760	1.423	0.137	22.048
Benzene	52.548	2.779	0.134	3.393	31.156	21.806	8.002	1.502		121.319
Acetaldehyde	0.183	0.861	1.203	12.468	4.678	5.933	29.406	3.570	856.92	915.219
Hexavalent Chromium	0.003	0.000	0.000	0.000	0.000	0.000	0.000	0.000		0.004
para-Dichlorobenzene	0.000		5.883							5.883
Formaldehyde	0.795	5.512	1.559	24.952	17.192	18.162	58.851	10.277		137.302
Methylene Chloride	0.096	1.786	7.905							9.787
Perchloroethylene	0.000	11.522	6.697							18.220
Carbon Tetrachloride									>0.001	>0.001

Note: *SP = stationary point* *AP = aggregated point* *A = areawide* *OD = on-road diesel* *OG = on-road gasoline* *OMO = off-road mobile diesel* *OMD = off-road mobile gasoline* *OMO = off-road mobile other* *N = natural*

Sensitive Receptors

Some members of the population are especially sensitive to air pollutant emissions and should be given special consideration when evaluating air quality impacts from projects. These people include children, the elderly, and persons with preexisting respiratory or cardiovascular illness, and athletes and others who engage in frequent exercise. Structures that house these persons or places where they gather are defined as sensitive receptors by ICAPCD.

Residential areas are considered sensitive to air pollution because residents (including children and the elderly) tend to be at home for extended periods, resulting in sustained exposure to any pollutants present. Recreational land uses are considered moderately sensitive to air pollution. Exercise places a high demand on respiratory functions, which can be impaired by air pollution even though exposure periods during exercise are generally short. In addition, noticeable air pollution can detract from the enjoyment of recreation. Industrial and commercial areas are considered the least sensitive to air pollution. Exposure periods are relatively short and intermittent, as most of the workers tend to stay indoors most of the time.

2000.

[7] California Toxics Inventory – Draft 2010 CTI Summary Table. California Air Resources Board. (November 2013. http://www.arb.ca.gov/toxics/cti/cti.htm. Accessed May 2017.

2.3. Greenhouse Gases

Constituent gases that trap heat in the Earth's atmosphere are called greenhouse gases (GHGs), analogous to the way a greenhouse retains heat. GHGs play a critical role in the Earth's radiation budget by trapping infrared radiation emitted from the Earth's surface, which would otherwise have escaped into space. Prominent GHGs contributing to this process include CO_2, methane (CH_4), nitrous oxide (N_2O), and chlorofluorocarbons (CFCs). Without the natural heat-trapping effect of GHG, the earth's surface would be about 34 °F cooler[8]. This is a natural phenomenon, known as the "Greenhouse Effect," is responsible for maintaining a habitable climate. However, anthropogenic emissions of these GHGs more than natural ambient concentrations are responsible for the enhancement of the greenhouse effect, and have led to a trend of unnatural warming of the Earth's natural climate known as global warming or climate change, or more accurately Global Climate Disruption. Emissions of these gases that induce global climate disruption are attributable to human activities associated with industrial/manufacturing, utilities, transportation, residential, and agricultural sectors.

The global warming potential (GWP) is the potential of a gas or aerosol to trap heat in the atmosphere. Individual GHG compounds have varying GWP and atmospheric lifetimes. The reference gas for the GWP is CO_2; CO_2 has a GWP of one. The calculation of the CO_2 equivalent (CO_2e) is a consistent methodology for comparing GHG emissions since it normalizes various GHG emissions to a consistent metric. Methane's warming potential of 25 indicates that methane has a 25 times greater warming affect than CO_2 on a molecular basis. he larger the GWP, the more that a given gas warms the Earth compared to CO_2 over that period. The period usually used for GWPs is 100 years. GWPs for the three GHGs produced by the Project are presented in Table 4. A CO_2e is the mass emissions of an individual GHG multiplied by its GWP. GHGs are often presented in units called tonnes (t) (i.e. metric tons) of CO_2e (tCO_2e).

Carbon Dioxide (CO_2) is a colorless, odorless gas consisting of molecules made up of two oxygen atoms and one carbon atom. CO_2 is produced when an organic carbon compound (such as wood) or fossilized organic matter, (such as coal, oil, or natural gas) is burned in the presence of oxygen. CO_2 is removed from the atmosphere by CO_2 "sinks", such as absorption by seawater and photosynthesis by ocean-dwelling plankton and land plants, including forests and grasslands. However, seawater is also a source of CO_2 to the atmosphere, along with land plants, animals, and soils, when CO_2 is released during respiration. Whereas the natural production and absorption of CO_2 is achieved through the terrestrial biosphere and the ocean, humankind has altered the natural carbon cycle by burning coal, oil, natural gas, and wood. Since the industrial revolution began in the mid-1700s, each of these activities has increased in scale and distribution. Prior to the industrial revolution, concentrations CO_2 were stable at a range of 275 to 285 ppm[9]. The National Oceanic and Atmospheric Administration's Earth

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[8] Climate Action Team Report to Governor Schwarzenegger and the California Legislature. California Environmental Protection Agency, Climate Action Team. March 2006.

[9] Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on

System Research Laboratory[10] indicates that global concentration of CO_2 was 398.17 ppm in July 2015. In addition, the CO_2 levels at Mauna Loa[11] averaged over 400 ppm for the first time during the week of May 26, 2013. These concentrations of CO_2 exceed by far the natural range over the last 650,000 years (180 to 300 ppm) as determined from ice cores.

Table 4 – Global Warming Potentials[12]

Pollutant	GWP for 100-year time horizon	
	Second assessment report (SAR)[13]	4th assessment report (AR4) [14]
Carbon dioxide (CO_2)	1	1
Methane (CH_4)	21	25
Nitrous oxide (N_2O)	310	298

Note: Current protocol is to use the 4th assessment values, however, the second assessment report values are also provided since they are the values used by many inventories and public documents.

Methane (CH_4) is a colorless, odorless non-toxic gas consisting of molecules made up of four hydrogen atoms and one carbon atom. CH_4 is combustible, and it is the main constituent of natural gas-a fossil fuel. CH_4 is released when organic matter decomposes in low oxygen environments. Natural sources include wetlands, swamps and marshes, termites, and oceans. Human sources include the mining of fossil fuels and transportation of natural gas, digestive processes in ruminant animals such as cattle, rice paddies and the buried waste in landfills. Over the last 50 years, human activities such as growing rice, raising cattle, using natural gas, and mining coal have added to the atmospheric concentration of CH_4. Other anthropogenic sources include fossil-fuel combustion and biomass burning.

Climate Change, 2007. Solomon, S., D. Qin, M. Manning, Z. Chen, M. Marquis, K.B. Averyt, M. Tignor and H.L. Miller (eds.). Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA.

10 Trends in Atmospheric Carbon Dioxide. Earth System Research Laboratory. National Oceanic and Atmospheric Administration. http://www.esrl.noaa.gov/gmd/ccgg/trends/global.html. Accessed May 2017.

11 *ibid*

12 Global Warming Potentials. Greenhouse Gas Protocol. World Resources Institute and World Business Council on Sustainable Development. http://www.ghgprotocol.org/files/ghgp/tools/Global-Warming-Potential-Values.pdf. May 2015. Accessed September 2017.

13 Second Assessment Report. Climate Change 1995: WG I - The Science of Climate Change. Intergovernmental Panel on Climate Change. 1996

14 Climate Change 2007: The Physical Science Basis. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change. 2007

Nitrous Oxide (N_2O) is a colorless, non-flammable gas with a sweetish odor, commonly known as "laughing gas", and sometimes used as an anesthetic. N_2O is naturally produced in the oceans and in rainforests. Man-made sources of N_2O include the use of fertilizers in agriculture, nylon and nitric acid production, cars with catalytic converters and the burning of organic matter. Concentrations of N_2O also began to rise at the beginning of the industrial revolution.

Chlorofluorocarbons (CFCs) are gases formed synthetically by replacing all hydrogen atoms in CH_4 or ethane with chlorine and/or fluorine atoms. CFCs are nontoxic, nonflammable, insoluble, and chemically un-reactive in the troposphere (the level of air at the Earth's surface). CFCs have no natural source but were first synthesized in 1928. It was used for refrigerants, aerosol propellants, and cleaning solvents. Because of the discovery that they can destroy stratospheric ozone, an ongoing global effort to halt their production was undertaken and has been extremely successful, so much so that levels of the major CFCs are now remaining steady or declining. However, their long atmospheric lifetimes mean that some of the CFCs will remain in the atmosphere for over 100 years.

Hydrofluorocarbons (HFCs) are synthesized chemicals that are used as a substitute for CFCs. Out of all the GHGs; HFCs are one of three groups with the highest GWP. HFCs are synthesized for applications such as automobile air conditioners and refrigerants.

Perfluorocarbons (PFCs) have stable molecular structures and do not break down through the chemical processes in the lower atmosphere. High-energy ultraviolet rays about 60 kilometers above Earth's surface can destroy the compounds. Because of this, PFCs have very long lifetimes, between 10,000 and 50,000 years. The two main sources of PFCs are primary aluminum production and semiconductor manufacture.

Sulfur Hexafluoride (SF_6) is an extremely potent greenhouse gas. SF_6 is very persistent, with an atmospheric lifetime of more than a thousand years. Thus, a relatively small amount of SF_6 can have a significant long-term impact on global climate change. SF_6 is human-made, and the primary user of SF_6 is the electric power industry. Because of its inertness and dielectric properties, it is the industry's preferred gas for electrical insulation, current interruption, and arc quenching (to prevent fires) in the transmission and distribution of electricity. SF_6 is used extensively in high voltage circuit breakers and switchgear, and in the magnesium metal casting industry.

GHG Emission Levels

Per the World Resources Institute[15] (WRI) in 2014, total worldwide GHG emissions were estimated to be 42,204.5 million (M) t CO_2e ($MtCO_2e$) and GHG emissions per capita worldwide was 4.61 tCO_2e. These emissions exclude GHG emissions associated with the land use, land-use change, and forestry sector, and bunker fuels. The WRI reports that in 2014, total GHG emissions in the U.S.

[15] Climate Analysis Indicators Tool. International Dataset. World Resources Institute. http://cait.wri.org/. Accessed October 2017.

were 5,234 $MtCO_2e$, with average GHG emissions per capita of 16.43 tCO_2e and total GHG emissions in California were 454.52 $MtCO_2e$ in 2014, with average GHG emissions per capita of 11.75 tCO_2e.

California has a larger percentage of its total GHG emissions coming from the transportation sector (47%) than the U.S. emissions (29%) and a smaller percentage of its total GHG emissions from the electricity generation sector, i.e. California have 11 percent but the U.S. has 31 percent.

Potential Environmental Effects

Worldwide, average temperatures are likely to increase by 3 °F to 7 °F by the end of the 21st century[16]. However, a global temperature increase does not directly translate to a uniform increase in temperature in all locations on the earth. Regional climate changes are dependent on multiple variables, such as topography. One region of the Earth may experience increased temperature, increased incidents of drought, and similar warming effects, whereas another region may experience a relative cooling. According to the International Panel on Climate Change's (IPCC's) Working Group II Report[17], climate change impacts to North America may include diminishing snowpack, increasing evaporation, exacerbated shoreline erosion, exacerbated inundation from sea level rising, increased risk and frequency of wildfire, increased risk of insect outbreaks, increased experiences of heat waves, and rearrangement of ecosystems, as species and ecosystem zones shift northward and to higher elevations.

California Implications

Even though climate change is a global problem and GHGs are global pollutants, the specific potential effects of climate change on California have been studied. The third assessment produced by the California Natural Resources Agency (CNRA)[18] explores local and statewide vulnerabilities to climate change, highlighting opportunities for taking concrete actions to reduce climate-change impacts. Projected changes for the remainder of this century in California include:

- **Temperatures** – By 2050, California is projected to warm by approximately 2.7 °F above 2000 averages, a threefold increase in the rate of warming over the last century and springtime warming — a critical influence on snowmelt — will be particularly pronounced.
- **Rainfall** – Even though model projections continue to show the Mediterranean pattern of wet winters and dry summers with seasonal, year-to-year, and decade-to-decade variability, improved climate models shift towards drier conditions by the mid-to-late 21st century in Central, and most notably, Southern California.

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16 Climate Change 2007: Impacts, Adaptation, and Vulnerability. Website http://www.ipcc.ch/ipccreports/ar4-wg2.htm. Accessed March 2013.

17 *ibid*

18 Our Changing Climate 2012: Vulnerability & Adaptation to the Increasing Risks from Climate Change in California. California Natural Resources Agency. July 2012 / CEC-500-2012-007

- **Wildfire** - Earlier snowmelt, higher temperatures, and longer dry periods over a longer fire season will directly increase wildfire risk. Indirectly, wildfire risk will also be influenced by potential climate-related changes in vegetation and ignition potential from lightning, with human activities continuing to be the biggest factor in ignition risk. Models are showing that estimated that property damage from wildfire risk could be as much as 35 percent lower if smart growth policies were adopted and followed than if there is no change in growth policies and patterns.

The third assessment by CNRA not only defines projected vulnerabilities to climatic changes but analyzes potential impacts from adaptation measures used to minimize harm and take advantage of beneficial opportunities that may arise from climate change.

The report highlights important new insights and data, using probabilistic and detailed climate projections and refined topographic, demographic, and land use information. The findings include:

- The state's electricity system is more vulnerable than was previously understood.
- The Sacramento-San Joaquin Delta is sinking, putting levees at growing risk.
- Wind and waves, in addition to faster rising seas, will worsen coastal flooding.
- Animals and plants need connected "migration corridors" to allow them to move to habitats that are more suitable to avoid serious impacts.
- Native freshwater fish are particularly threatened by climate change.
- Minority and low-income communities face the greatest risks from climate change.

2.4. Baseline Conditions

Local Ambient Air Quality

Existing levels of ambient air concentrations and historical trends and projections in the Project area are best documented by measurements made by the ICAPCD and CARB. Imperial County began its ambient air monitoring in 1976; however, monitoring of ozone began in 1986 at the El Centro monitoring station. Since that time, monitoring has been performed by the ICAPCD, CARB, and private industry. There are six monitoring sites in Imperial County from Niland to Calexico.

The nearest monitoring station to the Project site is approximately 8 miles east of the Project site. The El Centro-9th station is in El Centro at 150 9th Street. The station monitors ozone, $PM_{2.5}$, PM_{10}, CO, and NO_2. Table 5 summarizes 2011 through 2016 published monitoring data from the CARB's Aerometric Data Analysis and Management System for the El Centro-9th Station.

The monitoring data shows that the El Centro station demonstrated the general air quality problems of the Basin in it exceeded the State and federal ozone standards and the State PM_{10} standard in all six years. The National 8-hour ozone standard was changed in October of 2015 so only the 2016 monitoring year was evaluated to the 2016 Standard and the other 5 years evaluated to the 2008 Standard. The federal PM_{10} standard was exceeded in the years 2015 and 2016. The station only exceeded the federal $PM_{2.5}$ standard in 2011. The State or federal CO standards were not exceeded and the CO monitor was removed after the 2012 year. This station exceeded the NO_2 federal standard in 2011 only.

Table 5 – Ambient Air Quality Monitoring Summary for Project Vicinity[19]

Air Pollutant	Monitoring Year					
Ozone	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**
Max 1 Hour (ppm)	**0.103**	**0.111**	**0.110**	**0.101**	**0.099**	**0.108**
Days > CAAQS (0.09 ppm)	5	9	7	2	2	4
Max 8 Hour (ppm)	**0.084**	**0.091**	**0.088**	**0.080**	**0.079**	**0.082**
Days > NAAQS (0.075 ppm)	12	14	11	5	6	N/A
Days > NAAQS (0.070 ppm)	N/A	N/A	N/A	N/A	N/A	11
Days > CAAQS (0.070 ppm)	21	26	23	13	12	11
Inhalable Particulate Matter (PM_{10})	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**
Max Daily National Measurement	**81.9**	**75.6**	**147.9**	**120.4**	**165.9**	**185.1**
Days > NAAQS (150 µg/m^3)	0	0	0	0	1	2
Days > CAAQS (50 µg/m^3)	9	6	10	15	7	N/A
Fine Particulate Matter ($PM_{2.5}$)	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**
Max Daily National Measurement	**54.4**	26.4	30.0	27.5	31.2	31.3
Days > NAAQS (35 µg/m^3)	2	0	0	0	0	0
Carbon Monoxide (CO)	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**
Max 8 Hour (ppm)	9.01	3.64				
Days > NAAQS (9 ppm)	0	0	N/A	N/A	N/A	N/A
Days > CAAQS (9.0 ppm)	0	0				
Nitrogen Dioxide (NO_2)	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**
Max Hourly (ppb)	**117.4**	72.0	53.0	59.3	59.1	50.9
Days > NAAQS (100 ppb)	1	0	0	0	0	0
Days > CAAQS (0.18 ppm)	0	0	0	0	0	0

Abbreviations:

> = exceed ***Bold*** *= exceedance* *N/A = not available*
ppm = parts per million *ppb = parts per billion* *µg/m^3 = micrograms per cubic meter*
CAAQS = California Ambient Air Quality Standard *NAAQS = National Ambient Air Quality Standard*

Local Emissions Inventory

An emissions inventory is an account of the amount of air pollution generated by various emissions sources in a specified area. To estimate the sources and quantities of pollution CARB, in cooperation with local air districts, other government agencies, and industry, maintains an inventory of California emission sources. Sources are subdivided into four major emission categories: mobile, stationary, area-wide, and natural sources.

Mobile sources include on-road sources and off-road mobile sources. The on-road emissions inventory, which includes automobiles, motorcycles, and trucks, is based on an estimation of population, activity, and emissions of the on-road motor vehicles used in California. The off-road emissions inventory is based on an estimate of the population, activity, and emissions of various off-road equipment, including recreational vehicles, farm and construction equipment, lawn and garden

[19] Aerometric Data Analysis and Management System, Air Quality Data Statistics. California Air Resources Board. http://www.arb.ca.gov/adam/welcome.html. Accessed September 2017.

equipment, forklifts, locomotives, commercial marine ships, and marine pleasure craft.

Stationary sources are large, fixed sources of air pollution, such as power plants, refineries, and manufacturing facilities. Stationary sources also include aggregated point sources. These include many small point sources, or facilities, that are not inventoried individually but are estimated as a group and reported as a single-source category. Examples include gas stations and dry cleaners. Each of the local air districts estimates the emissions for most stationary sources within its jurisdiction.

Areawide sources include source categories associated with human activity that take place over a wide geographic area. Emissions from area-wide sources may be either from small, individual sources, such as residential fireplaces, or from widely distributed sources that cannot be tied to a specific location, such as consumer products, and dust from unpaved roads or farming operations (such as tilling).

2.4.1.1 Imperial County Emissions Inventory

Table 6 summarizes Imperial County's estimated 2020 projected emissions inventory (EI) for major categories of air pollutants presented in tons per day. Detailed breakdowns of the emissions sources and categories are available at CARB's website[20].

Table 6 – Imperial County 2020 Estimated Annual Emissions

Emission Category	2020 Emissions in tons per day					
Stationary Sources	**ROG**	**CO**	**NO_X**	**PM_{10}**	**$PM_{2.5}$**	**NH_3**
Fuel combustion	0.11	0.49	1.72	0.20	0.18	0
Waste disposal	0	0	0	0	0	0
Cleaning and surface coatings	0.62	0	0	0	0	0
Petroleum production and marketing	0.63	0	0	0	0	0
Industrial processes	0	0.09	0.08	4.55	0.84	0
Areawide Sources	**ROG**	**CO**	**NO_X**	**PM_{10}**	**$PM_{2.5}$**	**NH_3**
Solvent evaporation	3.67	0	0	0	0	14.74
Miscellaneous processes	3.54	11.76	0.51	278.8	36.79	15.40
Mobile Sources	**ROG**	**CO**	**NO_X**	**PM_{10}**	**$PM_{2.5}$**	**NH_3**
On-road motor vehicles	2.26	17.60	5.67	0.40	0.18	0.19
Other mobile sources	3.91	20.37	6.39	1.04	0.98	0
GRAND TOTAL	***14.65***	***50.31***	***14.37***	***285.00***	***38.97***	***31.83***

Notes:

All values in tons per day. Forecasted 2020 emissions are estimated from a base year inventory for 2012 and based on growth and control factors available from CARB. Control reflects only those rules already adopted. The sum of values may not equal total shown, due to rounding.

[20] Almanac Emissions Projection Data. California Air Resources Board. http://www.arb.ca.gov/app/emsinv/. Accessed May 2017.

2.4.1.2 2020 Imperial County Projected Emission Inventory Summary

Reactive organic gases (ROG)

ROG emissions result primarily from incomplete fuel combustion and the evaporation of chemical solvents and fuels. In 2020, Imperial County is projected to have 24 percent of the ROG emissions contributed by miscellaneous processes, primarily farming operations; approximately 25 percent will be contributed by solvent evaporation, such as pesticides and fertilizers and consumer products; 27 percent came from other mobile sources, primarily aircraft; and 15 percent came from on-road vehicles, predominantly light- and medium-duty cars and trucks.

Carbon monoxide (CO)

The primary source of CO in Imperial County in 2020 is projected to be from on-road motor vehicles, which will contribute 35 percent of the total CO. Other off-road engines and vehicles (such as aircraft and construction equipment) will contribute another 40 percent and miscellaneous processes (mainly from managed burning and disposal. Higher levels of CO generally occur in areas with heavy traffic congestion.

Nitrogen Oxides (NO_X)

A review of the projected 2020 EI shows that over 84 percent of the total NO_X emissions in Imperial County is projected to come from on- and off-road vehicles (39.5% from on-road and 44.5% from off-road). The largest portion of on-road NO_X emissions come from heavy-duty diesel trucks (48.7% of the total for on-road). The largest contributors from off-road sources are trains (37.6% of total off-road), aircraft (25.5%), and farm equipment (23.6%).

Inhalable Particulate Matter (PM_{10})

Almost 98 percent of the total PM_{10} emissions in Imperial County is projected to come from the category labeled Miscellaneous Processes in 2020. The largest portion of the PM_{10} emissions from miscellaneous processes comes from fugitive windblown dust (76.2% of the total for miscellaneous processes) and unpaved road dust (18.6%).

However, as part of ICAPCD's PM_{10} State Implementation Plan (SIP)[21], analysis of the potential sources of fugitive windblown shows that during high winds, Imperial County's desert areas can produce PM emissions over 50 times greater than the emissions from any anthropogenic source, including agricultural cropland. In addition, Imperial County is bordered to the south by the densely-populated city of Mexicali, Mexico. Mexicali comprises approximately 760,000 people within approximately 200 square miles, and has PM emissions estimated at 257 tons/day, compared with emissions of approximately 13 tons/day for the considerably smaller US town of Calexico situated just across the Mexican border from Mexicali. Under stagnant and light wind conditions, elevated dust concentrations in Mexicali can cause PM from Mexico to drift across the border into Calexico.

[21] 2009 Imperial County State Implementation Plan for Particulate Matter Less Than 10 Microns in Aerodynamic Diameter - Draft Final. Imperial County Air Pollution Control District. July 10, 2009.

Because of Imperial County's desert climate and of its shared border with the densely-populated city of Mexicali, the primary reasons for elevated PM levels in Imperial County are thus (i) disturbance of soils by wind and human activity, (ii) transport of PM_{10} from Mexico, and occasionally, (iii) wildfires.

Fine Particulate Matter ($PM_{2.5}$)

Whereas a sizeable portion of PM_{10} emissions come from dislocation processes (fugitive windblown), $PM_{2.5}$ is smaller and is more often a result of particulates coming from combustion sources. However, in Imperial County Miscellaneous Processes will still represent 94 percent of the total $PM_{2.5}$, with fugitive windblown dust contributing approximately 78 percent of the miscellaneous processes total.

Ammonia (NH_3)

Ammonia (NH_3) is addressed in the 2013 $PM_{2.5}$ SIP[22] due to NH_3's role as a precursor to PM_{10}, specifically the wintertime violations. The cooler temperatures and higher humidity of the winter months are conducive to ammonium nitrate (NH_4NO_3) formation through a complex process involving NO_X, NH_3, and ROGs. This occurs both at the surface and aloft, via both daytime and nighttime chemistry. Understanding the interactions amongst these precursors is needed to design an appropriate and effective approach to reduce NH_4NO_3. The 2020 Imperial County EI shows that about 48% of the NH_3 is generated from farming operations (primarily feedlots) and another 46% is from the use of pesticides and fertilizers.

[22] Imperial County 2013 SIP for the 2006 24-hr PM2.5 Moderate Nonattainment Area. Imperial County Air Pollution Control District. December 2, 2014.

SECTION 3.0 – REGULATORY CONTEXT

Air pollutants are regulated at the national, State, and air basin level; each agency has a different degree of control. The EPA regulates at the national level; the CARB regulates at the State level; and the ICAPCD regulates at the air basin level in the Project area.

3.1. Regulatory Agencies

Environmental Protection Agency (EPA)

EPA is the federal agency responsible for overseeing state air programs as they relate to the FCAA, approving SIP, establishing NAAQS and setting emission standards for mobile sources under federal jurisdiction. EPA has delegated the authority to implement many of the federal programs to the states while retaining an oversight role to ensure that the programs continue to be implemented.

California Air Resources Board (CARB)

CARB is the state agency responsible for establishing CAAQS, adopting and enforcing emission standards for various sources including mobile sources (except where federal law preempts their authority), fuels, consumer products, and toxic air contaminants. CARB is also responsible for providing technical support to California's 35 local air districts, which are organized at the county or regional level, overseeing local air district compliance with State and federal law, approving local air plans and submitting the SIP to the EPA. CARB also regulates mobile emission sources in California, such as construction equipment, trucks, and automobiles.

For the purposes of managing air quality in California, the California Health & Safety Codes Section 39606(a)(2) gave the CARB the responsibility to "based upon similar meteorological and geographic conditions and consideration for political boundary lines whenever practicable, divide the State into air basins to fulfill the purposes of this division". Imperial County is located within the Salton Sea Air Basin.

Imperial County Air Pollution Control District (ICAPCD)

The ICAPCD shares responsibility with CARB for ensuring that all State and federal ambient air quality standards are achieved and maintained within the County. State law assigns to local air pollution control districts the primary responsibility for control of air pollution from stationary sources, while reserving an oversight role for CARB. Generally, the air pollution control districts must meet minimum State and EPA program requirements. The air pollution control district is also responsible for the inspection of stationary sources, monitoring of ambient air quality, and planning activities such as modeling and maintenance of the emission inventory. Air pollution control districts in State nonattainment areas are also responsible for developing and implementing transportation control measures necessary to achieve the state ambient air quality. Regarding the SIP, air pollution control districts will implement the following activities:

1. Development of emission inventories, modeling process, trend analysis and quantification and comparison of emission reduction strategies;

2. Necessary information on all federal and State adopted emission reduction measures which affect the area;
3. Review of emissions inventory, modeling, and self-evaluation work;
4. Technical and strategic assistance, as appropriate, in the selection and implementation of emission reduction strategies;
5. Technical and planning assistance in developing and implementing processes to address the impact of emissions growth beyond the attainment date;
6. Maintenance of monitors and reporting and analysis of monitoring data;
7. Support for public education efforts by providing information to the community for means of outreach;
8. Coordinate communication between local areas and EPA to facilitate continuing EPA review of local work;
9. Expeditious review of the locally developed plan, and if deemed adequate, propose modification of the AQMP to adopt the early progress plan;
10. Adoption of emission reduction strategies into the AQMP as expeditiously as possible.

3.2. Attainment Status

3.2.1 Designations/Classifications

EPA has identified nonattainment and attainment areas for each NAAQS. Under amendments to the FCAA, EPA has designated air basins or portions thereof as attainment, nonattainment, or unclassifiable, based on whether the national standards have been achieved. The State designates air basins or portions thereof for all CAAQS. The State designation criteria specify four categories: nonattainment, nonattainment-transitional, attainment, and unclassified.

In addition, the FCAA uses a classification system to design clean-up requirements appropriate for the severity of the pollution and set realistic deadlines for reaching clean-up goals. If an air basin is not in federal attainment for a pollutant, the Basin is classified as a marginal, moderate, serious, severe, or extreme nonattainment area, based on the estimated time it would take to reach attainment. Nonattainment areas must take steps towards attainment by a specific timeline. Table 7 shows the federal and State attainment designations and federal classifications for the Basin.

3.2.2 Federal Clean Air Act Requirements

The FCAA requires plans to provide for the implementation of all reasonably available control measures including the adoption of reasonably available control technology for reducing emissions from existing sources. The FCAA encourages market-based approaches to emission control innovations.

On April 30, 2004, Imperial County was classified as a “Marginal” nonattainment area for 8-Hour Ozone NAAQS under the FCAA. On March 13, 2008, the EPA found that Imperial County failed to meet attainment for the 8-Hour Ozone NAAQS by June 15, 2007 and was reclassified as “Moderate” nonattainment. However, on November 17, 2009, EPA announced that Imperial County has met the 1997 federal 8-hour ozone standard—demonstrating improved air quality in the area. The

announcement is based on three years of certified clean air monitoring data for the years 2006-2008. Table 7 shows the designations and classifications for the Basin.

In response to the opinion of the *US Court of Appeals for the Ninth Circuit in Sierra Club v. United States Environmental Protection Agency, et al*., in August 2004 the EPA found that the Imperial Valley PM_{10} nonattainment area had failed to attain by the moderate area attainment date of December 31, 1994, and as a result reclassified under the FCAA the Imperial Valley from a moderate to a serious PM_{10} nonattainment area. Also in August 2004, the EPA proposed a rule to find that the Imperial area had failed to attain the annual and 24-hour PM_{10} standards by the serious area deadline of December 31, 2001. The EPA finalized the rule on December 11, 2007, citing as the basis for the rule that six Imperial County monitoring stations were in violation of the 24-hour standard during 1999-2001. The EPA's final rule action requires the State to submit to the EPA by December 11, 2008 (within one year of the rule's publication in the Federal Register) an air quality plan that demonstrates that the County will attain the PM_{10} standard as expeditiously as practicable.

Table 7 – Designations/Classifications for the Basin[23]

Pollutant	State Designation	Federal Designation (Classification)
Ozone	Nonattainment	Attainment
Respirable PM (PM_{10})	Nonattainment	Nonattainment (Serious) *
Fine PM ($PM_{2.5}$)	Attainment***	Nonattainment **
Carbon Monoxide (CO)	Attainment	Unclassifiable/Attainment
Nitrogen Dioxide (NO_2)	Attainment	Unclassifiable/Attainment
Sulfur Dioxide	Attainment	Attainment
Sulfates	Attainment	**No Federal Standard**
Lead	Attainment	
Hydrogen Sulfide	Unclassified	
Visibility reducing Particles	Unclassified	

* *Designation for Imperial Valley Planning Area only, which is most of Imperial County save for a small stretch of land on the County's eastern end.*

** *Designation is only for the urban areas within Imperial County*

*** *Designation for the whole of Imperial County except the City of Calexico.*

On November 13, 2009, EPA published Air Quality Designations for the 2006 24-Hour Fine Particle ($PM_{2.5}$) National Ambient Air Quality Standards[24] wherein Imperial County was listed as designated

[23] Area Designations and Maps – 2013. California Air Resources Board. April 10, 2014.

[24] Air Quality Designations for the 2006 24-Hour Fine Particle ($PM_{2.5}$) National Ambient Air Quality Standards. United States Environmental Protection Agency. Federal Register. Vol. 74, No. 218. November 13, 2009.

nonattainment for the 2006 24-hour $PM_{2.5}$ NAAQS. However, the nonattainment designation for Imperial County is only for the urban area within the County[25] and it has been determined that the Project is located outside of the nonattainment boundaries for $PM_{2.5}$. On April 10, 2014, CARB Board gave final approval to the 2013 Amendments to Area Designations for CAAQSs. For the State $PM_{2.5}$ standard, effective July 1, 2014, the City of Calexico will be designated nonattainment, while the rest of the SSAB will be designated attainment.

3.3. Regulatory Framework

This section contains a discussion of the federal, State, and local air quality regulations, plans, and policies applicable to the proposed landfill plan. Federal, state, and local authorities have adopted rules and regulations that govern the emissions of air pollutants from any facility. The local and federal authorities each have specific criteria for the evaluation of a source and its emissions and the authority to issue permit conditions and specify recordkeeping and reporting requirements that must be met to operate a source of air pollutants. This section focuses on current air quality regulations and their impact on the currently permitted landfill and on the proposed landfill plan.

3.3.1 Federal Regulations and Standards

The FCAA was enacted in 1970 and last amended in 1990 (42 USC 7401, et seq.) with the purpose of controlling air pollution and providing a framework for national, state, and local air pollution control efforts. Basic components of the FCAA and its amendments include NAAQS for major air pollutants, hazardous air pollutants standards, SIP requirements, motor vehicle emissions standards, and enforcement provisions. The FCAA was enacted for the purposes of protecting and enhancing the quality of the nation's air resources to benefit public health, welfare, and productivity.

3.3.2 State Regulations and Standards

CARB is responsible for responding to the FCAA, regulating emissions from motor vehicles and consumer products, and implementing the CCAA. The CCAA outlines a program to attain the CAAQSs for ozone, sulfur dioxide, and CO by the earliest practical date. Since CAAQSs are more stringent than NAAQSs in most cases, attainment of the CAAQS will require more emissions reductions than what would be required to show attainment of the NAAQS. Like the federal system, the State requirements and compliance dates are based upon the severity of the ambient air quality standard violation within a region.

3.3.3 Local Regulations and Standards

The ICAPCD also has the authority to adopt and enforce regulations dealing with controls for specific types of sources, emissions of hazardous air pollutants, and New Source Review. The ICAPCD Rules and Regulations are part of the SIP and are separately enforceable by the EPA. The following ICAPCD rules potentially apply to the proposed Project:

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[25] Final 2009 1997 8-Hour Modified Air Quality Management Plan. Imperial County Air Pollution Control District. July 13, 2010.

- **Rules 800** (General Requirements for Control of Fine Particulate Matter), **801** (Construction and Earthmoving Activities), **802** (Bulk Materials, **803** (Carry-out and Track-out), **804** (Open Areas), and **805** (Paved and Unpaved Roads) are intended to reduce the amount of PM_{10} entrained in the ambient air because of emissions generated by anthropogenic fugitive dust sources by requiring actions to prevent, reduce, or mitigate PM_{10} emissions. These rules include opacity limits, control measure requirements, and dust control plan requirements that apply to activities at the Facility.

Air Quality Management Plans (AQMP)

3.3.3.1 Ozone Plan

On December 3, 2009, the EPA issued a final ruling determining that the Imperial County "moderate" 8-hour ozone non-attainment area attained the 1997 8-hour NAAQS for ozone. The determination by EPA was based upon complete, quality-assured, and certified ambient air monitoring data for the years 2006 thru 2008. This determination effectively suspended the requirement for the state to submit an attainment demonstration, a RFP plan, contingency measures, and other planning requirements for so long as Imperial County continues to attain the 1997 8-hour ozone NAAQS. However, this determination did not constitute a re-designation to attainment; therefore, the classification and designation status for Imperial County remain as a "moderate" nonattainment area of the 1997 8-hour ozone NAAQS. As such, Imperial County was required to submit for EPA approval a 2009 8-Hour Ozone "Modified" Air Quality Management Plan (Modified AQMP), which was approved July 13, 2010.

The Modified AQMP serves as a comprehensive planning document intended to provide guidance to the ICAPCD, the County, and other local agencies on how to continue maintaining the 1997 8-hour ozone NAAQS. The Modified AQMP includes control measures consisting of three components: 1) the ICAPCD's Stationary Source Control Measures; 2) Regional Transportation Control Measures; and 3) the State Strategy. These measures primarily rely on the traditional command-and-control approach and as such provide the framework for ICAPCD rules that reduce ROG and NO_X emissions.

3.3.3.2 PM_{10} Plan

The ICAPCD District Board of Directors adopted the PM_{10} SIP for Imperial County on August 11, 2009[26]. The PM_{10} SIP meets EPA requirements to demonstrate that the County will attain the PM_{10} standard as expeditiously as practicable. The PM_{10} SIP was required to address and meet the following elements, required under the FCAA of areas classified to be in serious nonattainment of the NAAQS:

- Best available emission inventories;
- A plan that enables attainment of the PM_{10} federal air quality standards;

[26] 2009 Imperial County State Implementation Plan for Particulate Matter Less Than 10 Microns in Aerodynamic Diameter. Imperial County Air Pollution Control District. July 10, 2009.

- Annual reductions in PM_{10} or PM_{10} precursor emissions that are of not less than 5 percent from the date of SIP submission until attainment;
- Best available control measures and best available control technologies for significant sources and major stationary sources of PM_{10}, to be implemented no later than 4 years after reclassification of the area as serious;
- Transportation conformity and motor vehicle emission budgets in accord with the attainment plan;
- Reasonable further progress and quantitative milestones; and
- Contingency measures to be implemented (without the need for additional rulemaking actions) if the control measure regulations incorporated in the plan cannot be successfully implemented or fail to give the expected emission reductions.

The PM_{10} SIP updated the emission inventory to incorporate revised cattle emissions, revised windblown dust model results, revised South Coast Association of Governments activity data, and updated entrained and windblown unpaved road dust estimates. The adjustments made to the emission inventory fell in two categories: (i) adjustments to incorporate new methodology and updated information (e.g., throughputs, activity data, etc.), and (ii) adjustments to incorporate emission reductions arising from the implementation of new control measures.

Additionally, the PM_{10} SIP demonstrates that Imperial County attained the Federal PM_{10} NAAQS, but-for international emissions from Mexico, based on 2006-2008 monitoring data. Attainment was due, in part, to ICAPCD's November 2005 adoption and subsequent implementation of Regulation VIII fugitive dust rules; those rules were based on the related 2005 Best Available Control Measure (BACM) analysis.

Since the reclassification of Imperial County to serious nonattainment for PM_{10} occurred on August 2004 and control of fugitive PM_{10} emissions from the significant source categories that meets BACM stringency identified in the PM_{10} SIP began in January 2006.

Major stationary sources are required to implement Best Available Control Technology (BACT) to control PM_{10} emissions (Rule 207) and they are required to comply with the 20 percent opacity (Rule 403). In addition, stationary sources will be required to mitigate fugitive dust emissions from access roads, construction activities, handling and transferring of bulk materials, and track-out/carry-out according to the requirements of Regulation VIII.

Because the Imperial County is shown in the PM_{10} SIP to have attained the 24-hour PM_{10} NAAQS but-for international transport of Mexicali emissions in 2006-2008, reasonable further progress and milestone requirements are unnecessary, and specifically the 5% yearly emission reductions requirement does not apply to future years. As documented in the PM_{10} SIP, all remaining SIP requirements applicable to the 2009 Imperial County PM_{10} Plan have been successfully addressed.

3.3.3.3 $PM_{2.5}$ Plan

The ICAPCD District Board of Directors adopted the $PM_{2.5}$ SIP for Imperial County on December 2, 2014[27]. The $PM_{2.5}$ SIP fulfills the requirements of the FCAA for those areas classified as "moderate" nonattainment for $PM_{2.5}$. The $PM_{2.5}$ SIP incorporates updated emission inventories, and analysis of Reasonable Available Control Measures, an assessment of Reasonable Further Progress, and a discussion of contingency measures. Analyses in the $PM_{2.5}$ SIP included assessing emission inventories from Imperial County and Mexicali; evaluating the composition and elemental makeup of samples collected on Calexico violation days; reviewing the meteorology associated with high concentration measurements; and performing directional analysis of the sources potentially impacting the Calexico $PM_{2.5}$ monitor. As is demonstrated in the $PM_{2.5}$ SIP, the primary reason for elevated $PM_{2.5}$ levels in Imperial County is transport from Mexico. Essentially, the $PM_{2.5}$ SIP demonstrated attainment of the 2006 $PM_{2.5}$ NAAQS "but-for" transport of international emissions from Mexicali, Mexico.

3.4. Climate Change

Federal Climate Change Legislation

The federal government is taking several common-sense steps to address the challenge of climate change. EPA collects several types of GHG emissions data. This data helps policy makers, businesses, and EPA track GHG emissions trends and identify opportunities for reducing emissions and increasing efficiency. EPA has been collecting a national inventory of GHG emissions since 1990 and in 2009 established mandatory reporting of GHG emissions from large GHG emissions sources.

EPA is also getting GHG reductions through partnerships and initiatives; evaluating policy options, costs, and benefits; advancing the science; partnering internationally and with states, localities, and tribes; and helping communities adapt. Below is a program that has been implemented by the federal government.

3.4.1.1 Climate Action Plan

In June 2013, President Obama unveiled his Climate Action Plan. The plan was a national blueprint to slow the effects of climate change, and focuses on both CO_2 and short-lived climate pollutants, such as CH_4 and HFCs. Whereas, components of the plan are still active, the current administration is "committed to eliminating harmful and unnecessary policies such as the Climate Action Plan"[28].

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[27] Imperial County 2013 SIP for the 2006 24-hr PM2.5 Moderate Nonattainment Area. Imperial County Air Pollution Control District. December 2, 2014.

[28] *An America First Energy Plan. White House Issues*. White House. Accessed March 26, 2017. URL: https://www.whitehouse.gov/america-first-energy.

State Climate Change Legislation

3.4.1.2 Executive Order S 3-05

On June 1, 2005, the Governor issued Executive Order S 3-05 which set the following GHG emission reduction targets:

- By 2010, reduce GHG emissions to 2000 levels;
- By 2020, reduce GHG emissions to 1990 levels;
- By 2050, reduce GHG emissions to 80 percent below 1990 levels.

To meet these targets, the Climate Action Team prepared a report to the Governor in 2006 that contains recommendations and strategies to help ensure the targets in Executive Order S-3-05 are met.

3.4.1.3 Assembly Bill 32 (AB 32)

In 2006, the California State Legislature enacted the California Global Warming Solutions Act of 2006, also known as AB 32. AB 32 focuses on reducing GHG emissions in California. GHGs, as defined under AB 32, include CO_2, CH_4, N_2O, HFCs, PFCs, and SF_6. AB 32 requires that GHGs emitted in California be reduced to 1990 levels by the year 2020. The CARB is the state agency charged with monitoring and regulating sources of emissions of GHGs that cause global warming to reduce emissions of GHGs. AB 32 also requires that by January 1, 2008, the CARB must determine what the statewide GHG emissions level was in 1990, and it must approve a statewide GHG emissions limit so it may be applied to the 2020 benchmark. The CARB approved a 1990 GHG emissions level of 427 $MtCO_2e$, on December 6, 2007 in its Staff Report. Therefore, in 2020, emissions in California are required to be at or below 427 $MtCO_2e$.

Under the "business as usual or (BAU)" scenario established in 2008, Statewide emissions were increasing at a rate of approximately 1 percent per year as noted below. It was estimated that the 2020 estimated BAU of 596 $MtCO_2e$ would have required a 28 percent reduction to reach the 1990 level of 427 $MtCO_2e$.

3.4.1.4 Climate Change Scoping Plan

The Scoping Plan[29] released by CARB in 2008outlined the state's strategy to achieve the AB-32 goals. This Scoping Plan, developed by CARB in coordination with the Climate Action Team (CAT), proposed a comprehensive set of actions designed to reduce overall GHG emissions in California, improve the environment, reduce dependence on oil, diversify our energy sources, save energy, create new jobs, and enhance public health. It was adopted by CARB at its meeting in December 2008. According to the Scoping Plan, the 2020 target of 427 $MtCO_2e$ requires the reduction of 169 $MtCO_2e$, or approximately 28.3 percent, from the State's projected 2020 BAU emissions level of 596 $MtCO_2e$.

[29] Climate Change Scoping Plan: a framework for change. California Air Resources Board. December 2008.

In August 2011, the Scoping Plan was re-approved by the Board and includes the Final Supplement to the Scoping Plan Functional Equivalent Document[30]. This document includes expanded analysis of project alternatives as well as updates the 2020 emission projections considering the updated economic forecasts. The updated 2020 BAU estimate of 507 $MtCO_2e$ yielded that only a 16 percent reduction below the estimated new BAU levels would be necessary to return to 1990 levels by 2020. The 2011 Scoping Plan expands the list of nine Early Action Measures into a list of 39 Recommended Actions contained in Appendices C and E of the Plan.

However, in May 2014, CARB developed; in collaboration with the CAT, the First Update to California's Climate Change Scoping Plan[31] (Update), which shows that California is on track to meet the near-term 2020 GHG limit and is well positioned to maintain and continue reductions beyond 2020 as required by AB-32. In accordance with the United Nations Framework Convention on Climate Change (UNFCCC), CARB has mostly transitioned to the use of the IPCC's Fourth Assessment Report (AR4's)[32] 100-year GWPs in its climate change programs. CARB recalculated the 1990 GHG emissions level with the AR4 GWPs to be 431 $MtCO_2e$, therefore the 2020 GHG emissions limit established in response to AB-32 is now slightly higher than the 427 $MtCO_2e$ in the initial Scoping Plan.

A Proposed Scoping Plan[33] is out for comment which builds upon the former Scoping Plan and Update by outlining priorities and recommendations for the State to achieve its long-term climate objectives. The Proposed Scoping Plan establishes a proposed framework of action for California to meet the climate target of a 40 percent reduction in GHGs by 2030, compared to 1990 levels. The major elements of the framework proposed are enhancement of the Renewables Portfolio Standard (RPS) and the Low Carbon Fuel Standard; a Mobile Source Strategy, Sustainable Freight Action Plan, Short-Lived Climate Pollutant Reduction Strategy, Sustainable Communities Strategies, and a Post-2020 Cap-and-Trade Program; a 20 percent reduction in GHG emissions from the refinery sector and an Integrated Natural and Working Lands Action Plan.

3.4.1.5 Renewables Portfolio Standard (Scoping Action E-3)

The California Energy Commission estimates that in 2000 about 12 percent of California's retail electric load was met with renewable resources. Renewable energy includes (but is not limited to) wind, solar, geothermal, small hydroelectric, biomass, anaerobic digestion, and landfill gas.

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30 *Final Supplement to the AB 32 Scoping Plan Functional Equivalent Document.* California Air Resources Board. August 19, 2011.

31 *First Update to the Climate Change Scoping Plan, Building on the Framework*. California Air Resources Board. May 2014.

32 *Climate Change 2007: Synthesis Report. Contribution of Working Groups I, II and III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change.* Intergovernmental Panel on Climate Change. Core Writing Team; Pachauri, R.K; Reisinger, A., eds., 2007. ISBN 92-9169-122-4.

33 *The 2017 Climate Change Scoping Plan Update: The Proposed Strategy for Achieving California's 2030 Greenhouse Gas Target.* California Air Resources Board. January 20, 2017. URL: https://www.arb.ca.gov/cc/scopingplan/2030sp_pp_final.pdf

California's current RPS is intended to increase that share to 20 percent by 2010. Increased use of renewables will decrease California's reliance on fossil fuels, thus reducing emissions of GHGs from the electricity sector. Based on the Governor's call for a Statewide 33 percent RPS, the Scoping Plan anticipates that California will have 33 percent of its electricity provided by renewable resources by 2020, and includes this reduction in GHG emissions.

3.4.1.6 Senate Bill 350 (SB 350)

More recently, Governor Brown signed into legislation Senate Bill (SB) 350 in October 2015, which establishes new clean energy, clean air, and GHG reduction goals for 2030 and beyond. SB 350 established the State's 2030 GHG reduction target of 40 percent below 1990 levels. To achieve this goal, SB 350 sets ambitious 2030 targets for energy efficiency and renewable electricity, among other actions aimed at reducing GHG emissions across the energy and transportation sectors. SB 350 will greatly enhance the state's ability to meet its long-term climate goal of reducing GHG emissions to 80 percent below 1990 levels by 2050.

SB 350 requires the California Energy Commission (CEC) to develop and submit Integrated Resource Plans (IRPs), which will detail how each utility will meet their customers resource needs, reduce GHG emissions and ramp up the deployment of clean energy resources. Goals of the IRPs include, among others, meeting the 50 percent RPS and meeting ARB-established utility-specific GHG emission reduction targets by 2030. The CEC is also required to identify all potentially achievable energy efficiency savings, and establish targets for statewide energy efficiency savings and demand reductions to achieve doubling of energy efficiency by January 1, 2030 and implement the increased RPS target of 50 percent by December 31, 2030 for the publicly owned utilities.

3.4.1.7 Senate Bill 375 (SB 375)

SB 375 passed the Senate on August 30, 2008 and was signed by the Governor on September 30, 2008. According to SB 375, the transportation sector is the largest contributor of GHG emissions and contributes over 40 percent of the GHG emissions in California, with automobiles and light trucks alone contributing almost 30 percent. SB 375 indicates that GHGs from automobiles and light trucks can be reduced by new vehicle technology. However, significant reductions from changed land use patterns and improved transportation also are necessary. SB 375 states, "Without improved land use and transportation policy, California will not be able to achieve the goals of AB 32." SB 375 does the following: (1) requires metropolitan planning organizations to include sustainable community strategies in their regional transportation plans for reducing GHG emissions, (2) aligns planning for transportation and housing, and (3) creates specified incentives for the implementation of the strategies.

3.4.1.8 Executive Order B-30-15

On April 29, 2015, the Governor issued Executive Order (EO) B-30-15 which added an interim target of GHG emissions reductions to help ensure the State meets its 80 percent reduction by 2050, as set in EO S-3-05. The interim target is reducing GHG emissions by 40 percent by 2030. It also

directs State agencies to update the Scoping Plan, update Adaptation Strategy every 3 years, and take climate change into account in their planning and investment strategies. Additionally, it requires the State's Five-Year Infrastructure Plan will take current and future climate change impacts into account in all infrastructure projects. adopt a regulation that establishes a system of market-based declining annual aggregate emissions limits for sources or categories of sources that emit GHGs, applicable from January 1, 2012, to December 31, 2020, inclusive, as specified. adopt a regulation that establishes a system of market-based declining annual aggregate emissions limits for sources or categories of sources that emit GHGs, applicable from January 1, 2012, to December 31, 2020, inclusive, as specified.

3.4.1.9 Assembly Bill 398 (AB 398)

On July 25, 2017, the Governor approved AB 398, which requires CARB to provide an updated scoping plan no later than January 1, 2018 and update it a least once every 5 years; adopt a regulation that establishes a system of market-based declining annual aggregate emissions limits for sources or categories of sources that emit GHGs; and include specified price ceilings, price containment points, offset credit compliance limits, and industry assistance factors for allowance allocation as part of market-based system. AB 398 was declared that it was to take effect immediately as an urgency statute.

SECTION 4.0 – SIGNIFICANCE CRITERIA

The ICAPCD CEQA Air Quality Handbook[34] outlines significance determination thresholds. The significance criteria described in this section have been derived from this guidance document. In addition, significance criteria for stationary sources, which are permitted by the ICAPCD, are also cited in this section of the document.

4.1. CEQA Significance Determination Thresholds

As stated in the ICAPCD CEQA Air Quality Handbook and in the State CEQA Guidelines, a project is deemed to have a "potentially significant impact" on air quality if it could:

- Conflict with or obstruct implementation of the applicable air quality plan;
- Violate any air quality standard or contribute to an existing or projected air quality violation;
- Result in cumulatively considerable net increase of any criteria pollutant for which the project region is in non-attainment under an applicable federal or state ambient air quality standard (including releasing emissions that exceed quantitative thresholds for ozone precursors);
- Expose the public (especially schools, day care centers, hospitals, retirement homes convalescence facilities, and residences) to substantial pollutant concentrations; or
- Create objectionable odors affecting a substantial number of people. Each of these threshold criteria is discussed in this section.

4.2. ICAPCD Regional Thresholds of Significance

Under CEQA, each public agency is encouraged to develop and publish thresholds of significance. These thresholds of significance should be an identifiable quantitative, qualitative, or performance level of an environmental effect; the noncompliance with would mean the effect would normally be significant while compliance with would mean the effect would normally be less than significant.

4.2.1 Operational Thresholds

The ICAPCD has determined in their Guidelines that, because the operational phase of a proposed project has the potential of creating lasting or long-term impacts on air quality, it is important that a proposed development evaluate the potential impacts carefully. Therefore, air quality analyses should compare all operational emissions of a project, including motor vehicle, area source, and stationary or point sources to the thresholds in Table 8 below. Table 8 provides general guidelines for determining the significance of impacts and the recommended type of environmental analysis required based on the total emissions that are expected from the operational phase of a project.

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[34] CEQA Air Quality Handbook: Guidelines for the Implementation of the California Air Quality Act of 1970, as amended. Imperial County Air Pollution Control District. December 12, 2017. http://www.co.imperial.ca.us/AirPollution/PlanningDocs/CEQAHandbook.pdf.

4.2.1.1 Tier I

From the ICAPCD's perspective, residential, commercial, and industrial developments with a potential to emit below the Tier I level will not be required to develop a Comprehensive Air Quality Analysis Report (CAQAR) or an Environmental Impact Report (EIR). However, an Initial Study would be required to help the Lead Agency determine whether the project would have a less than significant impact. The Lead Agency is required by CEQA to disclose the identified environmental effects and the ways in which the environmental effects will be mitigated to achieve a level of less than significant. To achieve a level of insignificance the Lead Agency should require the implementation of all feasible standard mitigation measures listed in Section 7.2 in the ICAPCD Guidelines. It is important to note that the measures identified in Section 7.2 do not represent a comprehensive list of all mitigation measures. Alternative mitigation measures may be proposed by the project proponent, the Lead Agency, or the ICAPCD. The ICAPCD requires that alternative mitigation measures be fully documented with a copy of the documentation attached to the Initial Study. In addition, for some residential and commercial development projects, the developer may be required to implement off-site mitigation measures to reduce the air quality impacts further.

Table 8 – Regional Operational Thresholds of Significance[35]

Pollutant	Emissions in lbs/day	
	Tier I	Tier II
NO_X and ROG	Less than 137 lbs/day	137 lbs/day and greater
PM_{10} and SO_X	Less than 150 lbs/day	150 lbs/day and greater
CO and $PM_{2.5}$	Less than 550 lbs/day	550 lbs/day and greater
Level of Significance	*Less Than Significant*	*Significant Impact*

4.2.1.2 Tier II

Any proposed residential, commercial, or industrial development with a potential to meet or exceed Tier II Levels is considered to have a significant impact on regional and local air quality and, therefore required to implement all standard mitigation measures as well as all feasible discretionary mitigation measures. These measures must be listed and incorporated into the environmental document, which is prepared by the Lead Agency. Typically, Tier II projects are required, by the Lead Agency, to prepare an EIR however, should a Lead Agency exempt a project from the development of an EIR the ICAPCD requires, at a minimum, a CAQAR. A properly developed CAQAR will identify the significant air quality impacts and the required mitigation measures associated with the project. A menu of standard and discretionary mitigation measures is listed in Sections 7.2 and 7.3. These mitigation measures serve to provide the project proponent with feasible measures to help reduce the air quality impacts identified in the CAQAR. In addition, residential, commercial, and industrial development projects may be required to implement off-site mitigation

[35] *Ibid*

measures to further reduce the air quality impacts. All residential, commercial, and industrial projects are required to abide by off-site mitigation requirements under Section 7.4 of the ICAPCD Guidelines.

4.2.2 Construction Thresholds for Tier 1 Projects

Even though construction emissions are generally temporary in nature, they can have an adverse impact on air quality. Construction, by its very nature may produce a variety of emissions; however, PM_{10} is the pollutant of greatest concern. While construction PM_{10} emissions can vary greatly depending on the phase of the construction, level of activity, and other factors, ICPACD states there are feasible mitigation or control measures which can be reasonably implemented to reduce PM_{10} emissions significantly. Because particulate emissions from construction activities have the potential of leading to adverse health effects as well as nuisance concerns, such as reduced visibility, all projects are required to mitigate construction fugitive dust impacts by regulation, i.e. ICAPCD Regulation VIII. Another source of construction-related emissions comes from the use of diesel powered construction equipment which have been known to produce ozone precursor emissions and combustion related particulate emissions. To help projects address these emissions The ICAPCD has also listed standard mitigation measures for construction equipment in their Guidelines.

The ICAPCD suggests that the approach of the CEQA analyses for construction PM_{10} impacts should be qualitative as opposed to quantitative. While a Lead Agency may elect to quantify construction emissions, the ICAPCD recommends the implementation of effective and comprehensive mitigation measures. Standard Mitigation Measures for construction equipment and fugitive PM_{10} must be implemented at all construction sites. However, Table 9 shows construction thresholds ICAPCD provides to serve as a guide for project developers and interested parties in determining the recommended type of mitigation measures.

Table 9 – Construction Threshold Guide[36]

Pollutant	Threshold in lbs/day
PM_{10}	150
ROG	75
NO_X	100
CO	550

For those projects, which fall below the threshold for construction, adherence to the most current rules adopted for the control of fugitive dust is mandatory. In addition, the ICAPCD requires the use of the Standard Mitigation Measures for construction equipment and fugitive dust found under the Guidelines.

Projects that are greater than the threshold for construction may have a significant impact on local and, under certain circumstances, regional air quality. These projects must conduct a construction

[36] *ibid*

analysis that appropriately reflects the identified potential construction air quality impacts. In addition, the quantification of construction emissions should be utilized to help define the need for a Health Risk Assessment (HRA). Projects that are prone to a significant use of heavy-duty diesel equipment and that are within areas prone to human exposure will be required to perform a diesel exhaust screening level. Factors considered by the ICAPCD staff when determining if a screening risk analysis is necessary include the expected emissions from diesel equipment, the location of the project and the distance to sensitive receptors.

Standard mitigation measures listed in the Guidelines for construction equipment and fugitive PM_{10} control should be implemented at all sites. In addition, all discretionary mitigation measures listed in the guidelines should be implemented at construction sites greater than 4 acres in size.

4.2.3 Toxics or Hazardous Air Pollutant Thresholds

The ICAPCD has also determined that project impacts may also be considered significant if the project, which has the potential to emit toxic or hazardous air pollutants and are near sensitive receptors. These projects may be required to prepare an HRA to determine the potential level of risk associated with the operation.

4.2.4 Odor Threshold

While offensive odors rarely cause any physical harm, they still can be very unpleasant, leading to considerable distress among the public and often generating citizen complaints to local governments and the District. Any project with the potential to expose members of the public to objectionable odors frequently would be deemed to have a significant impact.

4.3. Greenhouse Gas (GHG) / Climate Change

4.3.1 California Environmental Quality Act (CEQA)

Effective March 18, 2010, CEQA Appendix G states that a project would have potentially significant GHG emission impacts if it would:

- Generate GHG emissions, either directly or indirectly, that may have a significant impact on the environment or
- Conflict with an applicable plan, policy, or regulation adopted for the purpose of reducing the emissions of GHGs.

4.3.2 Local Significance Thresholds

It is widely recognized that no single project could generate enough GHG emissions to noticeably change the global climate temperature. However, the combination of GHG emissions from past, present, and future projects could contribute substantially to global climate change. Thus, project specific GHG emissions should be evaluated in terms of whether they would result in a cumulatively significant impact on global climate change.

This analysis proposes the use of the "Tier 3" quantitative thresholds for residential and commercial

projects as recommended by the South Coast Air Quality Management District (SCAQMD)[37]. The SCAQMD proposes that if a project generates GHG emissions below 3,000 tCO_2e, it could be concluded that the project's GHG contribution is not "cumulatively considerable" and is therefore less than significant under CEQA. If the project generates GHG emissions above the threshold, the analysis must identify mitigation measures to reduce GHG emissions.

[37] Draft Guidance Document – Interim CEQA Greenhouse Gas (GHG) Significance Threshold. South Coast Air Quality Management District. October 2008.

SECTION 5.0 – IMPACT ANALYSIS

5.1. Analysis Methodology

Regional and local emissions of criteria air pollutants and precursors, and GHGs during Project construction and operations were assessed in accordance with the methodologies described below. ICAPCD suggests that the "approach of the CEQA analyses for construction PM_{10} impacts should be qualitative as opposed to quantitative"[38] but that any projects which are greater than the level of significance for construction may have a significant impact on local and, under certain circumstances, regional air quality. Even though the size of the Project is not large, this AQR has decided to include PM_{10} in the quantification.

Due to the type of project (i.e. solar farm), it was determined that emissions from the construction activities related to the Project could not be easily estimated using existing models, including Urban Emissions Model (URBEMIS2007) and California Emissions Estimator Model (CalEEMod) as these models are designed for "typical" land development projects. Therefore, this analysis attempts to provide detailed analysis of impacts related to site preparation, including any erosion control measures deemed necessary; stabilization of construction entrances and exits to reduce tracking; internal access roads; construction of PV modules; and testing/certification.

This AQR presents the emissions information separately for each of the four solar projects (BR-1, L-1, L-2, and L-3) as well as for the combined Big Rock Cluster. In combining the projects to estimate the effects of all four together, individual construction phases were staggered.

Construction Emissions

Construction of the Project would result in temporary emissions of ROG, CO, NO_X, SO_X, PM_{10}, and $PM_{2.5}$. Emissions from construction activities would result from fuel combustion and exhaust from construction equipment and vehicle traffic (i.e., worker commute and delivery truck trips), and grading and site work. Construction for the Project is expected to conservatively last 15 months, scheduled to begin early 2018. Each separate site would be divided into four potentially overlapping broad phase activities:

- **Phase 1 - Site Preparation, Fencing, and Ingress/Egress**, which includes erosion control (if necessary); stabilized construction entrances & exits; fencing & gates; and communication/security systems.
- **Phase 2 - Civil Improvements - Grading/Roads/ Earthwork**, which includes surface smoothing & grading; preparation of solar foundations; and internal access roads.
- **Phase 3 - PV Panel Construction**, which includes placement of underground electrical & communication lines; concrete for foundations & equipment pads; support structures (posts); cross-members & other hardware; electrical connections & equipment; and PV modules.

[38] CEQA Air Quality Handbook: Guidelines for the Implementation of the California Air Quality Act of 1970, and amended. Imperial County Air Pollution Control District, November 2007.

- **Phase 4 - Testing and Commissioning**, which includes final inspections testing, start-up, and certification; and facility brought on-line in stages and tested at every stage.

Each individual solar site is not projected to take the entire 15 months. To distribute potential impacts, the start dates of the individual solar projects will be staggered, or phased. Presented in Table 10 are the activity phase durations per solar site that were used in the estimation of emissions and Figure 3 graphically represents the proposed scheduling for the entire cluster Construction would primarily occur during daylight hours, Monday through Friday.

Table 10 – Project Phase Durations

Activity Phase	Duration (months)			
	BR-1	L-1	L-2	L-3
Phase 1 - Site Preparation, Fencing, and Ingress/Egress	1.5	0.8	1.5	1.9
Phase 2 - Civil Improvements - Grading/Roads/Earthwork	2.0	1.3	2.0	2.5
Phase 3 - PV Panel Construction	3.2	1.8	3.2	6.0
Phase 4 - Testing and Commissioning	1.0	0.7	1.0	1.3
Solar Site Facility Estimated Duration	**6**	**5**	**8**	**9**

Note: the sum of the individual activity phase durations does not add up to the overall project duration due to activity phase overlap or downtime.

For each solar site, emissions from off-road equipment, such as tractors, graders, loaders, scrapers, forklifts, trenchers, compactors, rollers, and post drivers; onsite mobile equipment, such as water trucks, pickup trucks, lube/fuel trucks, and flatbed delivery trucks; mobile activity from vendors, such as flatbed/delivery trucks and Porto-let trucks; and employee vehicular commute were estimated. Potential double counting that would occur by proportioning the size of the labor force as well as the duration of activity based on individual solar site size was left in to provide an overall conservative estimation. A detailed summary of the assumptions and model data used to estimate the Project's construction emissions is provided in Appendix A.

Operational Emissions

The facilities would be remotely operated, controlled, and monitored and with no requirement for daily on-site employees. Local and remote operations and maintenance staff would be on-call to respond to any alerts generated by the monitoring systems, and would be present on the site periodically to perform maintenance. A part-time O&M staff of up to five persons per project would be responsible for performing all routine and emergency operational and maintenance activities. Once operational, sources of emissions associated with the Project would be limited to routine maintenance and monitoring activities, such as inspections, equipment servicing, site and landscape clearing, and periodic washing of the PV modules if needed (up to four times per year) to increase the performance of the panels.

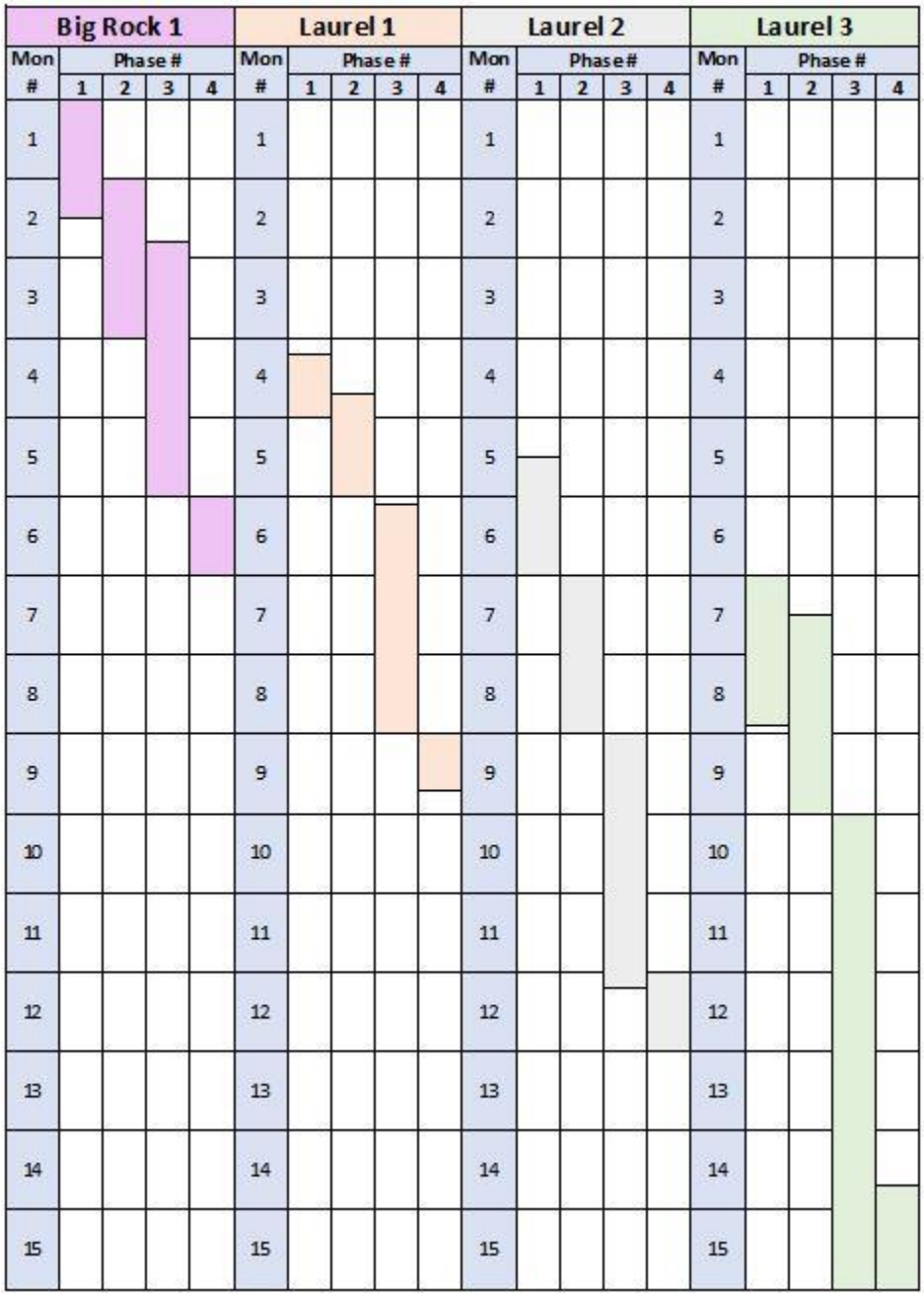

Figure 3 - Phased Cluster Activity Distributions

These facilities would operate seven days a week, 24 hours a day, generating electricity during normal daylight hours when the solar energy is available. Maintenance activities may occur seven days a week, 24 hours a day to ensure PV Panel output when solar energy is available; however, most scheduled maintenance would occur during daytime hours but work may be performed at night for safety reasons.

A detailed summary of the assumptions and model data used to estimate the Project's operational emissions is provided in Appendix A.

Other air quality impacts (i.e., local emissions of CO, odors, and construction- and operation-related TACs) were assessed in accordance with methodologies recommended by CARB and ICAPCD.

5.2. Analysis of Environmental Impacts

IMPACT 1: Would the Project conflict with or obstruct implementation of the applicable air quality plan?

CEQA requires that projects be consistent with the applicable AQMP. A consistency determination plays a significant role in local agency project review by linking local planning and individual projects to the AQMP. It fulfills the CEQA goal of informing decision-makers of the environmental efforts of the project under consideration at a stage early enough to ensure that air quality concerns are fully addressed.

ICAPCD's CEQA Handbook states that a CAQAR of a proposed project should demonstrate compliance with the most recent ozone AQMP and PM_{10} SIP. It also states the Analysis Report should also demonstrate compliance with the Imperial County Rules and Regulations but also those of the State and federal regulations.

Ozone Air Quality Management Plan (AQMP)

To develop the Modified AQMP[39], a control strategy for meeting State and federal requirements is required. The ICAPCD control strategy included an interactive process of technology and strategy review supported by ambient air quality modeling. The air quality modeling assists in identifying current and remaining emission targets that would help to achieve the ambient air quality standards. The Modified AQMP control measures consist of three components: 1) the ICAPCD's Stationary Source Control Measures; 2) Regional Transportation Strategy and Control Measures; and 3) State Strategy. These measures primarily rely on the traditional command and control approach and as such provide the framework for ICAPCD Rules that reduce ROG and NO_X emissions.

The Project does not produce new residential activity, produces only minimal additional traffic activity during project operations; and does not fall outside of the modeling forecast estimations used in determining continued maintenance.

PM_{10} State Implementation Plan (PM_{10} SIP)

The PM_{10} SIP was required to address and meet the following elements, required under the FCAA of areas classified to be in serious nonattainment of the NAAQS:

- Best available emission inventories;
- A plan that enables attainment of the PM_{10} federal air quality standards;

[39] Final 2009 1997 8-Hour Modified Air Quality Management Plan. Imperial County Air Pollution Control District. July 13, 2010.

- Annual reductions in PM_{10} or PM_{10} precursor emissions that are of not less than 5 percent from the date of SIP submission until attainment;
- Best available control measures and best available control technologies for significant sources and major stationary sources of PM_{10}, to be implemented no later than 4 years after reclassification of the area as serious;
- Transportation conformity and motor vehicle emission budgets in accord with the attainment plan;
- Reasonable further progress and quantitative milestones; and
- Contingency measures to be implemented (without the need for additional rulemaking actions) if the control measure regulations incorporated in the plan cannot be successfully implemented or fail to give the expected emission reductions.

In November 2005, revised Regulation VIII fugitive dust control measures were adopted, which form the core of the Imperial County PM_{10} control strategy. Portions of Regulation VIII that would apply to Construction and Earthmoving Activities are:

- Required to limit Visible Dust Emissions (VDE) to 20% opacity by complying with the following measures:
    - Phase work to minimize the amount of disturbed surface area at one time;
    - Apply water or chemical stabilization;
    - Construct and maintain wind barriers around the activity site;
    - Restrict vehicular access to the area by fencing or signage;
    - Mitigate track out/carry out of bulk materials at the site in compliance with Rule 803; and
    - Transport bulk material to, from, and around the site in compliance with Rule 802.
- Required to provide a Dust Control Plan that documents the type and location of the project, the expected start and completion dates of the dust generating activities, the total area of land surface to be disturbed, the actual and potential sources of fugitive dust emissions on the site (including the location of Bulk Material handling and storage areas, paved and unpaved roads, entrances and exits where track out/carry out may occur, etc.), and all the fugitive dust control measures to be implemented before, during, and after any dust-generating activity.
- For unpaved haul/access roads, unpaved traffic areas larger than 1 acre and with ≥ 75 average vehicle trips per day (AVTD), unpaved roads with ≥ 50 AVTD, and canal roads with ≥ 20 AVTD, visible dust emissions (VDE) must be limited to 20% opacity by applying at least one of the stabilization methods described below;
    - Paving,
    - Applying chemical stabilization as directed by the product manufacturer,
    - Applying and maintaining gravel, recrushed/recycled asphalt, or other material of low silt content (<5%) to a depth of three or more inches, or

- Applying water one or more times daily.

At only 40 vehicles per day, operational activities related to the Project would not generate enough traffic to significantly impact regional transportation emissions budgets; will comply with all applicable ICAPCD Rules and Regulations[40]; and will comply with all applicable State and federal requirements for attainment of air quality objectives.

Level of Significance Before Mitigation: The Project would not conflict with, or obstruct implementation of, the applicable air quality plan, therefore would result in a less than significant impact.

Mitigation Measures: No mitigation measures are necessary.

Level of Significance After Mitigation: Impacts would be less than significant.

IMPACT 2: Would the Project violate any air quality standard or contribute substantially to an existing or projected air quality violation?

An impact is potentially significant if emissions levels exceed the State or federal AAQSs. The ICAPCD has established that construction related PM_{10} emissions can cause a substantial increase in localized concentrations, which under certain circumstances can contribute to violations of the State and federal AAQSs. As such, the Imperial County adopted Regulation VIII which contains a variety of feasible fugitive dust control measures to help bring the ICAPCD into compliance with the NAAQS. Therefore, compliance with Regulation VIII and its measures is required and applies to any project regardless of its determined level of significance or size. In addition, the proposed Project will adopt all feasible discretionary measures listed in the ICAPCD's Guidelines (see **Impact 3**).

Level of Significance Before Mitigation: The Project would not violate an air quality standard or contribute to an existing or projected air quality violation, therefore would result in a less than significant impact.

Mitigation Measures: No mitigation measures are necessary.

Level of Significance After Mitigation: Impacts would be less than significant.

IMPACT 3: Would the Project result in construction-related air quality impacts?

Construction of the Project would result in emissions of the air pollutants ROG, NO_X, CO, PM_{10}, $PM_{2.5}$, and SO_X. Emissions from construction would result from fuel combustion and exhaust from construction equipment and vehicle traffic and fugitive dust from earth moving operations and roadways.

Criteria pollutant emissions from off-road construction equipment use were estimated using the underlying emission and load factors of URBEMIS and CalEEMod computer models. Emissions

[40] Imperial County Air Pollution Control District Rules and Regulations. Imperial County Air Pollution Control District. Revised June 2, 2009.

were estimated from the exhaust off-road equipment by using emission factors from Table 3.4 of Appendix D in the CalEEMod User's Guide[41] for year calendar year 2018.

Emissions from vehicular activity related to construction employees and vendors were estimated using CARB's EMFAC2011 Web Based Data Access[42] with emission rate data for Imperial County for the 2018 calendar year. This AQR used EMFAC2011's aggregate model years, which is an average age of vehicles specific for Imperial County. To generate expected exhaust emissions from employee vehicles, this AQR also used CARB's EMFAC2011 Web Based Data Access and to more accurately represent the type of vehicles used by the potential employee work pool, an activity-weighted average emission factor was generated using light-duty automobiles and light-duty trucks. The averages were derived from the distributions of vehicle miles travelled from EMFAC2011.

Grading fugitive dust was estimated using methodology described in Section 11.9, Western Surface Coal Mining, of the EPA AP-42[43] and as presented in the CalEEMod User's Guide. Entrained road dust emissions were assigned to both employee and vendor activity. Per the ICAPCD, 50 percent of vehicular travel in Imperial County is assumed to be on unpaved roads.

Emissions are presented below for each of the two individual solar projects and the combined Project. Since the thresholds for criteria pollutants are in pounds per day, emissions estimated from each activity phase for each project, the combined with other activity phases where they overlap, to generate the maximum emissions per day. There is some overlap of activity phases for each separate project, as well as some overlap between projects in the overall scheduling of the entire Project. Emissions presented below are considered unmitigated, which is to mean hypothetical emissions from construction activity, which does not apply equipment or activity restrictions or controls, even those required by ICAPCD regulations.

Project Specific Estimates

The BR-1 project is estimated to be completed within 6 months from project start and Table 11 presents the daily maximum hypothetical unmitigated emissions for each month of construction for the Big Rock 1 Solar Farm.

41 User's Guide: California Emissions Estimator Model® (CalEEMod). Version 2016.3.1. California Air Pollution Control Officers Association. September 2016.

42 http://www.arb.ca.gov/msei/modeling.htm#emfac2011_web_based_data

43 Compilation of Air Pollutant Emission Factors – AP-42. Fifth Edition. United States Environmental Protection Agency. January 1995.

Table 11 – Unmitigated Construction Emissions for Big Rock 1 Solar Farm

Month/Activity	Unmitigated Emissions (lbs/day)				
	ROG	CO	NO_X	PM_{10}	$PM_{2.5}$
1st Month – Phase 1	1.2	10.7	13.6	31.9	3.9
2nd Month – Phases 1 & 2	3.2	28.1	34.5	82.9	10.1
3rd Month – Phases 2 & 3	5.2	62.3	48.9	203.1	24.0
4th Month – Phase 3	3.3	44.9	28.0	152.1	17.8
5th Month – Phase 3	3.3	44.9	28.0	152.1	17.8
6th Month – Phase 4	0.1	1.7	0.3	12.6	1.4
Big Rock 1 Maximum Daily	***5.2***	***62.3***	***48.9***	***203.1***	***24.0***
ICAPCD Threshold	*75*	*550*	*100*	*150*	*N/A*
Exceed Thresholds?	*No*	*No*	*No*	***Yes***	

The L-1 project is estimated to be completed within 5 months from project start and Table 12 presents the daily maximum hypothetical unmitigated emissions for each month of construction for each month of construction for the Laurel 1 Solar Farm.

Table 12 – Unmitigated Construction Emissions for Laurel 1 Solar Farm

Month/Activity	Unmitigated Emissions (lbs/day)				
	ROG	CO	NO_X	PM_{10}	$PM_{2.5}$
1st Month – Phase 1	1.2	10.7	13.6	31.9	3.9
2nd Month – Phase 2	2.0	17.4	20.9	51.0	6.2
3rd Month – Phases 2 & 3	5.2	62.3	48.9	203.1	24.0
4th Month – Phase 3	3.3	44.9	28.0	152.1	17.8
5th Month – Phases 3 & 4	3.3	46.6	28.3	164.6	19.2
Laurel 1 Maximum Daily	***5.2***	***62.3***	***48.9***	***203.1***	***24.0***
ICAPCD Threshold	*75*	*550*	*100*	*150*	*N/A*
Exceed Thresholds?	*No*	*No*	*No*	***Yes***	

The L-2 project is estimated to be completed within 8 months from project start and Table 13 presents the daily maximum hypothetical unmitigated emissions for each month of construction for each month of construction for the Laurel 2 Solar Farm.

Table 13 – Unmitigated Construction Emissions for Laurel 2 Solar Farm

Month/Activity	Unmitigated Emissions (lbs/day)				
	ROG	CO	NO_X	PM_{10}	$PM_{2.5}$
1st Month – Phase 1	1.2	10.7	13.6	31.9	3.9
2nd Month – Phase 1	1.2	10.7	13.6	31.9	3.9
3rd Month – Phase 2	2.0	17.4	20.9	51.0	6.2
4th Month – Phase 2	2.0	17.4	20.9	51.0	6.2
5th Month – Phase 3	3.3	44.9	28.0	152.1	17.8
6th Month – Phase 3	3.3	44.9	28.0	152.1	17.8
7th Month – Phase 3	3.3	44.9	28.0	152.1	17.8
8th Month – Phases 3 & 4	3.3	46.6	28.3	164.6	19.2
Laurel 2 Maximum Daily	***3.3***	***46.6***	***28.3***	***164.6***	***19.2***
ICAPCD Threshold	*75*	*550*	*100*	*150*	*N/A*
Exceed Thresholds?	*No*	*No*	*No*	***Yes***	

The L-3 project is estimated to be completed within 9 months from project start and Table 14 presents the daily maximum hypothetical unmitigated emissions for each month of construction for each month of construction for the Laurel 3 Solar Farm.

Table 14 – Unmitigated Construction Emissions for Laurel 3 Solar Farm

Month/Activity	Unmitigated Emissions (lbs/day)				
	ROG	CO	NO_X	PM_{10}	$PM_{2.5}$
1st Month – Phases 1 & 2	3.2	28.1	34.5	82.9	10.1
2nd Month – Phases 1 & 2	3.2	28.1	34.5	82.9	10.1
3rd Month – Phase 2	2.0	17.4	20.9	51.0	6.2
4th Month – Phase 3	3.3	44.9	28.0	152.1	17.8
5th Month – Phase 3	3.3	44.9	28.0	152.1	17.8
6th Month – Phase 3	3.3	44.9	28.0	152.1	17.8
7th Month – Phase 3	3.3	44.9	28.0	152.1	17.8
8th Month – Phases 3 & 4	3.3	46.6	28.3	164.6	19.2
9th Month – Phases 3 & 4	3.3	46.6	28.3	164.6	19.2
Laurel 3 Maximum Daily	***3.3***	***46.6***	***34.5***	***164.6***	***19.2***
ICAPCD Threshold	*75*	*550*	*100*	*150*	*N/A*
Exceed Thresholds?	*No*	*No*	*No*	***Yes***	

In summary, individually all 4 projects would potentially exceed the PM_{10} threshold if unmitigated.

Project

Since this AQR also analyzes the entirety of the Project, additional analysis evaluates the impacts on the construction of all four solar sites within a 15-month period. In addition to the impracticality of hiring four separate teams of contractors to accomplish the same phase activity concurrently, a staggering of phase activity can distribute the air quality impacts from the entire Project, reducing the impacts locally and regionally. Table 15 shows the hypothetical unmitigated combined impacts from the construction of all four solar projects within a 15-month period using the Phase Activity Distributions presented in Figure 3.

Table 15 – Unmitigated Criteria Temporal Summary for Project

Month #	Solar Farm	Unmitigated Emissions (lbs/day)				
		ROG	CO	NO_X	PM_{10}	$PM_{2.5}$
1	Big Rock 1	1.17	10.71	13.57	31.88	3.86
	Month 1 Totals	**1.2**	**10.7**	**13.6**	**37.9**	**3.9**
2	Big Rock 1	6.42	72.98	62.44	234.98	27.86
	Month 2 Totals	**6.4**	**73.0**	**62.4**	**235.0**	**27.9**
3	Big Rock 1	5.25	62.26	48.87	203.10	24.00
	Month 3 Totals	**5.2**	**62.3**	**48.9**	**203.1**	**24.0**
4	Big Rock 1	3.25	44.85	27.97	152.09	17.79
	Laurel 1	3.16	28.12	37.47	82.89	10.07
	Month 4 Totals	**6.4**	**73.0**	**62.4**	**235.0**	**27.9**
5	Big Rock 1	3.25	44.85	27.97	152.06	17.79
	Laurel 1	1.99	17.41	20.90	51.01	6.20
	Laurel 2	1.17	10.71	13.57	31.88	3.86
	Month 5 Totals	**6.4**	**73.0**	**62.4**	**235.0**	**27.9**
6	Big Rock 1	0.06	1.73	0.33	12.56	1.37
	Laurel 1	3.25	44.85	27.97	152.06	17.79
	Laurel 2	1.17	10.71	13.57	31.88	3.86
	Month 6 Totals	**4.5**	**57.3**	**41.9**	**196.5**	**23.0**
7	Laurel 1	3.25	44.85	27.97	152.06	17.79
	Laurel 2	1.99	17.41	20.90	51.01	6.20
	Laurel 3	3.16	28.12	34.47	32.89	10.07
	Month 7 Totals	**8.4**	**90.4**	**83.3**	**286.0**	**34.1**
8	Laurel 1	3.25	44.85	27.97	152.06	17.79
	Laurel 2	1.99	17.41	20.90	51.01	6.20
	Laurel 3	3.16	28.12	34.47	32.89	10.07
	Month 8 Totals	**8.4**	**90.4**	**83.3**	**286.0**	**34.1**

Month #	Solar Farm	Unmitigated Emissions (lbs/day)				
		ROG	CO	NO_X	PM_{10}	$PM_{2.5}$
9	Laurel 1	0.06	1.73	0.33	12.56	1.37
	Laurel 2	3.25	44.85	27.97	152.06	17.79
	Laurel 3	1.99	17.41	20.90	51.01	6.20
	Month 9 Totals	**5.3**	**64.0**	**49.2**	**215.7**	**25.4**
10	Laurel 2	3.25	44.85	27.97	152.06	17.79
	Laurel 3	3.25	44.85	27.97	152.06	17.79
	Month 10 Totals	**6.5**	**89.7**	**55.9**	**304.2**	**35.6**
11	Laurel 2	3.25	44.85	27.97	152.06	17.79
	Laurel 3	3.25	44.85	27.97	152.06	17.79
	Month 11 Totals	**6.5**	**89.7**	**55.9**	**304.2**	**35.6**
12	Laurel 2	3.31	46.58	28.30	164.65	19.16
	Laurel 3	3.25	44.85	27.97	152.06	17.79
	Month 12 Totals	**6.6**	**91.4**	**56.3**	**316.7**	**37.0**
13	Laurel 3	3.25	44.85	27.97	152.06	17.79
	Month 13 Totals	**3.3**	**44.9**	**28.0**	**152.1**	**17.8**
14	Laurel 3	3.31	46.58	28.30	164.65	19.16
	Month 14 Totals	**3.3**	**46.6**	**28.3**	**164.6**	**19.2**
15	Laurel 3	3.31	46.58	28.30	164.65	19.16
	Month 15 Totals	**3.3**	**46.6**	**28.3**	**164.6**	**19.2**
	Project Maximum Daily	***8.4***	***91.4***	***83.3***	***316.7***	***37.0***
	ICAPCD Threshold	*75*	*550*	*100*	*150*	*N/A*
	Exceed Thresholds?	*No*	*No*	*No*	***Yes***	

The unmitigated impacts from the construction of the entire Project within a 15-month period would exceed the threshold for PM_{10}.

Level of Significance Before Mitigation: The Project would potentially have a significant impact from construction-related emissions.

Mitigation and Control: As described above, the individual projects are expected to generate unmitigated construction emissions that would exceed the ICAPCD construction threshold for PM_{10}. Since the ICAPCD requires all projects to implement Standard Mitigation Measures as presented in the ICAPCD's CEQA Guidelines[44] and, since the Project has a construction site greater than 5 acres, the ICAPCD also requires the inclusion of practicable Discretionary

[44] CEQA Air Quality Handbook: Guidelines for the Implementation of the California Air Quality Act of 1970, and amended. Imperial County Air Pollution Control District, November 2007.

Mitigation Measures.

Therefore, all individual projects will adopt all standard mitigations and all feasible discretionary mitigation measures for construction activities. Full compliance with ICAPCD's Regulation VIII Fugitive Dust Rules will also reduce fugitive dust emissions.

Although it is not Mitigation per CEQA standards, fugitive PM_{10} emissions will be reduced in the mandatory compliance with Regulation VIII. The operator shall implement the following Regulation VIII controls as listed in the CEQA Guidelines as standard mitigation measures:

- The operator shall insure that all disturbed areas, including bulk material storage which is not being actively utilized, will be effectively stabilized and visible emissions will be limited to no greater than 20% opacity for dust emissions by using water, chemical stabilizers, dust suppressants, tarps, or other suitable material such as vegetative ground cover.
- The operator shall insure that all on-site unpaved roads will be effectively stabilized and visible emissions be limited to no greater than 20% opacity for dust emissions by paving, chemical stabilizers, dust suppressants, and/or watering.
- The operator shall insure that all unpaved traffic areas with 75 or more average vehicle trips per day will be effectively stabilized and visible emission be limited to no greater than 20% opacity for dust emissions by paving, chemical stabilizers, dust suppressants, and/or watering.
- The operator shall insure that all transport (import or export) of borrow material used as cover material will be completely covered unless six inches of freeboard space from the top of the container is maintained with no spillage and loss of borrow material. In addition, the cargo compartment of all haul trucks is to be cleaned and/or washed at delivery site after removal of bulk material.
- The operator shall insure that all track-out or carryout will be cleaned at the end of each workday.
- The operator shall insure that all movement of borrow material handling or transfer shall be stabilized prior to handling or at points of transfer with application of sufficient water, chemical stabilizers, or by sheltering or enclosing the operation and transfer line.

In addition to Regulation VIII controls that relate to fugitive dust, the Project will implement the following mitigation:

MM-1 The operator shall water exposed soil with adequate frequency for continued moist soil and limit vehicle speed for all construction vehicles to less than 15 mph on any unpaved surface at the site.

Project Specific Estimates

Emissions presented below represent the estimated emissions associated with construction activity,

which exhibit the "regulated" emissions resulting from compliance with ICAPCD Regulation VIII and emissions from construction activity, which are "mitigated" pursuant to Mitigation Measures, listed above.

Applying controls obtained from Regulation VIII compliance and implementation of **MM-1**, the mitigated emissions are presented in for BR-1 in Table 16, for L-1 in Table 17, for L-2 in Table 18, and for L-3 in Table 19.

Table 16 – Mitigated Construction Emissions for Big Rock 1 Solar Farm

Month/Activity	Mitigated Emissions (lbs/day)				
	ROG	CO	NO_X	PM_{10}	$PM_{2.5}$
1st Month – Phase 1	1.2	10.7	13.6	14.0	1.9
2nd Month – Phases 1 & 2	3.2	28.1	34.5	36.5	5.1
3rd Month – Phases 2 & 3	5.2	62.3	48.9	88.9	11.7
4th Month – Phase 3	3.3	44.9	28.0	66.5	8.5
5th Month – Phase 3	3.3	44.9	28.0	66.5	8.5
6th Month – Phase 4	0.1	1.7	0.3	5.4	0.6
Big Rock 1 Maximum Daily	***5.2***	***62.3***	***48.9***	***88.9***	***11.7***
ICAPCD Threshold	*75*	*550*	*100*	*150*	*N/A*
Exceed Thresholds?	*No*	*No*	*No*	***Yes***	

Table 17 – Mitigated Construction Emissions for Laurel 1 Solar Farm

Month/Activity	Mitigated Emissions (lbs/day)				
	ROG	CO	NO_X	PM_{10}	$PM_{2.5}$
1st Month – Phase 1	1.2	10.7	13.6	14.0	1.9
2nd Month – Phase 2	2.0	17.4	20.9	22.5	3.1
3rd Month – Phases 2 & 3	5.2	62.3	48.9	88.9	11.7
4th Month – Phase 3	3.3	44.9	28.0	66.5	8.5
5th Month – Phases 3 & 4	3.3	46.6	28.3	71.9	9.1
Laurel 1 Maximum Daily	***5.2***	***62.3***	***48.9***	***88.9***	***11.7***
ICAPCD Threshold	*75*	*550*	*100*	*150*	*N/A*
Exceed Thresholds?	*No*	*No*	*No*	***Yes***	

Table 18 – Mitigated Construction Emissions for Laurel 2 Solar Farm

Month/Activity	Mitigated Emissions (lbs/day)				
	ROG	CO	NO_X	PM_{10}	$PM_{2.5}$
1st Month – Phase 1	1.2	10.7	13.6	14.0	1.9
2nd Month – Phase 1	1.2	10.7	13.6	14.0	1.9
3rd Month – Phase 2	2.0	17.4	20.9	22.5	3.1
4th Month – Phase 2	2.0	17.4	20.9	22.5	3.1
5th Month – Phase 3	3.3	44.9	28.0	66.5	8.5
6th Month – Phase 3	3.3	44.9	28.0	66.5	8.5
7th Month – Phase 3	3.3	44.9	28.0	66.5	8.5
8th Month – Phases 3 & 4	3.3	46.6	28.3	71.9	9.1
Laurel 2 Maximum Daily	***3.3***	***46.6***	***28.3***	***71.9***	***9.1***
ICAPCD Threshold	*75*	*550*	*100*	*150*	*N/A*
Exceed Thresholds?	*No*	*No*	*No*	***Yes***	

Table 19 – Mitigated Construction Emissions for Laurel 3 Solar Farm

Month/Activity	Mitigated Emissions (lbs/day)				
	ROG	CO	NO_X	PM_{10}	$PM_{2.5}$
1st Month – Phases 1 & 2	3.2	28.1	34.5	36.5	5.1
2nd Month – Phases 1 & 2	2.0	17.4	20.9	36.5	5.1
3rd Month – Phase 2	2.0	17.4	20.9	22.5	3.1
4th Month – Phase 3	3.3	44.9	28.0	66.5	8.5
5th Month – Phase 3	3.3	44.9	28.0	66.5	8.5
6th Month – Phase 3	3.3	44.9	28.0	66.5	8.5
7th Month – Phase 3	3.3	44.9	28.0	66.5	8.5
8th Month – Phases 3 & 4	3.3	46.6	28.3	71.9	9.1
9th Month – Phases 3 & 4	3.3	46.6	28.3	71.9	9.1
Laurel 3 Maximum Daily	***3.3***	***46.6***	***34.5***	***71.9***	***9.1***
ICAPCD Threshold	*75*	*550*	*100*	*150*	*N/A*
Exceed Thresholds?	*No*	*No*	*No*	***Yes***	

Project

Table 20 shows the regulated and mitigated emissions from construction all four sites within a 15-month period, i.e. the Project, by applying the mitigated emissions for each individual solar site to the Phase Activity Distributions.

Table 20 – Mitigated Criteria Temporal Summary for Project

Month #	Solar Farm	Mitigated Emissions (lbs/day)				
		ROG	CO	NO_X	PM_{10}	$PM_{2.5}$
1	Big Rock 1	1.17	10.71	13.57	14.04	1.94
	Month 1 Totals	**1.2**	**10.7**	**13.6**	**14.0**	**1.9**
2	Big Rock 1	6.42	72.98	62.44	102.97	13.61
	Month 2 Totals	**6.4**	**73.0**	**62.4**	**103.0**	**13.6**
3	Big Rock 1	5.25	62.26	48.87	88.93	11.67
	Month 3 Totals	**5.2**	**62.3**	**48.9**	**88.9**	**11.7**
4	Big Rock 1	3.25	44.85	27.97	66.47	8.55
	Laurel 1	3.16	28.12	37.47	36.51	5.06
	Month 4 Totals	**6.4**	**73.0**	**62.4**	**103.0**	**13.6**
5	Big Rock 1	3.25	44.85	27.97	66.47	8.55
	Laurel 1	1.99	17.41	20.90	22.47	3.12
	Laurel 2	1.17	10.71	13.57	14.04	1.94
	Month 5 Totals	**6.4**	**73.0**	**62.4**	**103.0**	**13.6**
6	Big Rock 1	0.06	1.73	0.33	5.42	0.60
	Laurel 1	3.25	44.85	27.97	66.47	8.55
	Laurel 2	1.17	10.71	13.57	14.04	1.94
	Month 6 Totals	**4.5**	**57.3**	**41.9**	**85.9**	**11.1**
7	Laurel 1	3.25	44.85	27.97	66.47	8.55
	Laurel 2	1.99	17.41	20.90	22.47	3.12
	Laurel 3	3.16	28.12	34.47	36.51	5.06
	Month 7 Totals	**8.4**	**90.4**	**83.3**	**125.4**	**16.7**
8	Laurel 1	3.25	44.85	27.97	66.47	8.55
	Laurel 2	1.99	17.41	20.90	22.47	3.12
	Laurel 3	3.16	28.12	34.47	36.51	5.06
	Month 8 Totals	**8.4**	**90.4**	**83.3**	**125.4**	**16.7**
9	Laurel 1	0.06	1.73	0.33	5.42	0.60
	Laurel 2	3.25	44.85	27.97	66.47	8.55
	Laurel 3	1.99	17.41	20.90	22.47	3.12
	Month 9 Totals	**5.3**	**64.0**	**49.2**	**94.4**	**12.3**
10	Laurel 2	3.25	44.85	27.97	66.47	8.55
	Laurel 3	3.25	44.85	27.97	66.47	8.55
	Month 10 Totals	**6.5**	**89.7**	**55.9**	**132.9**	**17.1**

Month #	Solar Farm	Mitigated Emissions (lbs/day)				
		ROG	CO	NO_X	PM_{10}	$PM_{2.5}$
11	Laurel 2	3.25	44.85	27.97	66.47	8.55
	Laurel 3	3.25	44.85	27.97	66.47	8.55
	Month 11 Totals	**6.5**	**89.7**	**55.9**	**132.9**	**17.1**
12	Laurel 2	3.31	46.58	28.30	71.89	9.15
	Laurel 3	3.25	44.85	27.97	66.47	8.55
	Month 12 Totals	**6.6**	**91.4**	**56.3**	**138.4**	**17.7**
13	Laurel 3	3.25	44.85	27.97	66.47	8.55
	Month 13 Totals	**3.3**	**44.9**	**28.0**	**66.5**	**8.5**
14	Laurel 3	3.31	46.58	28.30	71.89	9.15
	Month 14 Totals	**3.3**	**46.6**	**28.3**	**71.9**	**9.1**
15	Laurel 3	3.31	46.58	28.30	71.89	9.15
	Month 15 Totals	**3.3**	**46.6**	**28.3**	**71.9**	**9.1**
	Project Maximum Daily	***8.4***	***91.4***	***83.3***	***138.4***	***17.7***
	ICAPCD Threshold	*75*	*550*	*100*	*150*	*N/A*
	Exceed Thresholds?	*No*	*No*	*No*	*No*	

Level of Significance After Mitigation: Less than significant for each individual solar site and for the Project.

IMPACT 4: Would the Project result in operational-related air quality impacts?

These facilities would operate seven days a week, 24 hours a day, generating electricity during normal daylight hours when the solar energy is available. Maintenance activities may occur seven days a week, 24 hours a day to ensure PV Panel output when solar energy is available. Additionally, the surface of the PV panels would be washed seasonally to increase the average optical transmittance of the flat panel surface. Since the TIA estimates that the entire IRIS Solar Cluster would require 40 vehicle trips per day during operations, the total trips were distributed between the four sites. These vehicle trips would be off-site trips consisting mostly worker commute, with the occasional general service, electrical service, and equipment/delivery vehicles. In addition, there would be some activity from vehicles onsite including pickup trucks, water trucks, and utility/service vehicles. Table 21 summarizes each site's total project-related annual operational air emissions. The ICAPCD thresholds of significance are also included in this table as well as information regarding whether annual operational emissions would exceed those thresholds. As shown in Table 21, operational emissions would be well below ICAPCD Tier 1 Regional thresholds. Detailed emissions calculations are included in Appendix A.

Table 21 – Estimated Operational Criteria Emissions

Solar Farm	Activity Type	Criteria Emissions (lbs/d)				
		ROG	CO	NO_X	PM_{10}	$PM_{2.5}$
BR-1	Onsite Activity	0.001	0.038	0.004	0.001	0.000
	Offsite Activity	0.014	0.687	0.066	0.017	0.007
	Big Rock 1 Solar Farm Total	***0.02***	***0.73***	***0.07***	***0.02***	***0.01***
L-1	Onsite Activity	0.001	0.038	0.004	0.001	0.000
	Offsite Activity	0.014	0.687	0.066	0.017	0.007
	Laurel 1 Solar Farm Total	***0.02***	***0.73***	***0.07***	***0.02***	***0.01***
L-2	Onsite Activity	0.001	0.038	0.004	0.001	0.000
	Offsite Activity	0.014	0.687	0.066	0.017	0.007
	Laurel 2 Solar Farm Total	***0.02***	***0.73***	***0.07***	***0.02***	***0.01***
L-3	Onsite Activity	0.001	0.038	0.004	0.001	0.000
	Offsite Activity	0.014	0.687	0.066	0.017	0.007
	Laurel 3 Solar Farm Total	***0.02***	***0.73***	***0.07***	***0.02***	***0.01***
Maximum Daily for Big Rock Cluster		***0.1***	***2.9***	***0.3***	***0.1***	***0.0***
ICAPCD Regional Thresholds		*137*	*550*	*137*	*150*	*550*
Exceed Thresholds?		*No*	*No*	*No*	*No*	*No*

Level of Significance Before Mitigation: The Project's operational emissions would not create a significant quantity of criteria emissions, therefore would result in a less than significant impact.

Mitigation Measures: No mitigation measures are necessary.

Level of Significance After Mitigation: Impacts would be less than significant.

IMPACT 5: Would the Project result in a cumulatively considerable net increase of any criteria pollutant for which the project region is nonattainment under an applicable federal or state ambient air quality standard (including releasing emissions which exceed quantitative thresholds for ozone precursors)?

In accordance with CEQA Guidelines 15130(b), this analysis of cumulative impacts incorporates a summary of projections. The following three-tiered approach is to assess cumulative air quality impacts.

- Consistency with the ICAPCD project specific thresholds for construction and operation;
- Project consistency with existing air quality plans; and
- Assessment of the cumulative health effects of the pollutants.

Project Specific Thresholds

As established previously in **Impact 2**, during construction, after implementation of mitigation measures, emissions of NO_X and PM_{10} are not expected to exceed the ICAPCD regional significance thresholds. It is assumed that construction emissions that do not exceed the project specific thresholds will not result in a cumulative impact.

Air Quality Plans

The area in which the Project is located, is in nonattainment for ozone and PM_{10}. As such, the ICAPCD is required to prepare and maintain an AQMP to document the strategies and measures to be undertaken to reach attainment of ambient air quality standards. While the ICAPCD does not have direct authority over land use decisions, it was recognized that changes in land use and circulation planning were necessary to maintain clean air. As discussed above in Impact 1, the Project is compliant with the AQMP and would not result in a significant impact.

Cumulative Health Impacts

The area is in nonattainment for ozone and PM_{10}, which means that the background levels of those pollutants are at times higher than the ambient air quality standards. The air quality standards were set to protect the health of sensitive individuals (i.e., elderly, children, and the sick). Therefore, when the concentration of those pollutants exceeds the standard, it is likely that some of the sensitive individuals of the population experience adverse health effects.

The localized significance analysis in **Impact 2** demonstrated that during construction activities, no localized significance threshold was expected to be exceeded; therefore, the emissions of particulate matter and NO_X would not result in a significant cumulative health impact.

Level of Significance before Mitigation: The Project would not result in cumulatively considerable net increase of a precursor to a criteria pollutant for which the region is in nonattainment under an applicable federal or State ambient air quality standard.

Mitigation Measures: No mitigation measures are necessary.

Level of Significance After Mitigation: Impacts would be less than significant.

IMPACT 6: Would the Project expose sensitive receptors to substantial pollutant concentrations?

Sensitive receptors are defined as land uses where sensitive population groups are likely to be located (e.g., children, the elderly, the acutely ill, and the chronically ill). These land uses include residences, schools, childcare centers, retirement homes, convalescent homes, medical care facilities, and recreational facilities. Sensitive receptors that may be adversely affected by the Project include the surrounding residential land uses.

Impacts to sensitive receptors, particularly from dust, would vary depending on the level and type of activity, the silt content of the soil, and prevailing weather. As mentioned above, the project vicinity consists predominantly of agricultural and undeveloped land with an occasional rural residence.

Even though the Project has a few residential (rural-very low density) adjacent to the solar site's boundaries, the physical proximity to the construction activity is not adjacent. It is important to note that distances to potential receptors are measured from the exterior boundary of the project and not from the individual construction project areas within the interior of the site. The Project's compliance with Regulation VIII will prevent the residences exposure to substantial pollutant concentrations.

Another way a project can establish significance with this impact is the potential to create a CO hotspot. CO hotspots can occur when vehicles are idling at highly congested intersections. According to the Traffic Impact Analysis (TIA)[45], the Project would not create an increase in congestion of the magnitude required to generate a CO hotspot.

During construction activities, diesel equipment will be operating and DPM is known to the State of California as a TAC. However, the risks associated with exposure to substances with carcinogenic effects are typically evaluated based on a lifetime of chronic exposure, which is defined as 24 hours per day, 7 days per week, 365 days per year, for 70 years. However, the short-term nature of project construction would support that exposure to diesel exhaust emissions during construction would not be significant.

Level of Significance Before Mitigation: The Project would not expose the public to substantial pollutant concentrations.

Mitigation Measures: No mitigation measures are necessary.

Level of Significance After Mitigation: Impacts would be less than significant.

IMPACT 7: Would the Project create objectionable odors affecting a substantial number of people?

The CEQA Guidelines indicate that a significant impact would occur if a project would create objectionable odors affecting a substantial number of people. While offensive odors rarely cause any physical harm, they can be very unpleasant, leading to considerable distress among the public and often generating citizen complaints to local governments and the ICAPCD. Because offensive odors rarely cause any physical harm and no requirements for their control are included in State or federal air quality regulations, the ICAPCD has no rules or standards related to odor emissions, other than its nuisance rule.

The construction and operation of a solar farm is not an odor producer nor located near an odor producer; therefore, the Project would not result in a significant odor impact.

[45] Traffic Impact Analysis. Big Rock Cluster Solar Farm. Linscott, Law & Greenspan. September 18, 2017.

Level of Significance Before Mitigation: The Project would not create objectionable odors affecting a substantial number of people.

Mitigation Measures: No mitigation measures are necessary.

Level of Significance After Mitigation: Impacts would be less than significant.

IMPACT 8: Would the Project generate GHG emissions, either directly or indirectly, that may have a significant impact on the environment?

Construction and operation of the Project would result in a relatively small amount of GHG emissions. The project would generate GHG emissions during construction and routine operational activities at the sites. During construction, GHG emissions would be generated from operation of both on-road and off-road equipment. Once operational, emissions associated with the Project would be limited to vehicle trips associated with routine maintenance and monitoring activities at each of the sites.

Solar projects are an integral part of CARB's emission reduction strategy presented in the Scoping Plans. The 2008 Scoping Plan[46] specifically addresses critical complementary measures directed at emission sources that are included in the cap-and-trade program that are designed to achieve cost-effective emissions reductions while accelerating the necessary transition to the low-carbon economy. One of these measures was the RPS, which was to promote multiple objectives, including diversifying the electricity supply by accelerating the transformation of the Electricity sector, including investment in the transmission infrastructure and system changes to allow integration of massive quantities of intermittent wind and solar generation. Therefore, this project complies with an approved GHG emission reduction plan and is presumed to have less-than-significant GHG impacts.

Using the methods developed by the SCAQMD when comparing to their adopted GHG thresholds, GHGs are quantified as the sum of annual operational GHG emissions and total construction GHG emissions amortized over 30 years. Table 22 shows that the amortized construction plus annual operation for the Project would be 124 tCO_2e per year.

In addition, the Project would be a renewable source of energy that could displace electricity generated by fossil fuel combustion and provide low-GHG electricity to consumers. Of the potential fossil fuels typically used for power generation, natural gas is one of the cleanest. To provide a conservative estimate, this AQR estimated emissions that would be generated from an equivalent amount of energy by natural gas generators to estimate the reduction in GHG emissions by electricity displacement by assuming that the solar power displaces electricity generated by dispatchable natural-gas fired combined-cycle power plants and that the Project has a capacity factor of 26 percent. Natural gas energy requirements for generation by combined-cycle power plants and emission factors from The Climate Registry were used to estimate the displaced emissions. This AQR estimated the 325 MW-AC generated by the Project would displace 212,913 tCO_2e per year.

[46] Climate Change Scoping Plan: a framework for change. California Air Resources Board. December 2008.

Detailed calculations are presented in Appendix A.

Table 22 – Project GHG Emissions

Phase	Source	tCO_2e per Year
Construction	Big Rock 1 (BR-1)	370
	Laurel 1 (L-1)	213
	Laurel 2 (L-2)	372
	Laurel 3 (L-3)	*590*
	Project Construction Total	**1,545**
	Amortized over 30 years	**51**
Operation	Big Rock 1 (BR-1)	18.2
	Laurel 1 (L-1)	18.2
	Laurel 2 (L-2)	18.2
	Laurel 3 (L-3)	18.2
	Project Operational Total	**73**
Total Annual Emissions		**124**
Annually Displaced Emissions		(212,913)
Net Project GHG Emissions		***(213,788)***

Level of Significance Before Mitigation: The Project would not generate GHG emissions, either directly or indirectly, that may have a significant impact on the environment.

Mitigation Measures: No mitigation measures are necessary.

Level of Significance After Mitigation: Impacts would be less than significant.

IMPACT 9: Would the Project conflict with an applicable plan, policy, or regulation adopted for the purpose of reducing the emissions of GHGs?

One of the critical complementary measures directed at emission sources that are included in the cap-and-trade program is the RPS, which places an obligation on electricity supply companies to produce 33 percent of their electricity from renewable energy sources by 2020. A key prerequisite to reaching the target would be to provide sufficient electric transmission lines to renewable resource zones and system changes to allow integration of massive quantities of intermittent wind and solar generation. The Project would help the State meet this goal by generating up to 325 MW-AC of power to California's current renewable portfolio. Therefore, in this regard, the Project would help the state meet its goals under AB 32.

Neither the County of Imperial or ICAPCD have any specific plans, policies, nor regulations adopted for reducing the emissions of GHGs. However, since the long-term, operational GHG emissions are minimal and the construction emissions are short-term, the Project would not conflict with any applicable plan, policy, or regulation adopted for reducing the emissions of GHGs.

Level of Significance Before Mitigation: The Project would not conflict with an applicable plan, policy, or regulation adopted for reducing the emissions of GHGs.

Mitigation Measures: No mitigation measures are necessary.

Level of Significance After Mitigation: Impacts would be less than significant.

Mitigated Criteria Temporal Summary

Month 1		Mitigated (lbs/day)				
		ROG	CO	NO_X	PM_{10}	$PM_{2.5}$
BR-1	Site Preparation, Fencing, and Ingress/Egress	1.17	10.71	13.57	14.04	1.94
	Month Maximum	***1.2***	***10.7***	***13.6***	***14.0***	***1.9***
Month 2		**Mitigated (lbs/day)**				
		ROG	**CO**	**NO_X**	**PM_{10}**	**$PM_{2.5}$**
BR-1	Site Preparation, Fencing, and Ingress/Egress	1.17	10.71	13.57	14.04	1.94
	Civil Improvements - Grading/Roads/Earthwork	1.99	17.41	20.90	22.47	3.12
	PV Panel Construction	3.25	44.85	27.97	66.47	8.55
	Month Maximum	***6.4***	***73.0***	***62.4***	***103.0***	***13.6***
Month 3		**Mitigated (lbs/day)**				
		ROG	**CO**	**NO_X**	**PM_{10}**	**$PM_{2.5}$**
BR-1	Civil Improvements - Grading/Roads/Earthwork	1.99	17.41	20.90	22.47	3.12
	PV Panel Construction	3.25	44.85	27.97	66.47	8.55
	Month Maximum	***5.2***	***62.3***	***48.9***	***88.9***	***11.7***
Month 4		**Mitigated (lbs/day)**				
		ROG	**CO**	**NO_X**	**PM_{10}**	**$PM_{2.5}$**
BR-1	PV Panel Construction	3.25	44.85	27.97	66.47	8.55
L-1	Site Preparation, Fencing, and Ingress/Egress	1.17	10.71	13.57	14.04	1.94
	Civil Improvements - Grading/Roads/Earthwork	1.99	17.41	20.90	22.47	3.12
	Month Maximum	***6.4***	***73.0***	***62.4***	***103.0***	***13.6***
Month 5		**Mitigated (lbs/day)**				
		ROG	**CO**	**NO_X**	**PM_{10}**	**$PM_{2.5}$**
BR-1	PV Panel Construction	3.25	44.85	27.97	66.47	8.55
L-1	Civil Improvements - Grading/Roads/Earthwork	1.99	17.41	20.90	22.47	3.12
L-2	Site Preparation, Fencing, and Ingress/Egress	1.17	10.71	13.57	14.04	1.94
	Month Maximum	***6.4***	***73.0***	***62.4***	***103.0***	***13.6***

Month 6		Mitigated (lbs/day)				
		ROG	CO	NO_X	PM_{10}	$PM_{2.5}$
BR-1	Testing and Commissioning	0.06	1.73	0.33	5.42	0.60
L-1	PV Panel Construction	3.25	44.85	27.97	66.47	8.55
L-2	Site Preparation, Fencing, and Ingress/Egress	1.17	10.71	13.57	14.04	1.94
	Month Maximum	***4.5***	***57.3***	***41.9***	***85.9***	***11.1***
Month 7		**Mitigated (lbs/day)**				
		ROG	**CO**	**NO_X**	**PM_{10}**	**$PM_{2.5}$**
L-1	PV Panel Construction	3.25	44.85	27.97	66.47	8.55
L-2	Civil Improvements - Grading/Roads/Earthwork	1.99	17.41	20.90	22.47	3.12
L-3	Site Preparation, Fencing, and Ingress/Egress	1.17	10.71	13.57	14.04	1.94
	Civil Improvements - Grading/Roads/Earthwork	1.99	17.41	20.90	22.47	3.12
	Month Maximum	***8.4***	***90.4***	***83.3***	***125.4***	***16.7***
Month 8		**Mitigated (lbs/day)**				
		ROG	**CO**	**NO_X**	**PM_{10}**	**$PM_{2.5}$**
L-1	PV Panel Construction	3.25	44.85	27.97	66.47	8.55
L-2	Civil Improvements - Grading/Roads/Earthwork	1.99	17.41	20.90	22.47	3.12
L-3	Site Preparation, Fencing, and Ingress/Egress	1.17	10.71	13.57	14.04	1.94
	Civil Improvements - Grading/Roads/Earthwork	1.99	17.41	20.90	22.47	3.12
	Month Maximum	***8.4***	***90.4***	***83.3***	***125.4***	***16.7***
Month 9		**Mitigated (lbs/day)**				
		ROG	**CO**	**NO_X**	**PM_{10}**	**$PM_{2.5}$**
L-1	Testing and Commissioning	0.06	1.73	0.33	5.42	0.60
L-2	PV Panel Construction	3.25	44.85	27.97	66.47	8.55
L-3	Civil Improvements - Grading/Roads/Earthwork	1.99	17.41	20.90	22.47	3.12
	Month Maximum	***5.3***	***64.0***	***49.2***	***94.4***	***12.3***
Month 10		**Mitigated (lbs/day)**				
		ROG	**CO**	**NO_X**	**PM_{10}**	**$PM_{2.5}$**
L-2	PV Panel Construction	3.25	44.85	27.97	66.47	8.55
L-3	PV Panel Construction	3.25	44.85	27.97	66.47	8.55
	Month Maximum	***6.5***	***89.7***	***55.9***	***132.9***	***17.1***

Month 11		Mitigated (lbs/day)				
		ROG	CO	NO_X	PM_{10}	$PM_{2.5}$
L-2	PV Panel Construction	3.25	44.85	27.97	66.47	8.55
L-3	PV Panel Construction	3.25	44.85	27.97	66.47	8.55
	Month Maximum	***6.5***	***89.7***	***55.9***	***132.9***	***17.1***
Month 12		**Mitigated (lbs/day)**				
		ROG	**CO**	**NO_X**	**PM_{10}**	**$PM_{2.5}$**
L-2	PV Panel Construction	3.25	44.85	27.97	66.47	8.55
	Testing and Commissioning	0.06	1.73	0.33	5.42	0.60
L-3	PV Panel Construction	3.25	44.85	27.97	66.47	8.55
	Month Maximum	***6.6***	***91.4***	***56.3***	***138.4***	***17.7***
Month 13		**Mitigated (lbs/day)**				
		ROG	**CO**	**NO_X**	**PM_{10}**	**$PM_{2.5}$**
L-3	PV Panel Construction	3.25	44.85	27.97	66.47	8.55
	Month Maximum	***3.3***	***44.9***	***28.0***	***66.5***	***8.5***
Month 14		**Mitigated (lbs/day)**				
		ROG	**CO**	**NO_X**	**PM_{10}**	**$PM_{2.5}$**
L-3	PV Panel Construction	3.25	44.85	27.97	66.47	8.55
	Testing and Commissioning	0.06	1.73	0.33	5.42	0.60
	Month Maximum	***3.3***	***46.6***	***28.3***	***71.9***	***9.1***
Month 15		**Mitigated (lbs/day)**				
		ROG	**CO**	**NO_X**	**PM_{10}**	**$PM_{2.5}$**
L-3	PV Panel Construction	3.25	44.85	27.97	66.47	8.55
	Testing and Commissioning	0.06	1.73	0.33	5.42	0.60
	Month Maximum	***3.3***	***46.6***	***28.3***	***71.9***	***9.1***

Big Rock Cluster Project Maximun Pounds per Day	***8.4***	***91.4***	***83.3***	***138.4***	***17.7***
ICAPCD Thresholds	*75*	*550*	*100*	*150*	*N/A*
Exceeds?	*N*	*N*	*N*	*N*	

Unmitigated Criteria Temporal Summary

Month 1		Unmitigated (lbs/day)				
		ROG	CO	NO_X	PM_{10}	$PM_{2.5}$
BR-1	Site Preparation, Fencing, and Ingress/Egress	1.17	10.71	13.57	31.88	3.86
	Month Maximum	***1.2***	***10.7***	***13.6***	***31.9***	***3.9***
Month 2		**Unmitigated (lbs/day)**				
		ROG	**CO**	**NO_X**	**PM_{10}**	**$PM_{2.5}$**
BR-1	Site Preparation, Fencing, and Ingress/Egress	1.17	10.71	13.57	31.88	3.86
	Civil Improvements - Grading/Roads/Earthwork	1.99	17.41	20.90	51.01	6.20
	PV Panel Construction	3.25	44.85	27.97	152.09	17.79
	Month Maximum	***6.4***	***73.0***	***62.4***	***235.0***	***27.9***
Month 3		**Unmitigated (lbs/day)**				
		ROG	**CO**	**NO_X**	**PM_{10}**	**$PM_{2.5}$**
BR-1	Civil Improvements - Grading/Roads/Earthwork	1.99	17.41	20.90	51.01	6.20
	PV Panel Construction	3.25	44.85	27.97	152.09	17.79
	Month Maximum	***5.2***	***62.3***	***48.9***	***203.1***	***24.0***
Month 4		**Unmitigated (lbs/day)**				
		ROG	**CO**	**NO_X**	**PM_{10}**	**$PM_{2.5}$**
BR-1	PV Panel Construction	3.25	44.85	27.97	152.09	17.79
L-1	Site Preparation, Fencing, and Ingress/Egress	1.17	10.71	13.57	31.88	3.86
	Civil Improvements - Grading/Roads/Earthwork	1.99	17.41	20.90	51.01	6.20
	Month Maximum	***6.4***	***73.0***	***62.4***	***235.0***	***27.9***
Month 5		**Unmitigated (lbs/day)**				
		ROG	**CO**	**NO_X**	**PM_{10}**	**$PM_{2.5}$**
BR-1	PV Panel Construction	3.25	44.85	27.97	152.09	17.79
L-1	Civil Improvements - Grading/Roads/Earthwork	1.99	17.41	20.90	51.01	6.20
L-2	Site Preparation, Fencing, and Ingress/Egress	1.17	10.71	13.57	31.88	3.86
	Month Maximum	***6.4***	***73.0***	***62.4***	***235.0***	***27.9***

Month 6		Unmitigated (lbs/day)				
		ROG	CO	NO_X	PM_{10}	$PM_{2.5}$
BR-1	Testing and Commissioning	0.06	1.73	0.33	12.56	1.37
L-1	PV Panel Construction	3.25	44.85	27.97	152.09	17.79
L-2	Site Preparation, Fencing, and Ingress/Egress	1.17	10.71	13.57	31.88	3.86
	Month Maximum	***4.5***	***57.3***	***41.9***	***196.5***	***23.0***
Month 7		**Unmitigated (lbs/day)**				
		ROG	**CO**	**NO_X**	**PM_{10}**	**$PM_{2.5}$**
L-1	PV Panel Construction	3.25	44.85	27.97	152.09	17.79
L-2	Civil Improvements - Grading/Roads/Earthwork	1.99	17.41	20.90	51.01	6.20
L-3	Site Preparation, Fencing, and Ingress/Egress	1.17	10.71	13.57	31.88	3.86
	Civil Improvements - Grading/Roads/Earthwork	1.99	17.41	20.90	51.01	6.20
	Month Maximum	***8.4***	***90.4***	***83.3***	***286.0***	***34.1***
Month 8		**Unmitigated (lbs/day)**				
		ROG	**CO**	**NO_X**	**PM_{10}**	**$PM_{2.5}$**
L-1	PV Panel Construction	3.25	44.85	27.97	152.09	17.79
L-2	Civil Improvements - Grading/Roads/Earthwork	1.99	17.41	20.90	51.01	6.20
L-3	Site Preparation, Fencing, and Ingress/Egress	1.17	10.71	13.57	31.88	3.86
	Civil Improvements - Grading/Roads/Earthwork	1.99	17.41	20.90	51.01	6.20
	Month Maximum	***8.4***	***90.4***	***83.3***	***286.0***	***34.1***
Month 9		**Unmitigated (lbs/day)**				
		ROG	**CO**	**NO_X**	**PM_{10}**	**$PM_{2.5}$**
L-1	Testing and Commissioning	0.06	1.73	0.33	12.56	1.37
L-2	PV Panel Construction	3.25	44.85	27.97	152.09	17.79
L-3	Civil Improvements - Grading/Roads/Earthwork	1.99	17.41	20.90	51.01	6.20
	Month Maximum	***5.3***	***64.0***	***49.2***	***215.7***	***25.4***
Month 10		**Unmitigated (lbs/day)**				
		ROG	**CO**	**NO_X**	**PM_{10}**	**$PM_{2.5}$**
L-2	PV Panel Construction	3.25	44.85	27.97	152.09	17.79
L-3	PV Panel Construction	3.25	44.85	27.97	152.09	17.79
	Month Maximum	***6.5***	***89.7***	***55.9***	***304.2***	***35.6***

Month 11		Unmitigated (lbs/day)				
		ROG	CO	NO_X	PM_{10}	$PM_{2.5}$
L-2	PV Panel Construction	3.25	44.85	27.97	152.09	17.79
L-3	PV Panel Construction	3.25	44.85	27.97	152.09	17.79
	Month Maximum	***6.5***	***89.7***	***55.9***	***304.2***	***35.6***
Month 12		**Unmitigated (lbs/day)**				
		ROG	**CO**	**NO_X**	**PM_{10}**	**$PM_{2.5}$**
L-2	PV Panel Construction	3.25	44.85	27.97	152.09	17.79
	Testing and Commissioning	0.06	1.73	0.33	12.56	1.37
L-3	PV Panel Construction	3.25	44.85	27.97	152.09	17.79
	Month Maximum	***6.6***	***91.4***	***56.3***	***316.7***	***37.0***
Month 13		**Unmitigated (lbs/day)**				
		ROG	**CO**	**NO_X**	**PM_{10}**	**$PM_{2.5}$**
L-3	PV Panel Construction	3.25	44.85	27.97	152.09	17.79
	Month Maximum	***3.3***	***44.9***	***28.0***	***152.1***	***17.8***
Month 14		**Unmitigated (lbs/day)**				
		ROG	**CO**	**NO_X**	**PM_{10}**	**$PM_{2.5}$**
L-3	PV Panel Construction	3.25	44.85	27.97	152.09	17.79
	Testing and Commissioning	0.06	1.73	0.33	12.56	1.37
	Month Maximum	***3.3***	***46.6***	***28.3***	***164.6***	***19.2***
Month 15		**Unmitigated (lbs/day)**				
		ROG	**CO**	**NO_X**	**PM_{10}**	**$PM_{2.5}$**
L-3	PV Panel Construction	3.25	44.85	27.97	152.09	17.79
	Testing and Commissioning	0.06	1.73	0.33	12.56	1.37
	Month Maximum	***3.3***	***46.6***	***28.3***	***164.6***	***19.2***

Big Rock Cluster Project Maximun Pounds per Day	***8.4***	***91.4***	***83.3***	***316.7***	***37.0***
ICAPCD Thresholds	*75*	*550*	*100*	*150*	*N/A*
Exceeds?	*N*	*N*	*N*	***Y***	

GHG Emissions Summary

Construction

Solar Farm Site	GHG Emissions (total tonnes)			
	CO_2	CH_4	N_2O	CO_2e
Big Rock 1	322.8	0.066	0.015	329.0
Laurel 1	221.9	0.048	0.010	226.0
Laurel 2	143.8	0.040	0.005	146.3
Laurel 3	517.1	0.099	0.025	527.1
Big Rock Cluster Totals	***1,206***	***0.25***	***0.05***	***1,228***
		Amortized over 30 years		41

Operations

Solar Farm Site	GHG Emissions (tonnes per year)			
	CO_2	CH_4	N_2O	CO_2e
Big Rock 1	17.5	0.002	0.002	18.2
Laurel 1	17.5	0.002	0.002	18.2
Laurel 2	17.5	0.002	0.002	18.2
Laurel 3	17.5	0.002	0.002	18.2
Big Rock Cluster Totals	***70***	***0.01***	***0.01***	***73***

Total Annualized Emissions	114
minus Displaced Emissions	212,913
Project Net Emissions	***-212,799***

Proposed Big Rock Cluster Schedule

Big Rock 1					Laurel 1					Laurel 2					Laurel 3				
Mon #	Phase #				Mon #	Phase #				Mon #	Phase #				Mon #	Phase #			
	1	2	3	4		1	2	3	4		1	2	3	4		1	2	3	4
1					1					1					1				
2					2					2					2				
3					3					3					3				
4					4					4					4				
5					5					5					5				
6					6					6					6				
7					7					7					7				
8					8					8					8				
9					9					9					9				
10					10					10					10				
11					11					11					11				
12					12					12					12				
13					13					13					13				
14					14					14					14				
15					15					15					15				

Emissions Associated with Power Generation Using Natural Gas as Fuel

Constants			
PC =	250	MW	*project capacity*
OP =	8,760	hrs/yr	*annual operating hours*
CF =	26%		*Capacity Factor for NG*

Project Energy Generated (EG)			
	EG = PC x OP x CF		
EG =	569,400	MWh/yr	*Project Energy Generated*

Natural Gas Equivalent (NG_{eq})			
HR =	6,940	Btu/kWh	*Combined Cycle Heat Rate for NG*
	NG_{eq} = HR x EG x 1000 (kWh/MWh)		
NG_{eq} =	3.95E+12	Btu/yr	*or*
	3,951,636	MMBtu/yr	

Emission Factors (EF)			
CO_2 =	53.02	kg/MMBtu	*Climate Registry Default Factors*
CH_4 =	0.0009		
N_2O =	0.0028		
CO_2e =	53.88		

Estimated GHG Emissions		
Emissions = EF x NG_{eq} x 0.100 (t/kg)		
	209,516	tCO_2/yr
	3.556	tCH_4/yr
	11.065	tN_2O/yr
	212,913	***tCO_2e/yr***

Operational Emissions

Operational Vehicle Activity

Activity	Vehicle Type		Workdays per Year	Trips per day	Round Trip (mi)	VMT per day	Anual VMT (mi)
On-site	Pickup Trucks	LDT2	244	0.50	10	5	1,220
	Utility/Service Vehicles	T6	244	0.17	10	2	415
	Water Truck	T7	244	0.25	10	3	610
Off-site	Worker Commute *	LDA+	244	5.00	30	150	36,600
	Carpenter Service Vehicle	LHD1	244	0.25	30	8	1,830
	Electrical Service Vehicle	LHD1	244	0.25	30	8	1,830
	Equipment/Material Delivery	MDV	244	0.07	30	2	512
					Totals	***176***	***43,017***

Operational Criteria Emissions

Activity	Vehicle Type	Pounds per Day				
		ROG	CO	NO_X	PM_{10}	$PM_{2.5}$
On-site	Pickup Trucks	0.000	0.021	0.002	0.001	0.000
	Utility/Service Vehicles	0.000	0.007	0.001	0.000	0.000
	Water Truck	0.000	0.010	0.001	0.000	0.000
	On-site Total	**0.001**	**0.038**	**0.004**	**0.001**	**0.000**
Off-site	Worker Commute	0.013	0.617	0.059	0.015	0.006
	Carpenter Service Vehicle	0.001	0.031	0.003	0.001	0.000
	Electrical Service Vehicle	0.001	0.031	0.003	0.001	0.000
	Equipment/Material Delivery	0.000	0.009	0.001	0.000	0.000
	Off-site Total	**0.014**	**0.687**	**0.066**	**0.017**	**0.007**
	Totals	***0.02***	***0.73***	***0.07***	***0.02***	***0.01***
		0.1	***2.9***	***0.3***	***0.1***	***0.0***

Operational GHG Emissions

Activity	Vehicle Type	Total Tonnes			
		CO_2	CH_4	N_2O	CO_2e
On-site	Pickup Trucks	0.53	0.0000	0.0001	0.54
	Utility/Service Vehicles	0.44	0.0003	0.0002	0.52
	Water Truck	0.65	0.0004	0.0003	0.76
Off-site	Worker Commute	12.80	0.0011	0.0012	13.20
	Carpenter Service Vehicle	1.38	0.0001	0.0001	1.41
	Electrical Service Vehicle	1.38	0.0001	0.0001	1.41
	Equipment/Material Delivery	0.30	0.0000	0.0000	0.31

Totals	***17.5***	***0.0018***	***0.0020***	***18.2***

* *Worker commute trips per day was estimated based on 5 employees*

GHG Emissions Summary

Phase Activity	Category	GHG Emissions (tonnes)			
		CO_2	CH_4	N_2O	CO_2e
Phase 1 - Site Preparation, Fencing, and Ingress/Egress	Offroad	39.05	0.0122	N/A	39.36
	Vendors	2.26	0.0012	0.0011	2.61
	Employees	6.13	0.0005	0.0006	6.32
	Phase 1 Total	***47.4***	***0.014***	***0.002***	***48.3***
Phase 2 - Civil Improvements - Grading/Roads/Earthwork	Offroad	58.35	0.0182	N/A	58.81
	Vendors	1.95	0.0008	0.0008	2.20
	Employees	13.26	0.0011	0.0013	13.67
	Phase 2 Total	***73.6***	***0.020***	***0.002***	***74.7***
Phase 3 - PV Panel Construction	Offroad	107.97	0.0217	N/A	108.51
	Vendors	6.31	0.0030	0.0028	7.21
	Employees	84.89	0.0070	0.0081	87.49
	Phase 3 Total	***199.2***	***0.032***	***0.011***	***203.2***
Phase 4 - Testing and Commissioning	Offroad	0.00	0.0000	N/A	0.00
	Vendors	0.44	0.0003	0.0002	0.52
	Employees	2.21	0.0002	0.0002	2.28
	Phase 4 Total	***2.7***	***0.000***	***0.000***	***2.8***
Grand Total for Construction		***322.8***	***0.066***	***0.015***	***329.0***
	Construction Amortized over 30 Years				*11*
	Annual Operational Emissions				*18*
	Minus Annually Displaced Emissions				*63,906*
	Net Project GHG Emissions				***-63,877***

Criteria Temporal Mitigated Summary

Month	Activity	Pounds per Day			
		ROG	CO	NO_X	PM_{10}
#1	Phase 1 - Site Preparation, Fencing, and Ingress/Egress	1.17	10.71	13.57	14.04
	Month 1 Maximum	***1.2***	***10.7***	***13.6***	***14.0***
#2	Phase 1 - Site Preparation, Fencing, and Ingress/Egress	1.17	10.71	13.57	14.04
	Phase 2 - Civil Improvements - Grading/Roads/Earthwork	1.99	17.41	20.90	22.47
	Month 2 Maximum	***3.2***	***28.1***	***34.5***	***36.5***
#3	Phase 2 - Civil Improvements - Grading/Roads/Earthwork	1.99	17.41	20.90	22.47
	Phase 3 - PV Panel Construction	3.25	44.85	27.97	66.47
	Month 3 Maximum	***5.2***	***62.3***	***48.9***	***88.9***
#4	Phase 3 - PV Panel Construction	3.25	44.85	27.97	66.47
	Month 4 Maximum	***3.3***	***44.9***	***28.0***	***66.5***
#5	Phase 3 - PV Panel Construction	3.25	44.85	27.97	66.47
	Month 5 Maximum	***3.3***	***44.9***	***28.0***	***66.5***
#6	Phase 4 - Testing and Commissioning	0.06	1.73	0.33	5.42
	Month 6 Maximum	***0.1***	***1.7***	***0.3***	***5.4***

Big Rock 1 Solar Farm Maximum Pounds per Day	***5.2***	***62.3***	***48.9***	***88.9***
ICAPCD Thresholds	*75*	*550*	*100*	*150*
Exceeds?	*N*	*N*	*N*	*N*

$PM_{2.5}$
1.94
1.9
1.94
3.12
5.1
3.12
8.55
11.7
8.55
8.5
8.55
8.5
0.60
0.6

11.7
N/A

Criteria Temporal Unmitigated Summary

Month	Activity	Pounds per Day			
		ROG	CO	NO_X	PM_{10}
#1	Phase 1 - Site Preparation, Fencing, and Ingress/Egress	1.17	10.71	13.57	31.88
	Month 1 Maximums	***1.2***	***10.7***	***13.6***	***31.9***
#2	Phase 1 - Site Preparation, Fencing, and Ingress/Egress	1.17	10.71	13.57	31.88
	Phase 2 - Civil Improvements - Grading/Roads/Earthwork	1.99	17.41	20.90	51.01
	Month 2 Maximums	***3.2***	***28.1***	***34.5***	***82.9***
#3	Phase 2 - Civil Improvements - Grading/Roads/Earthwork	1.99	17.41	20.90	51.01
	Phase 3 - PV Panel Construction	3.25	44.85	27.97	152.09
	Month 3 Maximums	***5.2***	***62.3***	***48.9***	***203.1***
#4	Phase 3 - PV Panel Construction	3.25	44.85	27.97	152.09
	Month 4 Maximums	***3.3***	***44.9***	***28.0***	***152.1***
#5	Phase 3 - PV Panel Construction	3.25	44.85	27.97	152.09
	Month 5 Maximums	***3.3***	***44.9***	***28.0***	***152.1***
#6	Phase 4 - Testing and Commissioning	0.06	1.73	0.33	12.56
	Month 6 Maximums	***0.1***	***1.7***	***0.3***	***12.6***

Big Rock 1 Solar Farm Maximum Pounds per Day	***5.2***	***62.3***	***48.9***	***203.1***
ICAPCD Thresholds	*75*	*550*	*100*	*150*
Exceeds?	*N*	*N*	*N*	***Y***

$PM_{2.5}$
3.86
3.9
3.86
6.20
10.1
6.20
17.79
24.0
17.79
17.8
17.79
17.8
1.37
1.4

24.0
N/A

Mitigated Criteria Summary

Mitigated

Phase Activity	Category	Criteria Emissions (lbs/d)				
		ROG	CO	NO_X	PM_{10}	$PM_{2.5}$
Phase 1 - Site Preparation, Fencing, and Ingress/Egress	Off-road	1.02	6.21	12.52	0.46	0.43
	Vendors	0.03	0.37	0.64	0.04	0.03
	Employees	0.12	4.13	0.41	0.07	0.03
	Road Dust	--	--	--	13.46	1.45
	Phase 1 Activity Total	***1.2***	***10.7***	***13.6***	***14.0***	***1.9***
Phase 2 - Civil Improvements - Grading/Roads/ Earthwork	Off-road	1.78	10.66	19.81	0.80	0.74
	Vendors	0.01	0.14	0.43	0.02	0.01
	Employees	0.20	6.61	0.65	0.12	0.05
	Road Dust	--	--	--	21.53	2.32
	Grading Fugitive	--	--	--	1.91	0.21
	Phase 2 Activity Total	***2.0***	***17.4***	***20.9***	***22.5***	***3.1***
Phase 3 - PV Panel Construction	Off-road	2.64	24.69	25.56	1.47	1.40
	Vendors	0.03	0.34	0.46	0.04	0.03
	Employees	0.59	19.83	1.96	0.36	0.15
	Road Dust	--	--	--	64.59	6.97
	Phase 3 Activity Total	***3.3***	***44.9***	***28.0***	***66.5***	***8.5***
Phase 4 - Testing and Commissioning	Off-road	N/A	N/A	N/A	N/A	N/A
	Vendors	0.01	0.08	0.17	0.01	0.01
	Employees	0.05	1.65	0.16	0.03	0.01
	Road Dust	--	--	--	5.38	0.58
	Phase 4 Activity Total	***0.1***	***1.7***	***0.3***	***5.4***	***0.6***

Unmitigated Criteria Summary

Unmitigated

Phase Activity	Category	Criteria Emissions (lbs/d)				
		ROG	CO	NO_X	PM_{10}	$PM_{2.5}$
Phase 1 - Site Preparation, Fencing, and Ingress/Egress	Off-road	1.02	6.21	12.52	0.46	0.43
	Vendors	0.03	0.37	0.64	0.04	0.03
	Employees	0.12	4.13	0.41	0.07	0.03
	Road Dust	--	--	--	31.30	3.38
	Phase 1 Activity Total	***1.2***	***10.7***	***13.6***	***31.9***	***3.9***
Phase 2 - Civil Improvements - Grading/Roads/ Earthwork	Off-road	1.78	10.66	19.81	0.80	0.74
	Vendors	0.01	0.14	0.43	0.02	0.01
	Employees	0.20	6.61	0.65	0.12	0.05
	Road Dust	--	--	--	50.07	5.41
	Grading Fugitive	--	--	--	1.91	0.21
	Phase 2 Activity Total	***2.0***	***17.4***	***20.9***	***51.0***	***6.2***
Phase 3 - PV Panel Construction	Off-road	2.64	24.69	25.56	1.47	1.40
	Vendors	0.03	0.34	0.46	0.04	0.03
	Employees	0.59	19.83	1.96	0.36	0.15
	Road Dust	--	--	--	150.21	16.22
	Phase 3 Activity Total	***3.3***	***44.9***	***28.0***	***152.1***	***17.8***
Phase 4 - Testing and Commissioning	Off-road	N/A	N/A	N/A	N/A	N/A
	Vendors	0.01	0.08	0.17	0.01	0.01
	Employees	0.05	1.65	0.16	0.03	0.01
	Road Dust	--	--	--	12.52	1.35
	Phase 4 Activity Total	***0.1***	***1.7***	***0.3***	***12.6***	***1.4***

Construction Employee Commute

Construction Employee Vehicle Activity

Activity	Total Work Days	Trips per day *	Round Trip (mi)	VMT per day
Phase 1 - Site Preparation, Fencing, and Ingress/Egress	24	23	32	727
Phase 2 - Civil Improvements - Grading/Roads/Earthwork	33	36	32	1,164
Phase 3 - PV Panel Construction	70	109	32	3,491
Phase 4 - Testing and Commissioning	22	9	32	291
			Totals	***5,673***

* *Trips per day modified to reflect a conservative 1.1 persons per vehicle carpool rate*

Construction Employee Criteria Emissions

Activity	Pounds per Day			
	ROG	CO	NO_X	PM_{10}
Phase 1 - Site Preparation, Fencing, and Ingress/Egress	0.124	4.131	0.408	0.074
Phase 2 - Civil Improvements - Grading/Roads/Earthwork	0.198	6.609	0.652	0.119
Phase 3 - PV Panel Construction	0.593	19.827	1.957	0.357
Phase 4 - Testing and Commissioning	0.049	1.652	0.163	0.030
Totals	***0.96***	***32.22***	***3.18***	***0.58***

Construction Employee GHG Emissions

Activity	Total Tonnes			
	CO_2	CH_4	N_2O	CO_2e
Phase 1 - Site Preparation, Fencing, and Ingress/Egress	6.13	0.0005	0.0006	6.32
Phase 2 - Civil Improvements - Grading/Roads/Earthwork	13.26	0.0011	0.0013	13.67
Phase 3 - PV Panel Construction	84.89	0.0070	0.0081	87.49
Phase 4 - Testing and Commissioning	2.21	0.0002	0.0002	2.28
Totals	***106.5***	***0.009***	***0.010***	***109.8***

Total VMT (mi)
17,539
37,922
242,701
6,320
304,483

$PM_{2.5}$
0.031
0.049
0.148
0.012
0.24

Vendor Activity

Vendors Vehicle Activity

Activity Phase	Vehicle Type (EMFAC)	Days per Phase	Trips per day	Round Trip (mi)
Phase 1 - Site Preparation, Fencing, and Ingress/Egress	MDV	24	0.50	30
	LHD1	24	2.00	30
	T6 instate construction small	24	1.50	30
				Phase 1 Total
Phase 2 - Civil Improvements - Grading/Roads/Earthwork	T7 tractor construction	33	0.25	107
	T6 instate construction small	33	0.16	30
	MDV	33	0.25	30
	LHD1	33	0.50	30
				Phase 2 Total
Phase 3 - PV Panel Construction	T6 instate construction small	70	2.00	30
	MDV	70	1.00	30
	LHD1	70	0.50	30
				Phase 3 Total
Phase 4 - Testing and Commissioning	T6 instate construction small	22	0.25	30
	LHD1	22	0.67	30
				Phase 4 Total
				Big Rock 1 Totals

For trips for PV panel delivery (which come from Port of San Diego), which use T7 trucks, only 1-way mileage was used due to bc

Vendors Criteria Emissions

Activity Phase	Vehicle Type (EMFAC)	Pounds per Da		
		ROG	CO	NO_X
Phase 1 - Site Preparation, Fencing, and Ingress/Egress	MDV	0.003	0.109	0.012
	LHD1	0.015	0.213	0.369
	T6 instate construction small	0.013	0.048	0.256
	Phase 1 Total	***0.03***	***0.37***	***0.64***
Phase 2 - Civil Improvements - Grading/Roads/Earthwork	T7 tractor construction	0.006	0.025	0.307
	T6 instate construction small	0.001	0.005	0.028
	MDV	0.001	0.054	0.006
	LHD1	0.004	0.053	0.092
	Phase 2 Total	***0.01***	***0.14***	***0.43***
Phase 3 - PV Panel Construction	T6 instate construction small	0.017	0.064	0.342
	MDV	0.005	0.218	0.024
	LHD1	0.004	0.053	0.092
	Phase 3 Total	***0.03***	***0.34***	***0.46***
Phase 4 - Testing and Commissioning	T6 instate construction small	0.002	0.008	0.043
	LHD1	0.005	0.071	0.123

	Phase 4 Total	***0.01***	***0.08***	***0.17***
	Big Rock 1 Totals	***0.08***	***0.92***	***1.69***

Vendors GHG Emissions

Activity Phase	Vehicle Type (EMFAC)	Total Tonnes		
		CO_2	CH_4	N_2O
Phase 1 - Site Preparation, Fencing, and Ingress/Egress	MDV	0.21	0.0000	0.0000
	LHD1	0.89	0.0005	0.0005
	T6 instate construction small	1.16	0.0007	0.0006
	Phase 1 Total	***2.3***	***0.001***	***0.001***
Phase 2 - Civil Improvements - Grading/Roads/Earthwork	T7 tractor construction	1.34	0.0005	0.0005
	T6 instate construction small	0.17	0.0001	0.0001
	MDV	0.14	0.0000	0.0000
	LHD1	0.30	0.0002	0.0002
	Phase 2 Total	***1.9***	***0.001***	***0.001***
Phase 3 - PV Panel Construction	T6 instate construction small	4.45	0.0025	0.0023
	MDV	1.23	0.0001	0.0001
	LHD1	0.64	0.0004	0.0003
	Phase 3 Total	***6.3***	***0.003***	***0.003***
Phase 4 - Testing and Commissioning	T6 instate construction small	0.17	0.0001	0.0001
	LHD1	0.27	0.0002	0.0001
	Phase 4 Total	***0.4***	***0.000***	***0.000***
	Big Rock 1 Totals	***11.0***	***0.0052***	***0.0049***

VMT per day	Total VMT (mi)
15	362
60	1,447
45	1,085
120	**2,894**
27	872
5	158
8	244
15	489
54	**1,763**
60	4,171
30	2,086
15	1,043
105	**7,300**
8	163
20	435
28	**598**
307	***12,555***

ıck haul.

y	
PM_{10}	$PM_{2.5}$
0.002	0.001
0.013	0.007
0.026	0.018
0.04	***0.03***
0.009	0.005
0.003	0.002
0.001	0.000
0.003	0.002
0.02	***0.01***
0.035	0.024
0.003	0.001
0.003	0.002
0.04	***0.03***
0.004	0.003
0.004	0.002

0.01	***0.01***
0.11	***0.07***

CO_2e
0.21
1.04
1.35
2.6
1.49
0.20
0.16
0.35
2.2
5.20
1.25
0.75
7.2
0.20
0.31
0.5
12.5

Unmitigated Offroad Equipment Emissions

Phase 1 - Site Preparation, Fencing, and Ingress/Egress

Equipment Type	Activity						Criteria Emissions (lbs/d)					GHG E
	BHP	Load Factor	Length (wkday)	hrs/ day	Avg Daily Number	total hours	ROG	CO	NO_X	PM_{10}	$PM_{2.5}$	CO_2
Crawler Tractors	212	0.43	24	5	1.0	121	0.56	3.44	5.89	0.33	0.30	5.44
Graders	187	0.41	24	6	1.0	145	0.39	1.44	5.35	0.17	0.16	5.52
Off-highway Trucks	402	0.38	24	7	1.0	169	0.68	3.68	7.28	0.27	0.25	12.73
Plate Compactor	8	0.43	24	4	0.8	96	0.02	0.08	0.10	0.00	0.00	0.15
Rubber-tired Loaders	203	0.36	24	8	1.0	193	0.43	1.74	5.32	0.18	0.17	6.88
Scrapers	367	0.48	24	5	0.8	121	0.57	4.39	7.10	0.28	0.26	8.34
						Totals	***1.0***	***6.2***	***12.5***	***0.5***	***0.4***	***39.1***

Phase 2 - Civil Improvements - Grading/Roads/Earthwork

Equipment Type	Activity						Criteria Emissions (lbs/d)					GHG E
	BHP	Load Factor	Length (wkday)	hrs/ day	Avg Daily Number	total hours	ROG	CO	NO_X	PM_{10}	$PM_{2.5}$	CO_2
Crawler Tractors	212	0.43	33	8	1.0	261	0.89	5.50	9.42	0.52	0.48	11.76
Graders	187	0.41	33	6	1.0	196	0.39	1.44	5.35	0.17	0.16	7.46
Off-highway Trucks	402	0.38	33	7	1.0	228	0.68	3.68	7.28	0.27	0.25	17.20
Rollers	80	0.38	33	4	1.0	130	0.13	0.97	0.44	0.09	0.08	1.95
Rubber-tired Loaders	203	0.36	33	5	1.5	163	0.40	1.63	4.99	0.17	0.16	8.72
Scrapers	367	0.48	33	4	1.0	130	0.57	4.39	7.10	0.28	0.26	11.27
						Totals	***1.8***	***10.7***	***19.8***	***0.8***	***0.7***	***58.4***

Phase 3 - PV Panel Construction

Equipment Type	Activity						Criteria Emissions (lbs/d)					GHG E
	BHP	Load Factor	Length (wkday)	hrs/ day	Avg Daily Number	total hours	ROG	CO	NO_x	PM_{10}	$PM_{2.5}$	CO_2
Air Compressors	78	0.48	70	8	1.0	556	0.40	2.47	2.67	0.20	0.20	11.83
Crawler Tractors	212	0.43	70	4	0.6	278	0.27	1.65	2.83	0.16	0.14	7.53
Generator Sets	84	0.74	70	8	2.0	556	1.01	14.07	8.23	0.52	0.52	39.30
Oher construction equipment	172	0.42	70	2	0.6	139	0.08	0.62	0.91	0.05	0.04	2.97
Rough Terrain Forklifts	100	0.40	70	5	1.3	348	0.12	1.80	1.62	0.07	0.07	8.54
Rubber-tired Loaders	203	0.36	70	5	1.3	348	0.34	1.36	4.16	0.14	0.13	15.49
Trenchers	78	0.50	70	5	2.0	348	0.57	3.31	5.09	0.39	0.36	13.39
Vibratory Post Driver	172	0.42	70	4	0.9	278	0.25	1.87	2.73	0.14	0.13	8.92
						Totals	***2.6***	***24.7***	***25.6***	***1.5***	***1.4***	***108.0***

Phase 4 - Testing and Commissioning - *(no offroad activity)*

Equipment Type	Activity						Criteria Emissions (lbs/d)					GHG E
	BHP	Load Factor	Length (wkday)	hrs/ day	Avg Daily Number	total hours	ROG	CO	NO_x	PM_{10}	$PM_{2.5}$	CO_2
None			22				0.00	0.00	0.00	0.00	0.00	0.00
						Totals	***0.0***	***0.0***	***0.0***	***0.0***	***0.0***	***0.0***

GHG E
CO_2
205.4

Emissions (tonnes)	
CH_4	CO_2e
0.0017	5.48
0.0017	5.56
0.0040	12.83
0.0000	0.15
0.0021	6.93
0.0026	8.40
0.012	***39.4***

Emissions (tonnes)	
CH_4	CO_2e
0.0037	11.85
0.0023	7.51
0.0054	17.33
0.0006	1.97
0.0027	8.78
0.0035	11.36
0.018	***58.8***

Emissions (tonnes)	
CH_4	CO_2e
0.0011	11.86
0.0023	7.59
0.0028	39.37
0.0009	3.00
0.0027	8.60
0.0048	15.61
0.0042	13.49
0.0028	8.99
0.022	***108.5***

Emissions (tonnes)	
CH_4	CO_2e
0.0000	0.00
0.000	***0.0***

Emissions (tonnes)	
CH_4	CO_2e
0.052	***206.7***

Grading Fugitive Dust

Fugitive dust emissions from grading equipment passes are estimated using the methodology described in Section 11.9, Western Surface Coal Mining, of the EPA AP-42.

AP-42 estimates the emission factor of PM_{10} applying a scaling factor to that of PM_{15}. Similarly, the emission factor of $PM_{2.5}$ is scaled from that of total suspended particulates (TSP). The equations used to calculate the emission factors for PM_{15} and TSP and the scaling factor for those of PM_{10} and $PM_{2.5}$ are presented below:

Emission Factors (lbs/day)

EF PM_{15} =	$0.051 \times S^{2.0}$ =	2.571
EF PM_{TSP} =	$0.04 \times S^{2.5}$ =	5.373

S **=** *mean vehicle speed (mph). The AP-42 default value is* *7.1*

EF PM_{10} =	$EF_{PM15} \times F_{PM10}$ =	1.5
EF $PM_{2.5}$ =	$EF_{PMTSP} \times F_{PM2.5}$ =	0.167

F_{PM10} = *PM_{10} scaling factor. The AP-42 default value is* *0.6*

$F_{PM2.5}$ = *$PM_{2.5}$ scaling factor. The AP-42 default value is* *0.031*

Emissions

The grading dust emissions are calculated by multiplying the emission factors with the total vehicle miles traveled (VMT) for the grading equipment (i.e., grader). The VMT for grader (VMT_G) are estimated based on the dimensions of the grading area and the blade width of the grading equipment.

Emissions (lb) = **EF × VMT_G** *# of Days = 33*

Pollutant	Emissions	
	total lbs	lbs/d
PM_{10}	62.25	1.910
$PM_{2.5}$	6.72	0.206

where VMT = $A_S \div W_b \times$ ft^2 per acre ÷ ft per mile = 40.4

A_S = *grading will occur only on approximately 10% of gross acreage for roads* *59*

W_b = *Blade width of the grading equipment. (default based on Caterpillar's 140 Motor Grader.* *12*

Entrained Road Dust

Entrained road dust emissions are generated by vehicles traveling on both paved and unpaved roads. These equations are based on the paved and unpaved roads emission factors found in AP-42. Defaults are from URBEMIS.

Emission Factors - Paved Roads

EF PM_{10} = $k \times (sL \div 2) \times 0.65 \times (W \div 3) \times 1.5 =$ 0.000057 lbs PM_{10}/VMT

Constant	Description	Value
k =	*particle size multiplier for particle size range and units of interest*	*0.016*
sL =	*road surface silt loading in g/m^2 (allowable range is 0.02 to 400 g/m^2)*	*0.1*
W =	*average weight of the vehicles traveling the road in megagrams (mean average fleet vehicle weight ranging from 1.8 - 39 megagrams or 2.0 - 42 tons)*	*2.2*

Emission Factors - Unpaved Roads

EF PM_{10} = $(k \times (s \div 12) \times 1.0 \times (S \div 30) \times 0.5) \div ((M \div 0.5) \times 0.2 =$ 0.086 lbs PM_{10}/VMT

Constant	Description	Value
k =	*the fraction of particles less than or equal to the particle size cutoff of 10 microns*	*1.8*
s =	*surface material silt content (%) (allowable range [1.8 - 25.2 %])*	*4.3%*
S =	*the average vehicle speed (mph) (allowable range [10 - 43 mph])*	*40*
M =	*surface moisture content (%) (allowable range 0.03 – 13 %)*	*0.5%*

Entrained Road Dust Emissions

Phase/Category		VMT/d		Paved Roads (lbs/d)		Unpaved Roads (lbs/d)		Total Roads (lbs/d)		Mitigate
		(paved)	(unpaved)	PM_{10}	$PM_{2.5}$	PM_{10}	$PM_{2.5}$	PM_{10}	$PM_{2.5}$	PM_{10}
Phase 1 - Site Preparation, Fencing, and Ingress/Egress	Employee	364	364	0.021	0.002	31.273	3.377	31.294	3.379	13.456
	Vendor	120	0	0.007	0.001	0.000	0.000	0.007	0.001	0.003
	TOTAL	**484**	**364**	**0.03**	**0.00**	**31.27**	**3.38**	**31.30**	**3.38**	**13.46**
Phase 2 - Civil Improvements - Grading/Roads/Earthwork	Employee	582	582	0.033	0.004	50.036	5.403	50.070	5.406	21.530
	Vendor	54	0	0.003	0.000	0.000	0.000	0.003	0.000	0.001
	TOTAL	**636**	**582**	**0.04**	**0.00**	**50.04**	**5.40**	**50.07**	**5.41**	**21.53**
Phase 3 - PV Panel Construction	Employee	1,745	1,745	0.100	0.011	150.109	16.208	150.209	16.219	64.590
	Vendor	105	0	0.006	0.001	0.000	0.000	0.006	0.001	0.003
	TOTAL	**1,850**	**1,745**	**0.11**	**0.01**	**150.11**	**16.21**	**150.21**	**16.22**	**64.59**
Phase 4 - Testing and Commissioning	Employee	145	145	0.008	0.001	12.509	1.351	12.517	1.352	5.382
	Vendor	28	0	0.002	0.000	0.000	0.000	0.002	0.000	0.001
	TOTAL	**173**	**145**	**0.01**	**0.00**	**12.51**	**1.35**	**12.52**	**1.35**	**5.38**
	GRAND TOTAL	***3,143***	***2,836***	***0.2***	***0.0***	***243.9***	***26.3***	***244.1***	***26.4***	***105.0***

Notes: Mitigation of 57% for traffic speed restriction

Per ICAPCD, vehicular travel in Imperial County is 50% on unpaved roads.

d (lbs/d)
$PM_{2.5}$
1.453
0.000
1.45
2.325
0.000
2.32
6.974
0.000
6.97
0.581
0.000
0.58
11.3

EMFAC2014 (v1.0.7) Emission Rates

Calendar Year 2018

EMFAC2011 Vehicle Categories

Imperial COUNTY

Vehicle Info			Emission Factor (grams/mile)								
Type	Fuel	VMT	ROG	CO	NO_X	PM_{10}			$PM_{2.5}$		
						Exhaust	TW+BW	Total	Exhaust	TW+BW	Total
LDA	GAS	2,929,674	0.0878	2.6963	0.2733	0.0014	0.0448	0.0462	0.0013	0.0178	0.0191
LDA	DSL	26,370	0.0231	0.2121	0.1369	0.0156	0.0448	0.0603	0.0149	0.0178	0.0327
LDT1	GAS	216,975	0.1122	4.5084	0.3571	0.0033	0.0448	0.0481	0.0030	0.0178	0.0208
LDT1	DSL	285	0.1618	1.0545	1.1484	0.1273	0.0448	0.1721	0.1218	0.0178	0.1395
LDT2	GAS	991,299	0.0390	1.8655	0.1783	0.0016	0.0448	0.0463	0.0014	0.0178	0.0192
LDT2	DSL	1,512	0.0126	0.1077	0.0727	0.0060	0.0448	0.0507	0.0057	0.0178	0.0235
Weighted Average for Employees LDV			***0.077***	***2.576***	***0.254***	***0.002***	***0.045***	***0.046***	***0.002***	***0.018***	***0.019***
LHD1	GAS	57,787	0.0930	2.5119	0.4813	0.0015	0.0844	0.0859	0.0013	0.0348	0.0361
LHD1	DSL	76,401	0.1279	0.9233	4.5365	0.0295	0.0844	0.1140	0.0282	0.0348	0.0630
Weighted Average for LHD1			***0.113***	***1.607***	***2.790***	***0.017***	***0.084***	***0.102***	***0.017***	***0.035***	***0.051***
MDV	GAS	857,127	0.0823	3.2951	0.3584	0.0016	0.0448	0.0464	0.0015	0.0178	0.0192
T6 instate construction small	DSL	20,975	0.1282	0.4870	2.5832	0.1246	0.1423	0.2669	0.1192	0.0589	0.1780
T7 tractor construction	DSL	11,121	0.1050	0.4205	5.2026	0.0497	0.0977	0.1474	0.0475	0.0355	0.0830

Notes: - Criteria and CO_2 factors come from 2014 EMFAC2014 (v1.0.7) and represent Estimated 2018 Annual Emission Rates for Imperial

CO_2	CH_4	N_2O
320.8	0.0278	0.0294
257.8	0.6037	0.5554
376.2	0.0315	0.0433
359.9	0.6037	0.5554
432.2	0.0315	0.0433
332.3	0.6037	0.5554
349.8	***0.0289***	***0.0334***
754.2	0.0315	0.0433
504.2	0.6037	0.5554
611.9	***0.3573***	***0.3349***
587.8	0.0315	0.0433
1,066.6	0.6037	0.5554
1,532.5	0.6037	0.5554

County

2018 Offroad Emission Factors

Equipment Type	BHP	Load Factor	Emission Factor (g/bhp-hr)						
			ROG	CO	NO_X	PM_{10}	$PM_{2.5}$	CO_2	CH_4
Air Compressors	78	0.48	0.603	3.744	4.050	0.304	0.304	568.3	0.054
Crawler Tractors	212	0.43	0.555	3.421	5.859	0.325	0.299	494.9	0.154
Generator Sets	84	0.74	0.461	6.418	3.752	0.239	0.239	568.3	0.041
Graders	187	0.41	0.384	1.416	5.271	0.171	0.156	497.4	0.155
Off-highway truck	402	0.38	0.287	1.560	3.090	0.113	0.104	493.5	0.154
Other Construction Equipment	172	0.42	0.436	3.263	4.755	0.250	0.230	493.4	0.154
Plate Compactor	8	0.43	0.661	3.469	4.142	0.161	0.161	568.3	0.059
Rollers	80	0.38	0.481	3.610	1.650	0.320	0.294	492.2	0.153
Rough Terrain Forklifts	100	0.40	0.222	3.270	2.945	0.136	0.125	491.2	0.153
Rubber Tired Loaders	203	0.36	0.333	1.346	4.131	0.140	0.129	487.9	0.152
Scrapers	367	0.48	0.369	2.828	4.568	0.180	0.166	490.8	0.153
Trenchers	78	0.50	0.658	3.855	5.915	0.450	0.414	493.7	0.154
Vibratory post driver *	158	0.38	0.273	3.093	2.924	0.142	0.13	490.7	0.153

* *A vibratory post driver is mounted on an excavator, so excavator emission factors are used*

Emissions Associated with Power Generation Using Natural Gas as Fuel

Constants

PC =	75	MW	*project capacity*
OP =	8,760	hrs/yr	*annual operating hours*
CF =	26%		*Capacity Factor for NG*

Project Energy Generated (EG)

EG = PC x OP x CF

EG =	170,820	MWh/yr	*Project Energy Generated*

Natural Gas Equivalent (NG_{eq})

HR =	6,940	Btu/kWh	*Combined Cycle Heat Rate for NG*

NG_{eq} = HR x EG x 1000 (kWh/MWh)

NG_{eq} =	1.19E+12	Btu/yr	*or*
	1,185,491	MMBtu/yr	

Emission Factors (EF)

CO_2 =	53.02	kg/MMBtu	*Climate Registry Default Factors*
CH_4 =	0.0009		
N_2O =	0.0028		
CO_2e =	53.91		

GHG Emissions

Emissions = EF x NG_{eq} x 0.100 (t/kg)

62,855	tCO_2/yr
1.067	tCH_4/yr
3.319	tN_2O/yr
63,906	***tCO_2e/yr***

Operational Emissions

Operational Vehicle Activity

Activity	Vehicle Type		Workdays per Year	Trips per day	Round Trip (mi)	VMT per day	Anual VMT (mi)
On-site	Pickup Trucks	LDT2	244	0.50	10	5	1,220
	Utility/Service Vehicles	T6	244	0.17	10	2	415
	Water Truck	T7	244	0.25	10	3	610
Off-site	Worker Commute *	LDA+	244	5.00	30	150	36,600
	Carpenter Service Vehicle	LHD1	244	0.25	30	8	1,830
	Electrical Service Vehicle	LHD1	244	0.25	30	8	1,830
	Equipment/Material Delivery	MDV	244	0.07	30	2	512
					Totals	***176***	***43,017***

Operational Criteria Emissions

Activity	Vehicle Type	Pounds per Day				
		ROG	CO	NO_X	PM_{10}	$PM_{2.5}$
On-site	Pickup Trucks	0.000	0.021	0.002	0.001	0.000
	Utility/Service Vehicles	0.000	0.007	0.001	0.000	0.000
	Water Truck	0.000	0.010	0.001	0.000	0.000
	On-site Total	**0.001**	**0.038**	**0.004**	**0.001**	**0.000**
Off-site	Worker Commute	0.013	0.617	0.059	0.015	0.006
	Carpenter Service Vehicle	0.001	0.031	0.003	0.001	0.000
	Electrical Service Vehicle	0.001	0.031	0.003	0.001	0.000
	Equipment/Material Delivery	0.000	0.009	0.001	0.000	0.000
	Off-site Total	**0.014**	**0.687**	**0.066**	**0.017**	**0.007**
	Totals	***0.02***	***0.73***	***0.07***	***0.02***	***0.01***

Operational GHG Emissions

Activity	Vehicle Type	Total Tonnes			
		CO_2	CH_4	N_2O	CO_2e
On-site	Pickup Trucks	0.53	0.0000	0.0001	0.54
	Utility/Service Vehicles	0.44	0.0003	0.0002	0.52
	Water Truck	0.65	0.0004	0.0003	0.76
Off-site	Worker Commute	12.80	0.0011	0.0012	13.20
	Carpenter Service Vehicle	1.38	0.0001	0.0001	1.41
	Electrical Service Vehicle	1.38	0.0001	0.0001	1.41
	Equipment/Material Delivery	0.30	0.0000	0.0000	0.31
	Totals	***17.5***	***0.0018***	***0.0020***	***18.2***

* *Worker commute trips per day was estimated based on 5 employees*

GHG Emissions Summary

Phase Activity	Category	GHG Emissions (tonnes)			
		CO_2	CH_4	N_2O	CO_2e
Phase 1 - Site Preparation, Fencing, and Ingress/Egress	Offroad	28.15	0.0088	N/A	28.37
	Vendors	1.63	0.0008	0.0008	1.88
	Employees	4.42	0.0004	0.0004	4.56
	Phase 1 Total	***34.2***	***0.010***	***0.001***	***34.8***
Phase 2 - Civil Improvements - Grading/Roads/Earthwork	Offroad	58.35	0.0182	N/A	58.81
	Vendors	1.95	0.0008	0.0008	2.20
	Employees	13.26	0.0011	0.0013	13.67
	Phase 2 Total	***73.6***	***0.020***	***0.002***	***74.7***
Phase 3 - PV Panel Construction	Offroad	60.73	0.0122	N/A	61.04
	Vendors	3.55	0.0017	0.0016	4.05
	Employees	47.75	0.0039	0.0046	49.21
	Phase 3 Total	***112.0***	***0.018***	***0.006***	***114.3***
Phase 4 - Testing and Commissioning	Offroad	0.00	0.0000	N/A	0.00
	Vendors	0.35	0.0002	0.0002	0.41
	Employees	1.77	0.0001	0.0002	1.82
	Phase 4 Total	***2.1***	***0.000***	***0.000***	***2.2***
Grand Total for Construction		***221.9***	***0.048***	***0.010***	***226.0***
	Construction Amortized over 30 Years				*8*
	Annual Operational Emissions				*18*
	Minus Annually Displaced Emissions				*63,906*
	Net Project GHG Emissions				***-63,880***

Mitigated Criteria Temporal Summary

Month	Activity	Mitigated Pounds per Day			
		ROG	CO	NO_X	PM_{10}
#1	Phase 1 - Site Preparation, Fencing, and Ingress/Egress	1.17	10.71	13.57	14.04
	Month 1 Maxmum	***1.2***	***10.7***	***13.6***	***14.0***
#2	Phase 2 - Civil Improvements - Grading/Roads/Earthwork	1.99	17.41	20.90	22.47
	Month 2 Maximum	***2.0***	***17.4***	***20.9***	***22.5***
#3	Phase 2 - Civil Improvements - Grading/Roads/Earthwork	1.99	17.41	20.90	22.47
	Phase 3 - PV Panel Construction	3.25	44.85	27.97	66.47
	Month 3 Maximum	***5.2***	***62.3***	***48.9***	***88.9***
#4	Phase 3 - PV Panel Construction	3.25	44.85	27.97	66.47
	Month 4 Maximum	***3.3***	***44.9***	***28.0***	***66.5***
#5	Phase 3 - PV Panel Construction	3.25	44.85	27.97	66.47
	Phase 4 - Testing and Commissioning	0.06	1.73	0.33	5.42
	Month 5 Maximum	***3.3***	***46.6***	***28.3***	***71.9***

Laurel 1 Solar Farm Maximum Pounds per Day	***5.2***	***62.3***	***48.9***	***88.9***
ICAPCD Thresholds	*137*	*550*	*137*	*150*
Exceeds?	*N*	*N*	*N*	*N*

$PM_{2.5}$
1.94
1.9
3.12
3.1
3.12
8.55
11.7
8.55
8.5
8.55
0.60
9.1

11.7
550
N

Unmitigated Criteria Temporal Summary

Month	Activity	Pounds per Day			
		ROG	CO	NO_X	PM_{10}
#1	Phase 1 - Site Preparation, Fencing, and Ingress/Egress	1.17	10.71	13.57	31.88
	Month 1 Maxmum	***1.2***	***10.7***	***13.6***	***31.9***
#2	Phase 2 - Civil Improvements - Grading/Roads/Earthwork	1.99	17.41	20.90	51.01
	Month 2 Maximum	***2.0***	***17.4***	***20.9***	***51.0***
#3	Phase 2 - Civil Improvements - Grading/Roads/Earthwork	1.99	17.41	20.90	51.01
	Phase 3 - PV Panel Construction	3.25	44.85	27.97	152.09
	Month 3 Maximum	***5.2***	***62.3***	***48.9***	***203.1***
#4	Phase 3 - PV Panel Construction	3.25	44.85	27.97	152.09
	Month 4 Maximum	***3.3***	***44.9***	***28.0***	***152.1***
#5	Phase 3 - PV Panel Construction	3.25	44.85	27.97	152.09
	Phase 4 - Testing and Commissioning	0.06	1.73	0.33	12.56
	Month 5 Maximum	***3.3***	***46.6***	***28.3***	***164.6***

Laurel 1 Solar Farm Maximum Pounds per Day	***5.2***	***62.3***	***48.9***	***203.1***
ICAPCD Thresholds	*137*	*550*	*137*	*150*
Exceeds?	*N*	*N*	*N*	***Y***

$PM_{2.5}$
3.86
3.9
6.20
6.2
6.20
17.79
24.0
17.79
17.8
17.79
1.37
19.2

24.0
550
N

Criteria Emissions Summary

Mitigated

Phase Activity	Category	Criteria Emissions (lbs/d)				
		ROG	CO	NO_X	PM_{10}	$PM_{2.5}$
Phase 1 - Site Preparation, Fencing, and Ingress/Egress	Off-road	1.02	6.21	12.52	0.46	0.43
	Vendors	0.03	0.37	0.64	0.04	0.03
	Employees	0.12	4.13	0.41	0.07	0.03
	Road Dust	--	--	--	13.46	1.45
	Phase 1 Activity Total	***1.2***	***10.7***	***13.6***	***14.0***	***1.9***
Phase 2 - Civil Improvements - Grading/Roads/Earthwork	Off-road	1.78	10.66	19.81	0.80	0.74
	Vendors	0.01	0.14	0.43	0.02	0.01
	Employees	0.20	6.61	0.65	0.12	0.05
	Road Dust	--	--	--	21.53	2.32
	Grading Fugitive	--	--	--	0.42	0.05
	Phase 2 Activity Total	***2.0***	***17.4***	***20.9***	***22.5***	***3.1***
Phase 3 - PV Panel Construction	Off-road	2.64	24.69	25.56	1.47	1.40
	Vendors	0.03	0.34	0.46	0.04	0.03
	Employees	0.59	19.83	1.96	0.36	0.15
	Road Dust	--	--	--	64.59	6.97
	Phase 3 Activity Total	***3.3***	***44.9***	***28.0***	***66.5***	***8.5***
Phase 4 - Testing and Commissioning	Off-road	N/A	N/A	N/A	N/A	N/A
	Vendors	0.01	0.08	0.17	0.01	0.01
	Employees	0.05	1.65	0.16	0.03	0.01
	Road Dust	--	--	--	5.38	0.58
	Phase 4 Activity Total	***0.1***	***1.7***	***0.3***	***5.4***	***0.6***

Criteria Emissions Summary

Unmitigated

Phase Activity	Category	Criteria Emissions (lbs/d)				
		ROG	CO	NO_X	PM_{10}	$PM_{2.5}$
Phase 1 - Site Preparation, Fencing, and Ingress/Egress	Off-road	1.02	6.21	12.52	0.46	0.43
	Vendors	0.03	0.37	0.64	0.04	0.03
	Employees	0.12	4.13	0.41	0.07	0.03
	Road Dust	--	--	--	31.30	3.38
	Phase 1 Activity Total	***1.2***	***10.7***	***13.6***	***31.9***	***3.9***
Phase 2 - Civil Improvements - Grading/Roads/Earthwork	Off-road	1.78	10.66	19.81	0.80	0.74
	Vendors	0.01	0.14	0.43	0.02	0.01
	Employees	0.20	6.61	0.65	0.12	0.05
	Road Dust	--	--	--	50.07	5.41
	Grading Fugitive	--	--	--	0.42	0.05
	Phase 2 Activity Total	***2.0***	***17.4***	***20.9***	***51.0***	***6.2***
Phase 3 - PV Panel Construction	Off-road	2.64	24.69	25.56	1.47	1.40
	Vendors	0.03	0.34	0.46	0.04	0.03
	Employees	0.59	19.83	1.96	0.36	0.15
	Road Dust	--	--	--	150.21	16.22
	Phase 3 Activity Total	***3.3***	***44.9***	***28.0***	***152.1***	***17.8***
Phase 4 - Testing and Commissioning	Off-road	N/A	N/A	N/A	N/A	N/A
	Vendors	0.01	0.08	0.17	0.01	0.01
	Employees	0.05	1.65	0.16	0.03	0.01
	Road Dust	--	--	--	12.52	1.35
	Phase 4 Activity Total	***0.1***	***1.7***	***0.3***	***12.6***	***1.4***

Construction Employee Commute

Construction Employee Vehicle Activity

Activity	Total Work Days	Trips per day *	Round Trip (mi)	VMT per day	Total VMT (mi)
Phase 1 - Site Preparation, Fencing, and Ingress/Egress	17	23	32	727	12,641
Phase 2 - Civil Improvements - Grading/Roads/Earthwork	33	36	32	1,164	37,922
Phase 3 - PV Panel Construction	39	109	32	3,491	136,519
Phase 4 - Testing and Commissioning	17	9	32	291	5,056
			Totals	***5,673***	***192,139***

** Trips per day modified to reflect a conservative 1.1 persons per vehicle carpool rate*

Construction Employee Criteria Emissions

Activity	Pounds per Day				
	ROG	CO	NO_X	PM_{10}	$PM_{2.5}$
Phase 1 - Site Preparation, Fencing, and Ingress/Egress	0.124	4.131	0.408	0.074	0.031
Phase 2 - Civil Improvements - Grading/Roads/Earthwork	0.198	6.609	0.652	0.119	0.049
Phase 3 - PV Panel Construction	0.593	19.827	1.957	0.357	0.148
Phase 4 - Testing and Commissioning	0.049	1.652	0.163	0.030	0.012
Totals	***0.96***	***32.22***	***3.18***	***0.58***	***0.24***

Construction Employee GHG Emissions

Activity	Total Tonnes			
	CO_2	CH_4	N_2O	CO_2e
Phase 1 - Site Preparation, Fencing, and Ingress/Egress	4.42	0.0004	0.0004	4.56
Phase 2 - Civil Improvements - Grading/Roads/Earthwork	13.26	0.0011	0.0013	13.67
Phase 3 - PV Panel Construction	47.75	0.0039	0.0046	49.21
Phase 4 - Testing and Commissioning	1.77	0.0001	0.0002	1.82
Totals	***67.2***	***0.006***	***0.006***	***69.3***

Vendor Activity

Vendors Vehicle Activity

Activity Phase	Vehicle Type (EMFAC)	Days per Phase	Trips per day	Round Trip (mi)
Phase 1 - Site Preparation, Fencing, and Ingress/Egress	MDV	17	0.50	30
	LHD1	17	2.00	30
	T6 instate construction small	17	1.50	30
				Phase 1 Total
Phase 2 - Civil Improvements - Grading/Roads/Earthwork	T7 tractor construction	33	0.25	107
	T6 instate construction small	33	0.16	30
	MDV	33	0.25	30
	LHD1	33	0.50	30
				Phase 2 Total
Phase 3 - PV Panel Construction	T6 instate construction small	39	2.00	30
	MDV	39	1.00	30
	LHD1	39	0.50	30
				Phase 3 Total
Phase 4 - Testing and Commissioning	T6 instate construction small	17	0.25	30
	LHD1	17	0.67	30
				Phase 4 Total
				Big Rock 1 Totals

For trips for PV panel delivery (which come from Port of San Diego), which use T7 trucks, only 1-way mileage was used due to b

Vendors Criteria Emissions

Activity Phase	Vehicle Type (EMFAC)	Pounds per Da		
		ROG	CO	NO_X
Phase 1 - Site Preparation, Fencing, and Ingress/Egress	MDV	0.003	0.109	0.012
	LHD1	0.015	0.213	0.369
	T6 instate construction small	0.013	0.048	0.256
	Phase 1 Total	***0.03***	***0.37***	***0.64***
Phase 2 - Civil Improvements - Grading/Roads/Earthwork	T7 tractor construction	0.006	0.025	0.307
	T6 instate construction small	0.001	0.005	0.028
	MDV	0.001	0.054	0.006
	LHD1	0.004	0.053	0.092
	Phase 2 Total	***0.01***	***0.14***	***0.43***
Phase 3 - PV Panel Construction	T6 instate construction small	0.017	0.064	0.342
	MDV	0.005	0.218	0.024
	LHD1	0.004	0.053	0.092
	Phase 3 Total	***0.03***	***0.34***	***0.46***
Phase 4 - Testing and Commissioning	T6 instate construction small	0.002	0.008	0.043
	LHD1	0.005	0.071	0.123
	Phase 4 Total	***0.01***	***0.08***	***0.17***
	Big Rock 1 Totals	***0.08***	***0.92***	***1.69***

Vendors GHG Emissions

Activity Phase	Vehicle Type (EMFAC)	Total Tonnes		
		CO_2	CH_4	N_2O
Phase 1 - Site Preparation, Fencing, and Ingress/Egress	MDV	0.15	0.0000	0.0000
	LHD1	0.64	0.0004	0.0003
	T6 instate construction small	0.83	0.0005	0.0004
	Phase 1 Total	***1.6***	***0.001***	***0.001***
Phase 2 - Civil Improvements - Grading/Roads/Earthwork	T7 tractor construction	1.34	0.0005	0.0005
	T6 instate construction small	0.17	0.0001	0.0001
	MDV	0.14	0.0000	0.0000
	LHD1	0.30	0.0002	0.0002
	Phase 2 Total	***1.9***	***0.001***	***0.001***
Phase 3 - PV Panel Construction	T6 instate construction small	2.50	0.0014	0.0013
	MDV	0.69	0.0000	0.0001
	LHD1	0.36	0.0002	0.0002
	Phase 3 Total	***3.6***	***0.002***	***0.002***
Phase 4 - Testing and Commissioning	T6 instate construction small	0.14	0.0001	0.0001
	LHD1	0.21	0.0001	0.0001
	Phase 4 Total	***0.4***	***0.000***	***0.000***
	Big Rock 1 Totals	***7.5***	***0.0035***	***0.0033***

VMT per day	Total VMT (mi)
15	261
60	1,043
45	782
120	**2,086**
27	872
5	158
8	244
15	489
54	**1,763**
60	2,346
30	1,173
15	587
105	**4,106**
8	130
20	348
28	**478**
307	***8,434***

ack haul.

y	
PM_{10}	$PM_{2.5}$
0.002	0.001
0.013	0.007
0.026	0.018
0.04	***0.03***
0.009	0.005
0.003	0.002
0.001	0.000
0.003	0.002
0.02	***0.01***
0.035	0.024
0.003	0.001
0.003	0.002
0.04	***0.03***
0.004	0.003
0.004	0.002
0.01	***0.01***
0.11	***0.07***

CO_2e
0.15
0.75
0.98
1.9
1.49
0.20
0.16
0.35
2.2
2.93
0.71
0.42
4.1
0.16
0.25
0.4
8.5

Unmitigated Offroad Equipment Emissions

Phase 1 - Site Preparation, Fencing, and Ingress/Egress

Equipment Type	Activity						Criteria Emissions (lbs/d)					GHG Emissions (to	
	BHP	Load Factor	Length (wkday)	hrs/ day	Avg Daily Number	total hours	ROG	CO	NO_X	PM_{10}	$PM_{2.5}$	CO_2	CH_4
Crawler Tractors	212	0.43	17	5	1.0	87	0.56	3.44	5.89	0.33	0.30	3.92	0.0012
Graders	187	0.41	17	6	1.0	104	0.39	1.44	5.35	0.17	0.16	3.98	0.0012
Off-highway Trucks	402	0.38	17	7	1.0	122	0.68	3.68	7.28	0.27	0.25	9.17	0.0029
Plate Compactor	8	0.43	17	4	0.8	70	0.02	0.08	0.10	0.00	0.00	0.11	0.0000
Rubber-tired Loaders	203	0.36	17	8	1.0	139	0.43	1.74	5.32	0.18	0.17	4.96	0.0015
Scrapers	367	0.48	17	5	0.8	87	0.57	4.39	7.10	0.28	0.26	6.01	0.0019
						Totals	***1.0***	***6.2***	***12.5***	***0.5***	***0.4***	***28.1***	***0.009***

Phase 2 - Civil Improvements - Grading/Roads/Earthwork

Equipment Type	Activity						Criteria Emissions (lbs/d)					GHG Emissions (to	
	BHP	Load Factor	Length (wkday)	hrs/ day	Avg Daily Number	total hours	ROG	CO	NO_X	PM_{10}	$PM_{2.5}$	CO_2	CH_4
Crawler Tractors	212	0.43	33	8	1.0	261	0.89	5.50	9.42	0.52	0.48	11.76	0.0037
Graders	187	0.41	33	6	1.0	196	0.39	1.44	5.35	0.17	0.16	7.46	0.0023
Off-highway Trucks	402	0.38	33	7	1.0	228	0.68	3.68	7.28	0.27	0.25	17.20	0.0054
Rollers	80	0.38	33	4	1.0	130	0.13	0.97	0.44	0.09	0.08	1.95	0.0006
Rubber-tired Loaders	203	0.36	33	5	1.5	163	0.40	1.63	4.99	0.17	0.16	8.72	0.0027
Scrapers	367	0.48	33	4	1.0	130	0.57	4.39	7.10	0.28	0.26	11.27	0.0035
						Totals	***1.8***	***10.7***	***19.8***	***0.8***	***0.7***	***58.4***	***0.018***

Phase 3 - PV Panel Construction

Equipment Type	Activity						Criteria Emissions (lbs/d)					GHG Emissions (to	
	BHP	Load Factor	Length (wkday)	hrs/ day	Avg Daily Number	total hours	ROG	CO	NO_X	PM_{10}	$PM_{2.5}$	CO_2	CH_4
Air Compressors	78	0.48	39	8	1.0	313	0.40	2.47	2.67	0.20	0.20	6.66	0.0006
Crawler Tractors	212	0.43	39	4	0.6	156	0.27	1.65	2.83	0.16	0.14	4.23	0.0013
Generator Sets	84	0.74	39	8	2.0	313	1.01	14.07	8.23	0.52	0.52	22.10	0.0016
Oher construction equipment	172	0.42	39	2	0.6	78	0.08	0.62	0.91	0.05	0.04	1.67	0.0005
Rough Terrain Forklifts	100	0.40	39	5	1.3	196	0.12	1.80	1.62	0.07	0.07	4.80	0.0015
Rubber-tired Loaders	203	0.36	39	5	1.3	196	0.34	1.36	4.16	0.14	0.13	8.72	0.0027
Trenchers	78	0.50	39	5	2.0	196	0.57	3.31	5.09	0.39	0.36	7.53	0.0023
Vibratory Post Driver	172	0.42	39	4	0.9	156	0.25	1.87	2.73	0.14	0.13	5.02	0.0016
						Totals	***2.6***	***24.7***	***25.6***	***1.5***	***1.4***	***60.7***	***0.012***

Phase 4 - Testing and Commissioning - *(no offroad activity)*

Equipment Type	Activity						Criteria Emissions (lbs/d)					GHG Emissions (to	
	BHP	Load Factor	Length (wkday)	hrs/ day	Avg Daily Number	total hours	ROG	CO	NO_X	PM_{10}	$PM_{2.5}$	CO_2	CH_4
None			17				0.00	0.00	0.00	0.00	0.00	0.00	0.0000
						Totals	***0.0***	***0.0***	***0.0***	***0.0***	***0.0***	***0.0***	***0.000***

GHG Emissions (to	
CO_2	CH_4
147.2	***0.039***

...nnes)
CO_2e
3.95
4.01
9.24
0.11
5.00
6.06
28.4

...nnes)
CO_2e
11.85
7.51
17.33
1.97
8.78
11.36
58.8

...nnes)
CO_2e
6.67
4.27
22.14
1.69
4.84
8.78
7.59
5.06
61.0

...nnes)
CO_2e
0.00
0.0

...nnes)
CO_2e
148.2

Entrained Road Dust

Entrained road dust emissions are generated by vehicles traveling on both paved and unpaved roads. These equations are based on the paved and unpaved roads emission factors found in AP-42. Defaults are from URBEMIS.

Emission Factors - Paved Roads

EF PM_{10} = $k \times (sL \div 2) \times 0.65 \times (W \div 3) \times 1.5 =$ 0.000057 lbs PM_{10}/VMT

Constant	Description	Value
k =	*particle size multiplier for particle size range and units of interest*	*0.016*
sL =	*road surface silt loading in g/m^2 (allowable range is 0.02 to 400 g/m^2)*	*0.1*
W =	*average weight of the vehicles traveling the road in megagrams (mean average fleet vehicle weight ranging from 1.8 - 39 megagrams or 2.0 - 42 tons)*	*2.2*

Emission Factors - Unpaved Roads

EF PM_{10} = $(k \times (s \div 12) \times 1.0 \times (S \div 30) \times 0.5) \div ((M \div 0.5) \times 0.2 =$ 0.086 lbs PM_{10}/VMT

Constant	Description	Value
k =	*the fraction of particles less than or equal to the particle size cutoff of 10 microns*	*1.8*
s =	*surface material silt content (%) (allowable range [1.8 - 25.2 %])*	*4.3%*
S =	*the average vehicle speed (mph) (allowable range [10 - 43 mph])*	*40*
M =	*surface moisture content (%) (allowable range 0.03 – 13 %)*	*0.5%*

Entrained Road Dust Emissions

Phase/Category		VMT/d		Paved Roads (lbs/d)		Unpaved Roads (lbs/d)		Total Roads (lbs/d)		Mitigated (lbs/d)	
		(paved)	(unpaved)	PM_{10}	$PM_{2.5}$	PM_{10}	$PM_{2.5}$	PM_{10}	$PM_{2.5}$	PM_{10}	$PM_{2.5}$
Phase 1 - Site Preparation, Fencing, and Ingress/Egress	Employee	364	364	0.021	0.002	31.273	3.377	31.294	3.379	13.456	1.453
	Vendor	120	0	0.007	0.001	0.000	0.000	0.007	0.001	0.003	0.000
	TOTAL	**484**	**364**	**0.03**	**0.00**	**31.27**	**3.38**	**31.30**	**3.38**	**13.46**	**1.45**
Phase 2 - Civil Improvements - Grading/Roads/Earthwork	Employee	582	582	0.033	0.004	50.036	5.403	50.070	5.406	21.530	2.325
	Vendor	54	0	0.003	0.000	0.000	0.000	0.003	0.000	0.001	0.000
	TOTAL	**636**	**582**	**0.04**	**0.00**	**50.04**	**5.40**	**50.07**	**5.41**	**21.53**	**2.32**
Phase 3 - PV Panel Construction	Employee	1,745	1,745	0.100	0.011	150.109	16.208	150.209	16.219	64.590	6.974
	Vendor	105	0	0.006	0.001	0.000	0.000	0.006	0.001	0.003	0.000
	TOTAL	**1,850**	**1,745**	**0.11**	**0.01**	**150.11**	**16.21**	**150.21**	**16.22**	**64.59**	**6.97**
Phase 4 - Testing and Commissioning	Employee	145	145	0.008	0.001	12.509	1.351	12.517	1.352	5.382	0.581
	Vendor	28	0	0.002	0.000	0.000	0.000	0.002	0.000	0.001	0.000
	TOTAL	**173**	**145**	**0.01**	**0.00**	**12.51**	**1.35**	**12.52**	**1.35**	**5.38**	**0.58**
GRAND TOTAL		***3,143***	***2,836***	***0.2***	***0.0***	***243.9***	***26.3***	***244.1***	***26.4***	***105.0***	***11.3***

Notes: Mitigation of 57% for traffic speed restriction

Per ICAPCD, vehicular travel in Imperial County is 50% on unpaved roads.

Grading Fugitive Dust

Fugitive dust emissions from grading equipment passes are estimated using the methodology described in Section 11.9, Western Surface Coal Mining, of the EPA AP-42.

AP-42 estimates the emission factor of PM_{10} applying a scaling factor to that of PM_{15}. Similarly, the emission factor of $PM_{2.5}$ is scaled from that of total suspended particulates (TSP). The equations used to calculate the emission factors for PM_{15} and TSP and the scaling factor for those of PM_{10} and $PM_{2.5}$ are presented below:

Emission Factors (lbs/day)

EF PM_{15} =	$0.051 \times S^{2.0}$ =	2.571
EF PM_{TSP} =	$0.04 \times S^{2.5}$ =	5.373

S = *mean vehicle speed (mph). The AP-42 default value is* *7.1*

EF PM_{10} =	$EF_{PM15} \times F_{PM10}$ =	1.5
EF $PM_{2.5}$ =	$EF_{PMTSP} \times F_{PM2.5}$ =	0.167

F_{PM10} = *PM_{10} scaling factor. The AP-42 default value is* *0.6*

$F_{PM2.5}$ = *$PM_{2.5}$ scaling factor. The AP-42 default value is* *0.031*

Emissions

The grading dust emissions are calculated by multiplying the emission factors with the total vehicle miles traveled (VMT) for the grading equipment (i.e., grader). The VMT for grader (VMT_G) are estimated based on the dimensions of the grading area and the blade width of the grading equipment.

Emissions (lb) = **EF × VMT_G** *# of Days = 33*

Pollutant	Emissions	
	total lbs	lbs/d
PM_{10}	13.79	0.423
$PM_{2.5}$	1.49	0.046

where VMT = $A_S \div W_b \times$ ft^2 per acre ÷ ft per mile = 8.9

A_S = *grading will occur only on approximately 10% of gross acreage for roads* *13*

W_b = *Blade width of the grading equipment. (default based on Caterpillar's 140 Motor Grader.* *12*

EMFAC2014 (v1.0.7) Emission Rates

Calendar Year 2018

EMFAC2011 Vehicle Categories

Imperial COUNTY

Vehicle Info			Emission Factor (grams/mile)								
Type	Fuel	VMT	ROG	CO	NO_X	PM_{10}			$PM_{2.5}$		
						Exhaust	TW+BW	Total	Exhaust	TW+BW	Total
LDA	GAS	2,929,674	0.0878	2.6963	0.2733	0.0014	0.0448	0.0462	0.0013	0.0178	0.0191
LDA	DSL	26,370	0.0231	0.2121	0.1369	0.0156	0.0448	0.0603	0.0149	0.0178	0.0327
LDT1	GAS	216,975	0.1122	4.5084	0.3571	0.0033	0.0448	0.0481	0.0030	0.0178	0.0208
LDT1	DSL	285	0.1618	1.0545	1.1484	0.1273	0.0448	0.1721	0.1218	0.0178	0.1395
LDT2	GAS	991,299	0.0390	1.8655	0.1783	0.0016	0.0448	0.0463	0.0014	0.0178	0.0192
LDT2	DSL	1,512	0.0126	0.1077	0.0727	0.0060	0.0448	0.0507	0.0057	0.0178	0.0235
Weighted Average for Employees LDV			***0.077***	***2.576***	***0.254***	***0.002***	***0.045***	***0.046***	***0.002***	***0.018***	***0.019***
LHD1	GAS	57,787	0.0930	2.5119	0.4813	0.0015	0.0844	0.0859	0.0013	0.0348	0.0361
LHD1	DSL	76,401	0.1279	0.9233	4.5365	0.0295	0.0844	0.1140	0.0282	0.0348	0.0630
Weighted Average for LHD1			***0.113***	***1.607***	***2.790***	***0.017***	***0.084***	***0.102***	***0.017***	***0.035***	***0.051***
MDV	GAS	857,127	0.0823	3.2951	0.3584	0.0016	0.0448	0.0464	0.0015	0.0178	0.0192
T6 instate construction small	DSL	20,975	0.1282	0.4870	2.5832	0.1246	0.1423	0.2669	0.1192	0.0589	0.1780
T7 tractor construction	DSL	11,121	0.1050	0.4205	5.2026	0.0497	0.0977	0.1474	0.0475	0.0355	0.0830

Notes: - Criteria and CO_2 factors come from 2014 EMFAC2014 (v1.0.7) and represent Estimated 2018 Annual Emission Rates for Imperial

CO_2	CH_4	N_2O
320.8	0.0278	0.0294
257.8	0.6037	0.5554
376.2	0.0315	0.0433
359.9	0.6037	0.5554
432.2	0.0315	0.0433
332.3	0.6037	0.5554
349.8	***0.0289***	***0.0334***
754.2	0.0315	0.0433
504.2	0.6037	0.5554
611.9	***0.3573***	***0.3349***
587.8	0.0315	0.0433
1,066.6	0.6037	0.5554
1,532.5	0.6037	0.5554

County

2018 Offroad Emission Factors - Unmitigated

Equipment Type	BHP	Load Factor	Emission Factor (g/bhp-hr)						
			ROG	CO	NO_X	PM_{10}	$PM_{2.5}$	CO_2	CH_4
Air Compressors	78	0.48	0.603	3.744	4.050	0.304	0.304	568.3	0.054
Crawler Tractors	212	0.43	0.555	3.421	5.859	0.325	0.299	494.9	0.154
Generator Sets	84	0.74	0.461	6.418	3.752	0.239	0.239	568.3	0.041
Graders	187	0.41	0.384	1.416	5.271	0.171	0.156	497.4	0.155
Off-highway truck	402	0.38	0.287	1.560	3.090	0.113	0.104	493.5	0.154
Other Construction Equipment	172	0.42	0.436	3.263	4.755	0.250	0.230	493.4	0.154
Plate Compactor	8	0.43	0.661	3.469	4.142	0.161	0.161	568.3	0.059
Rollers	80	0.38	0.481	3.610	1.650	0.320	0.294	492.2	0.153
Rough Terrain Forklifts	100	0.40	0.222	3.270	2.945	0.136	0.125	491.2	0.153
Rubber Tired Loaders	203	0.36	0.333	1.346	4.131	0.140	0.129	487.9	0.152
Scrapers	367	0.48	0.369	2.828	4.568	0.180	0.166	490.8	0.153
Trenchers	78	0.50	0.658	3.855	5.915	0.450	0.414	493.7	0.154
Vibratory post driver *	158	0.38	0.273	3.093	2.924	0.142	0.13	490.7	0.153

* *A vibratory post driver is mounted on an excavator, so excavator emission factors are used*

Emissions Associated with Power Generation Using Natural Gas as Fuel

Constants

PC =	75	MW	*project capacity*
OP =	8,760	hrs/yr	*annual operating hours*
CF =	26%		*Capacity Factor for NG*

Project Energy Generated (EG)

EG = PC x OP x CF

EG =	170,820	MWh/yr	*Project Energy Generated*

Natural Gas Equivalent (NG_{eq})

HR =	6,940	Btu/kWh	*Combined Cycle Heat Rate for NG*

NG_{eq} = HR x EG x 1000 (kWh/MWh)

NG_{eq} =	1.19E+12	Btu/yr	*or*
	1,185,491	MMBtu/yr	

Emission Factors (EF)

CO_2 =	53.02	kg/MMBtu	*Climate Registry Default Factors*
CH_4 =	0.0009		
N_2O =	0.0028		
CO_2e =	53.91		

GHG Emissions

Emissions = EF x NG_{eq} x 0.100 (t/kg)

62,855	tCO_2/yr
1.067	tCH_4/yr
3.319	tN_2O/yr
63,906	***tCO_2e/yr***

Operational Emissions

Operational Vehicle Activity

Activity	Vehicle Type		Workdays per Year	Trips per day	Round Trip (mi)	VMT per day	Anual VMT (mi)
On-site	Pickup Trucks	LDT2	244	0.50	10	5	1,220
	Utility/Service Vehicles	T6	244	0.17	10	2	415
	Water Truck	T7	244	0.25	10	3	610
Off-site	Worker Commute *	LDA+	244	5.00	30	150	36,600
	Carpenter Service Vehicle	LHD1	244	0.25	30	8	1,830
	Electrical Service Vehicle	LHD1	244	0.25	30	8	1,830
	Equipment/Material Delivery	MDV	244	0.07	30	2	512
					Totals	***176***	***43,017***

Operational Criteria Emissions

Activity	Vehicle Type	Pounds per Day				
		ROG	CO	NO_X	PM_{10}	$PM_{2.5}$
On-site	Pickup Trucks	0.000	0.021	0.002	0.001	0.000
	Utility/Service Vehicles	0.000	0.007	0.001	0.000	0.000
	Water Truck	0.000	0.010	0.001	0.000	0.000
	On-site Total	**0.001**	**0.038**	**0.004**	**0.001**	**0.000**
Off-site	Worker Commute	0.013	0.617	0.059	0.015	0.006
	Carpenter Service Vehicle	0.001	0.031	0.003	0.001	0.000
	Electrical Service Vehicle	0.001	0.031	0.003	0.001	0.000
	Equipment/Material Delivery	0.000	0.009	0.001	0.000	0.000
	Off-site Total	**0.014**	**0.687**	**0.066**	**0.017**	**0.007**
	Totals	***0.02***	***0.73***	***0.07***	***0.02***	***0.01***

Operational GHG Emissions

Activity	Vehicle Type	Total Tonnes			
		CO_2	CH_4	N_2O	CO_2e
On-site	Pickup Trucks	0.53	0.0000	0.0001	0.54
	Utility/Service Vehicles	0.44	0.0003	0.0002	0.52
	Water Truck	0.65	0.0004	0.0003	0.76
Off-site	Worker Commute	12.80	0.0011	0.0012	13.20
	Carpenter Service Vehicle	1.38	0.0001	0.0001	1.41
	Electrical Service Vehicle	1.38	0.0001	0.0001	1.41
	Equipment/Material Delivery	0.30	0.0000	0.0000	0.31
	Totals	***17.5***	***0.0018***	***0.0020***	***18.2***

* *Worker commute trips per day was estimated based on 5 employees*

GHG Emissions Summary

Phase Activity	Category	GHG Emissions (tonnes)			
		CO_2	CH_4	N_2O	CO_2e
Phase 1 - Site Preparation, Fencing, and Ingress/Egress	Offroad	45.56	0.0142	N/A	45.92
	Vendors	2.63	0.0014	0.0013	3.04
	Employees	7.16	0.0006	0.0007	7.38
	Phase 1 Total	***55.4***	***0.016***	***0.002***	***56.3***
Phase 2 - Civil Improvements - Grading/Roads/Earthwork	Offroad	68.08	0.0212	N/A	68.61
	Vendors	2.27	0.0010	0.0009	2.57
	Employees	15.48	0.0013	0.0015	15.95
	Phase 2 Total	***85.8***	***0.023***	***0.002***	***87.1***
Phase 3 - PV Panel Construction	Offroad	0.00	0.0000	N/A	0.00
	Vendors	0.00	0.0000	0.0000	0.00
	Employees	0.00	0.0000	0.0000	0.00
	Phase 3 Total	***0.0***	***0.000***	***0.000***	***0.0***
Phase 4 - Testing and Commissioning	Offroad	0.00	0.0000	N/A	0.00
	Vendors	0.44	0.0003	0.0002	0.52
	Employees	2.21	0.0002	0.0002	2.28
	Phase 4 Total	***2.7***	***0.000***	***0.000***	***2.8***
Grand Total for Construction		***143.8***	***0.040***	***0.005***	***146.3***
	Construction Amortized over 30 Years				*5*
	Annual Operational Emissions				*18*
	Minus Annually Displaced Emissions				*59,646*
	Net Project GHG Emissions				***-59,623***

Construction Criteria Temporal Summary

Month	Activity	Pounds per Day				
		ROG	CO	NO_X	PM_{10}	$PM_{2.5}$
#1	Phase 1 - Site Preparation, Fencing, and Ingress/Egress	1.17	10.71	13.57	14.04	1.94
	Month 1 Maxmum	***1.2***	***10.7***	***13.6***	***14.0***	***1.9***
#2	Phase 1 - Site Preparation, Fencing, and Ingress/Egress	1.17	10.71	13.57	14.04	1.94
	Month 2 Maximum	***1.2***	***10.7***	***13.6***	***14.0***	***1.9***
#3	Phase 2 - Civil Improvements - Grading/Roads/Earthwork	1.99	17.41	20.90	22.47	3.12
	Month 3 Maximum	***2.0***	***17.4***	***20.9***	***22.5***	***3.1***
#4	Phase 2 - Civil Improvements - Grading/Roads/Earthwork	1.99	17.41	20.90	22.47	3.12
	Month 4 Maximum	***2.0***	***17.4***	***20.9***	***22.5***	***3.1***
#5	Phase 3 - PV Panel Construction	3.25	44.85	27.97	66.47	8.55
	Month 5 Maximum	***3.3***	***44.9***	***28.0***	***66.5***	***8.5***
#6	Phase 3 - PV Panel Construction	3.25	44.85	27.97	66.47	8.55
	Month 6 Maximum	***3.3***	***44.9***	***28.0***	***66.5***	***8.5***
#7	Phase 3 - PV Panel Construction	3.25	44.85	27.97	66.47	8.55
	Month 6 Maximum	***3.3***	***44.9***	***28.0***	***66.5***	***8.5***
#8	Phase 3 - PV Panel Construction	3.25	44.85	27.97	66.47	8.55
	Phase 4 - Testing and Commissioning	0.06	1.73	0.33	5.42	0.60
	Month 6 Maximum	***3.3***	***46.6***	***28.3***	***71.9***	***9.1***

Laurel 2 Solar Farm Maximum Pounds per Day	***3.3***	***46.6***	***28.3***	***71.9***	***9.1***
ICAPCD Thresholds	*75*	*550*	*100*	*150*	*N/A*
Exceeds?	*N*	*N*	*N*	*N*	

Construction Criteria Temporal Summary

Month	Activity	Pounds per Day				
		ROG	CO	NO_X	PM_{10}	$PM_{2.5}$
#1	Phase 1 - Site Preparation, Fencing, and Ingress/Egress	1.17	10.71	13.57	31.88	3.86
	Month 1 Maxmum	***1.2***	***10.7***	***13.6***	***31.9***	***3.9***
#2	Phase 1 - Site Preparation, Fencing, and Ingress/Egress	1.17	10.71	13.57	31.88	3.86
	Month 2 Maximum	***1.2***	***10.7***	***13.6***	***31.9***	***3.9***
#3	Phase 2 - Civil Improvements - Grading/Roads/Earthwork	1.99	17.41	20.90	51.01	6.20
	Month 3 Maximum	***2.0***	***17.4***	***20.9***	***51.0***	***6.2***
#4	Phase 2 - Civil Improvements - Grading/Roads/Earthwork	1.99	17.41	20.90	51.01	6.20
	Month 4 Maximum	***2.0***	***17.4***	***20.9***	***51.0***	***6.2***
#5	Phase 3 - PV Panel Construction	3.25	44.85	27.97	152.09	17.79
	Month 5 Maximum	***3.3***	***44.9***	***28.0***	***152.1***	***17.8***
#6	Phase 3 - PV Panel Construction	3.25	44.85	27.97	152.09	17.79
	Month 6 Maximum	***3.3***	***44.9***	***28.0***	***152.1***	***17.8***
#7	Phase 3 - PV Panel Construction	3.25	44.85	27.97	152.09	17.79
	Month 6 Maximum	***3.3***	***44.9***	***28.0***	***152.1***	***17.8***
#8	Phase 3 - PV Panel Construction	3.25	44.85	27.97	152.09	17.79
	Phase 4 - Testing and Commissioning	0.06	1.73	0.33	12.56	1.37
	Month 6 Maximum	***3.3***	***46.6***	***28.3***	***164.6***	***19.2***

Laurel 2 Solar Farm Maximum Pounds per Day	***3.3***	***46.6***	***28.3***	***164.6***	***19.2***
ICAPCD Thresholds	*75*	*550*	*100*	*150*	*N/A*
Exceeds?	*N*	*N*	*N*	***Y***	

Criteria Emissions Summary

Mitigated

Phase Activity	Category	Criteria Emissions (lbs/d)				
		ROG	CO	NO_X	PM_{10}	$PM_{2.5}$
Phase 1 - Site Preparation, Fencing, and Ingress/Egress	Off-road	1.02	6.21	12.52	0.46	0.43
	Vendors	0.03	0.37	0.64	0.04	0.03
	Employees	0.12	4.13	0.41	0.07	0.03
	Road Dust	--	--	--	13.46	1.45
	Phase 1 Activity Total	***1.2***	***10.7***	***13.6***	***14.0***	***1.9***
Phase 2 - Civil Improvements - Grading/Roads/ Earthwork	Off-road	1.78	10.66	19.81	0.80	0.74
	Vendors	0.01	0.14	0.43	0.02	0.01
	Employees	0.20	6.61	0.65	0.12	0.05
	Road Dust	--	--	--	21.53	2.32
	Grading Fugitive	--	--	--	0.78	0.08
	Phase 2 Activity Total	***2.0***	***17.4***	***20.9***	***22.5***	***3.1***
Phase 3 - PV Panel Construction	Off-road	2.64	24.69	25.56	1.47	1.40
	Vendors	0.03	0.34	0.46	0.04	0.03
	Employees	0.59	19.83	1.96	0.36	0.15
	Road Dust	--	--	--	64.59	6.97
	Phase 3 Activity Total	***3.3***	***44.9***	***28.0***	***66.5***	***8.5***
Phase 4 - Testing and Commissioning	Off-road	N/A	N/A	N/A	N/A	N/A
	Vendors	0.01	0.08	0.17	0.01	0.01
	Employees	0.05	1.65	0.16	0.03	0.01
	Road Dust	--	--	--	5.38	0.58
	Phase 4 Activity Total	***0.1***	***1.7***	***0.3***	***5.4***	***0.6***

Criteria Emissions Summary

Unmitigated

Phase Activity	Category	Criteria Emissions (lbs/d)				
		ROG	CO	NO_X	PM_{10}	$PM_{2.5}$
Phase 1 - Site Preparation, Fencing, and Ingress/Egress	Off-road	1.02	6.21	12.52	0.46	0.43
	Vendors	0.03	0.37	0.64	0.04	0.03
	Employees	0.12	4.13	0.41	0.07	0.03
	Road Dust	--	--	--	31.30	3.38
	Phase 1 Activity Total	***1.2***	***10.7***	***13.6***	***31.9***	***3.9***
Phase 2 - Civil Improvements - Grading/Roads/Earthwork	Off-road	1.78	10.66	19.81	0.80	0.74
	Vendors	0.01	0.14	0.43	0.02	0.01
	Employees	0.20	6.61	0.65	0.12	0.05
	Road Dust	--	--	--	50.07	5.41
	Grading Fugitive	--	--	--	0.78	0.08
	Phase 2 Activity Total	***2.0***	***17.4***	***20.9***	***51.0***	***6.2***
Phase 3 - PV Panel Construction	Off-road	2.64	24.69	25.56	1.47	1.40
	Vendors	0.03	0.34	0.46	0.04	0.03
	Employees	0.59	19.83	1.96	0.36	0.15
	Road Dust	--	--	--	150.21	16.22
	Phase 3 Activity Total	***3.3***	***44.9***	***28.0***	***152.1***	***17.8***
Phase 4 - Testing and Commissioning	Off-road	N/A	N/A	N/A	N/A	N/A
	Vendors	0.01	0.08	0.17	0.01	0.01
	Employees	0.05	1.65	0.16	0.03	0.01
	Road Dust	--	--	--	12.52	1.35
	Phase 4 Activity Total	***0.1***	***1.7***	***0.3***	***12.6***	***1.4***

Construction Employee Commute

Construction Employee Vehicle Activity

Activity	Total Work Days	Trips per day *	Round Trip (mi)	VMT per day	Total VMT (mi)
Phase 1 - Site Preparation, Fencing, and Ingress/Egress	28	23	32	727	20,462
Phase 2 - Civil Improvements - Grading/Roads/Earthwork	38	36	32	1,164	44,242
Phase 3 - PV Panel Construction	0	109	32	3,491	0
Phase 4 - Testing and Commissioning	22	9	32	291	6,320
			Totals	***5,673***	***71,025***

** Trips per day modified to reflect a conservative 1.1 persons per vehicle carpool rate*

Construction Employee Criteria Emissions

Activity	Pounds per Day				
	ROG	CO	NO_X	PM_{10}	$PM_{2.5}$
Phase 1 - Site Preparation, Fencing, and Ingress/Egress	0.124	4.131	0.408	0.074	0.031
Phase 2 - Civil Improvements - Grading/Roads/Earthwork	0.198	6.609	0.652	0.119	0.049
Phase 3 - PV Panel Construction	0.593	19.827	1.957	0.357	0.148
Phase 4 - Testing and Commissioning	0.049	1.652	0.163	0.030	0.012
Totals	***0.96***	***32.22***	***3.18***	***0.58***	***0.24***

Construction Employee GHG Emissions

Activity	Total Tonnes			
	CO_2	CH_4	N_2O	CO_2e
Phase 1 - Site Preparation, Fencing, and Ingress/Egress	7.16	0.0006	0.0007	7.38
Phase 2 - Civil Improvements - Grading/Roads/Earthwork	15.48	0.0013	0.0015	15.95
Phase 3 - PV Panel Construction	0.00	0.0000	0.0000	0.00
Phase 4 - Testing and Commissioning	2.21	0.0002	0.0002	2.28
Totals	***24.8***	***0.002***	***0.002***	***25.6***

Vendor Activity

Vendors Vehicle Activity

Activity Phase	Vehicle Type (EMFAC)	Days per Phase	Trips per day	Round Trip (mi)	VMT per day	Total VMT (mi)
Phase 1 - Site Preparation, Fencing, and Ingress/Egress	MDV	28	0.50	30	15	422
	LHD1	28	2.00	30	60	1,688
	T6 instate construction small	28	1.50	30	45	1,266
				Phase 1 Total	**120**	**3,376**
Phase 2 - Civil Improvements - Grading/Roads/Earthwork	T7 tractor construction	38	0.25	107	27	1,017
	T6 instate construction small	38	0.16	30	5	185
	MDV	38	0.25	30	8	285
	LHD1	38	0.50	30	15	570
				Phase 2 Total	**54**	**2,057**
Phase 3 - PV Panel Construction	T6 instate construction small	0	2.00	30	60	0
	MDV	0	1.00	30	30	0
	LHD1	0	0.50	30	15	0
				Phase 3 Total	**105**	**0**
Phase 4 - Testing and Commissioning	T6 instate construction small	22	0.25	30	8	163
	LHD1	22	0.67	30	20	435
				Phase 4 Total	**28**	**598**
				Big Rock 1 Totals	***307***	***6,031***

For trips for PV panel delivery (which come from Port of San Diego), which use T7 trucks, only 1-way mileage was used due to back haul.

Vendors Criteria Emissions

Activity Phase	Vehicle Type (EMFAC)	Pounds per Day				
		ROG	CO	NO_X	PM_{10}	$PM_{2.5}$
Phase 1 - Site Preparation, Fencing, and Ingress/Egress	MDV	0.003	0.109	0.012	0.002	0.001
	LHD1	0.015	0.213	0.369	0.013	0.007
	T6 instate construction small	0.013	0.048	0.256	0.026	0.018
	Phase 1 Total	***0.03***	***0.37***	***0.64***	***0.04***	***0.03***
Phase 2 - Civil Improvements - Grading/Roads/Earthwork	T7 tractor construction	0.006	0.025	0.307	0.009	0.005
	T6 instate construction small	0.001	0.005	0.028	0.003	0.002
	MDV	0.001	0.054	0.006	0.001	0.000
	LHD1	0.004	0.053	0.092	0.003	0.002
	Phase 2 Total	***0.01***	***0.14***	***0.43***	***0.02***	***0.01***
Phase 3 - PV Panel Construction	T6 instate construction small	0.017	0.064	0.342	0.035	0.024
	MDV	0.005	0.218	0.024	0.003	0.001
	LHD1	0.004	0.053	0.092	0.003	0.002
	Phase 3 Total	***0.03***	***0.34***	***0.46***	***0.04***	***0.03***
Phase 4 - Testing and Commissioning	T6 instate construction small	0.002	0.008	0.043	0.004	0.003
	LHD1	0.005	0.071	0.123	0.004	0.002
	Phase 4 Total	***0.01***	***0.08***	***0.17***	***0.01***	***0.01***
	Big Rock 1 Totals	***0.08***	***0.92***	***1.69***	***0.11***	***0.07***

Vendors GHG Emissions

Activity Phase	Vehicle Type (EMFAC)	Total Tonnes			
		CO_2	CH_4	N_2O	CO_2e
Phase 1 - Site Preparation, Fencing, and Ingress/Egress	MDV	0.25	0.0000	0.0000	0.25
	LHD1	1.03	0.0006	0.0006	1.22
	T6 instate construction small	1.35	0.0008	0.0007	1.58
	Phase 1 Total	***2.6***	***0.001***	***0.001***	***3.0***
Phase 2 - Civil Improvements - Grading/Roads/Earthwork	T7 tractor construction	1.56	0.0006	0.0006	1.74
	T6 instate construction small	0.20	0.0001	0.0001	0.23
	MDV	0.17	0.0000	0.0000	0.18
	LHD1	0.35	0.0002	0.0002	0.41
	Phase 2 Total	***2.3***	***0.001***	***0.001***	***2.6***
Phase 3 - PV Panel Construction	T6 instate construction small	0.00	0.0000	0.0000	0.00
	MDV	0.00	0.0000	0.0000	0.00
	LHD1	0.00	0.0000	0.0000	0.00
	Phase 3 Total	***0.0***	***0.000***	***0.000***	***0.0***
Phase 4 - Testing and Commissioning	T6 instate construction small	0.17	0.0001	0.0001	0.20
	LHD1	0.27	0.0002	0.0001	0.31
	Phase 4 Total	***0.4***	***0.000***	***0.000***	***0.5***
	Big Rock 1 Totals	***5.3***	***0.0026***	***0.0024***	***6.1***

Offroad Equipment Emissions

Phase 1 - Site Preparation, Fencing, and Ingress/Egress

Equipment Type	Activity						Criteria Emissions (lbs/d)					GHG Emissions (tonnes)		
	BHP	Load Factor	Length (wkday)	hrs/ day	Avg Daily Number	total hours	ROG	CO	NO_X	PM_{10}	$PM_{2.5}$	CO_2	CH_4	CO_2e
Crawler Tractors	212	0.43	28	5	1.0	141	0.56	3.44	5.89	0.33	0.30	6.35	0.0020	6.40
Graders	187	0.41	28	6	1.0	169	0.39	1.44	5.35	0.17	0.16	6.44	0.0020	6.49
Off-highway Trucks	402	0.38	28	7	1.0	197	0.68	3.68	7.28	0.27	0.25	14.85	0.0046	14.96
Plate Compactor	8	0.43	28	4	0.8	113	0.02	0.08	0.10	0.00	0.00	0.18	0.0000	0.18
Rubber-tired Loaders	203	0.36	28	8	1.0	225	0.43	1.74	5.32	0.18	0.17	8.03	0.0025	8.09
Scrapers	367	0.48	28	5	0.8	141	0.57	4.39	7.10	0.28	0.26	9.73	0.0030	9.81
						Totals	***1.0***	***6.2***	***12.5***	***0.5***	***0.4***	***45.6***	***0.014***	***45.9***

Phase 2 - Civil Improvements - Grading/Roads/Earthwork

Equipment Type	Activity						Criteria Emissions (lbs/d)					GHG Emissions (tonnes)		
	BHP	Load Factor	Length (wkday)	hrs/ day	Avg Daily Number	total hours	ROG	CO	NO_X	PM_{10}	$PM_{2.5}$	CO_2	CH_4	CO_2e
Crawler Tractors	212	0.43	38	8	1.0	304	0.89	5.50	9.42	0.52	0.48	13.72	0.0043	13.83
Graders	187	0.41	38	6	1.0	228	0.39	1.44	5.35	0.17	0.16	8.70	0.0027	8.77
Off-highway Trucks	402	0.38	38	7	1.0	266	0.68	3.68	7.28	0.27	0.25	20.06	0.0063	20.22
Rollers	80	0.38	38	4	1.0	152	0.13	0.97	0.44	0.09	0.08	2.28	0.0007	2.29
Rubber-tired Loaders	203	0.36	38	5	1.5	190	0.40	1.63	4.99	0.17	0.16	10.17	0.0032	10.25
Scrapers	367	0.48	38	4	1.0	152	0.57	4.39	7.10	0.28	0.26	13.15	0.0041	13.25
						Totals	***1.8***	***10.7***	***19.8***	***0.8***	***0.7***	***68.1***	***0.021***	***68.6***

Phase 3 - PV Panel Construction

Equipment Type	Activity						Criteria Emissions (lbs/d)					GHG Emissions (tonnes)		
	BHP	Load Factor	Length (wkday)	hrs/ day	Avg Daily Number	total hours	ROG	CO	NO_x	PM_{10}	$PM_{2.5}$	CO_2	CH_4	CO_2e
Air Compressors	78	0.48	0	8	1.0	0	0.40	2.47	2.67	0.20	0.20	0.00	0.0000	0.00
Crawler Tractors	212	0.43	0	4	0.6	0	0.27	1.65	2.83	0.16	0.14	0.00	0.0000	0.00
Generator Sets	84	0.74	0	8	2.0	0	1.01	14.07	8.23	0.52	0.52	0.00	0.0000	0.00
Oher construction equipment	172	0.42	0	2	0.6	0	0.08	0.62	0.91	0.05	0.04	0.00	0.0000	0.00
Rough Terrain Forklifts	100	0.40	0	5	1.3	0	0.12	1.80	1.62	0.07	0.07	0.00	0.0000	0.00
Rubber-tired Loaders	203	0.36	0	5	1.3	0	0.34	1.36	4.16	0.14	0.13	0.00	0.0000	0.00
Trenchers	78	0.50	0	5	2.0	0	0.57	3.31	5.09	0.39	0.36	0.00	0.0000	0.00
Vibratory Post Driver	172	0.42	0	4	0.9	0	0.25	1.87	2.73	0.14	0.13	0.00	0.0000	0.00
						Totals	***2.6***	***24.7***	***25.6***	***1.5***	***1.4***	***0.0***	***0.000***	***0.0***

Phase 4 - Testing and Commissioning - *(no offroad activity)*

Equipment Type	Activity						Criteria Emissions (lbs/d)					GHG Emissions (tonnes)		
	BHP	Load Factor	Length (wkday)	hrs/ day	Avg Daily Number	total hours	ROG	CO	NO_x	PM_{10}	$PM_{2.5}$	CO_2	CH_4	CO_2e
None			22				0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.00
						Totals	***0.0***	***0.0***	***0.0***	***0.0***	***0.0***	***0.0***	***0.000***	***0.0***

GHG Emissions (tonnes)		
CO_2	CH_4	CO_2e
113.6	***0.035***	***114.5***

Entrained Road Dust

Entrained road dust emissions are generated by vehicles traveling on both paved and unpaved roads. These equations are based on the paved and unpaved roads emission factors found in AP-42. Defaults are from URBEMIS.

Emission Factors - Paved Roads

EF PM_{10} = $k \times (sL \div 2) \times 0.65 \times (W \div 3) \times 1.5 =$ 0.000057 lbs PM_{10}/VMT

Constant	Description	Value
k =	*particle size multiplier for particle size range and units of interest*	*0.016*
sL =	*road surface silt loading in g/m^2 (allowable range is 0.02 to 400 g/m^2)*	*0.1*
W =	*average weight of the vehicles traveling the road in megagrams (mean average fleet vehicle weight ranging from 1.8 - 39 megagrams or 2.0 - 42 tons)*	*2.2*

Emission Factors - Unpaved Roads

EF PM_{10} = $(k \times (s \div 12) \times 1.0 \times (S \div 30) \times 0.5) \div ((M \div 0.5) \times 0.2 =$ 0.086 lbs PM_{10}/VMT

Constant	Description	Value
k =	*the fraction of particles less than or equal to the particle size cutoff of 10 microns*	*1.8*
s =	*surface material silt content (%) (allowable range [1.8 - 25.2 %])*	*4.3%*
S =	*the average vehicle speed (mph) (allowable range [10 - 43 mph])*	*40*
M =	*surface moisture content (%) (allowable range 0.03 – 13 %)*	*0.5%*

Entrained Road Dust Emissions

Phase/Category		VMT/d		Paved Roads (lbs/d)		Unpaved Roads (lbs/d)		Total Roads (lbs/d)		Mitigated (lbs/d)	
		(paved)	(unpaved)	PM_{10}	$PM_{2.5}$	PM_{10}	$PM_{2.5}$	PM_{10}	$PM_{2.5}$	PM_{10}	$PM_{2.5}$
Phase 1 - Site Preparation, Fencing, and Ingress/Egress	Employee	364	364	0.021	0.002	31.273	3.377	31.294	3.379	13.456	1.453
	Vendor	120	0	0.007	0.001	0.000	0.000	0.007	0.001	0.003	0.000
	TOTAL	**484**	**364**	**0.03**	**0.00**	**31.27**	**3.38**	**31.30**	**3.38**	**13.46**	**1.45**
Phase 2 - Civil Improvements - Grading/Roads/Earthwork	Employee	582	582	0.033	0.004	50.036	5.403	50.070	5.406	21.530	2.325
	Vendor	54	0	0.003	0.000	0.000	0.000	0.003	0.000	0.001	0.000
	TOTAL	**636**	**582**	**0.04**	**0.00**	**50.04**	**5.40**	**50.07**	**5.41**	**21.53**	**2.32**
Phase 3 - PV Panel Construction	Employee	1,745	1,745	0.100	0.011	150.109	16.208	150.209	16.219	64.590	6.974
	Vendor	105	0	0.006	0.001	0.000	0.000	0.006	0.001	0.003	0.000
	TOTAL	**1,850**	**1,745**	**0.11**	**0.01**	**150.11**	**16.21**	**150.21**	**16.22**	**64.59**	**6.97**
Phase 4 - Testing and Commissioning	Employee	145	145	0.008	0.001	12.509	1.351	12.517	1.352	5.382	0.581
	Vendor	28	0	0.002	0.000	0.000	0.000	0.002	0.000	0.001	0.000
	TOTAL	**173**	**145**	**0.01**	**0.00**	**12.51**	**1.35**	**12.52**	**1.35**	**5.38**	**0.58**
GRAND TOTAL		***3,143***	***2,836***	***0.2***	***0.0***	***243.9***	***26.3***	***244.1***	***26.4***	***105.0***	***11.3***

Notes: Mitigation of 57% for traffic speed restriction

Per ICAPCD, vehicular travel in Imperial County is 50% on unpaved roads.

Grading Fugitive Dust

Fugitive dust emissions from grading equipment passes are estimated using the methodology described in Section 11.9, Western Surface Coal Mining, of the EPA AP-42.

AP-42 estimates the emission factor of PM_{10} applying a scaling factor to that of PM_{15}. Similarly, the emission factor of $PM_{2.5}$ is scaled from that of total suspended particulates (TSP). The equations used to calculate the emission factors for PM_{15} and TSP and the scaling factor for those of PM_{10} and $PM_{2.5}$ are presented below:

Emission Factors (lbs/day)

EF PM_{15} =	$0.051 \times S^{2.0}$ =	2.571
EF PM_{TSP} =	$0.04 \times S^{2.5}$ =	5.373

S **=** *mean vehicle speed (mph). The AP-42 default value is* *7.1*

EF PM_{10} =	$EF_{PM15} \times F_{PM10}$ =	1.5
EF $PM_{2.5}$ =	$EF_{PMTSP} \times F_{PM2.5}$ =	0.167

F_{PM10} = *PM_{10} scaling factor. The AP-42 default value is* *0.6*

$F_{PM2.5}$ = *$PM_{2.5}$ scaling factor. The AP-42 default value is* *0.031*

Emissions

The grading dust emissions are calculated by multiplying the emission factors with the total vehicle miles traveled (VMT) for the grading equipment (i.e., grader). The VMT for grader (VMT_G) are estimated based on the dimensions of the grading area and the blade width of the grading equipment.

Emissions (lb) = **EF × VMT_G** *# of Days = 38*

Pollutant	Emissions	
	total lbs	lbs/d
PM_{10}	29.69	0.781
$PM_{2.5}$	3.21	0.084

where VMT = $A_S \div W_b \times$ ft^2 per acre ÷ ft per mile = 19.3

A_S = *grading will occur only on approximately 10% of gross acreage for roads* *28*

W_b = *Blade width of the grading equipment. (default based on Caterpillar's 140 Motor Grader.* *12*

EMFAC2014 (v1.0.7) Emission Rates

Calendar Year 2018

EMFAC2011 Vehicle Categories

Imperial COUNTY

Vehicle Info			Emission Factor (grams/mile)											
Type	Fuel	VMT	ROG	CO	NO_X	PM_{10}			$PM_{2.5}$			CO_2	CH_4	N_2O
						Exhaust	TW+BW	Total	Exhaust	TW+BW	Total			
LDA	GAS	2,929,674	0.0878	2.6963	0.2733	0.0014	0.0448	0.0462	0.0013	0.0178	0.0191	320.8	0.0278	0.0294
LDA	DSL	26,370	0.0231	0.2121	0.1369	0.0156	0.0448	0.0603	0.0149	0.0178	0.0327	257.8	0.6037	0.5554
LDT1	GAS	216,975	0.1122	4.5084	0.3571	0.0033	0.0448	0.0481	0.0030	0.0178	0.0208	376.2	0.0315	0.0433
LDT1	DSL	285	0.1618	1.0545	1.1484	0.1273	0.0448	0.1721	0.1218	0.0178	0.1395	359.9	0.6037	0.5554
LDT2	GAS	991,299	0.0390	1.8655	0.1783	0.0016	0.0448	0.0463	0.0014	0.0178	0.0192	432.2	0.0315	0.0433
LDT2	DSL	1,512	0.0126	0.1077	0.0727	0.0060	0.0448	0.0507	0.0057	0.0178	0.0235	332.3	0.6037	0.5554
Weighted Average for Employees LDV			***0.077***	***2.576***	***0.254***	***0.002***	***0.045***	***0.046***	***0.002***	***0.018***	***0.019***	***349.8***	***0.0289***	***0.0334***
LHD1	GAS	57,787	0.0930	2.5119	0.4813	0.0015	0.0844	0.0859	0.0013	0.0348	0.0361	754.2	0.0315	0.0433
LHD1	DSL	76,401	0.1279	0.9233	4.5365	0.0295	0.0844	0.1140	0.0282	0.0348	0.0630	504.2	0.6037	0.5554
Weighted Average for LHD1			***0.113***	***1.607***	***2.790***	***0.017***	***0.084***	***0.102***	***0.017***	***0.035***	***0.051***	***611.9***	***0.3573***	***0.3349***
MDV	GAS	857,127	0.0823	3.2951	0.3584	0.0016	0.0448	0.0464	0.0015	0.0178	0.0192	587.8	0.0315	0.0433
T6 instate construction small	DSL	20,975	0.1282	0.4870	2.5832	0.1246	0.1423	0.2669	0.1192	0.0589	0.1780	1,066.6	0.6037	0.5554
T7 tractor construction	DSL	11,121	0.1050	0.4205	5.2026	0.0497	0.0977	0.1474	0.0475	0.0355	0.0830	1,532.5	0.6037	0.5554

Notes: - Criteria and CO_2 factors come from 2014 EMFAC2014 (v1.0.7) and represent Estimated 2018 Annual Emission Rates for Imperial County

2018 Offroad Emission Factors

Equipment Type	BHP	Load Factor	Emission Factor (g/bhp-hr)						
			ROG	CO	NO_X	PM_{10}	$PM_{2.5}$	CO_2	CH_4
Air Compressors	78	0.48	0.603	3.744	4.050	0.304	0.304	568.3	0.054
Crawler Tractors	212	0.43	0.555	3.421	5.859	0.325	0.299	494.9	0.154
Generator Sets	84	0.74	0.461	6.418	3.752	0.239	0.239	568.3	0.041
Graders	187	0.41	0.384	1.416	5.271	0.171	0.156	497.4	0.155
Off-highway truck	402	0.38	0.287	1.560	3.090	0.113	0.104	493.5	0.154
Other Construction Equipment	172	0.42	0.436	3.263	4.755	0.250	0.230	493.4	0.154
Plate Compactor	8	0.43	0.661	3.469	4.142	0.161	0.161	568.3	0.059
Rollers	80	0.38	0.481	3.610	1.650	0.320	0.294	492.2	0.153
Rough Terrain Forklifts	100	0.40	0.222	3.270	2.945	0.136	0.125	491.2	0.153
Rubber Tired Loaders	203	0.36	0.333	1.346	4.131	0.140	0.129	487.9	0.152
Scrapers	367	0.48	0.369	2.828	4.568	0.180	0.166	490.8	0.153
Trenchers	78	0.50	0.658	3.855	5.915	0.450	0.414	493.7	0.154
Vibratory post driver *	158	0.38	0.273	3.093	2.924	0.142	0.13	490.7	0.153

* *A vibratory post driver is mounted on an excavator, so excavator emission factors are used*

Emissions Associated with Power Generation Using Natural Gas as Fuel

Constants

PC =	70	MW	*project capacity*
OP =	8,760	hrs/yr	*annual operating hours*
CF =	26%		*Capacity Factor for NG*

Project Energy Generated (EG)

EG = PC x OP x CF

EG =	159,432	MWh/yr	*Project Energy Generated*

Natural Gas Equivalent (NG_{eq})

HR =	6,940	Btu/kWh	*Combined Cycle Heat Rate for NG*

NG_{eq} = HR x EG x 1000 (kWh/MWh)

NG_{eq} =	1.11E+12	Btu/yr	*or*
	1,106,458	MMBtu/yr	

Emission Factors (EF)

CO_2 =	53.02	kg/MMBtu	*Climate Registry Default Factors*
CH_4 =	0.0009		
N_2O =	0.0028		
CO_2e =	53.91		

GHG Emissions

Emissions = EF x NG_{eq} x 0.100 (t/kg)

58,664	tCO_2/yr
0.996	tCH_4/yr
3.098	tN_2O/yr
59,646	***tCO_2e/yr***

Operational Emissions

Operational Vehicle Activity

Activity	Vehicle Type		Workdays per Year	Trips per day	Round Trip (mi)	VMT per day	Anual VMT (mi)
On-site	Pickup Trucks	LDT2	244	0.50	10	5	1,220
	Utility/Service Vehicles	T6	244	0.17	10	2	415
	Water Truck	T7	244	0.25	10	3	610
Off-site	Worker Commute *	LDA+	244	5.00	30	150	36,600
	Carpenter Service Vehicle	LHD1	244	0.25	30	8	1,830
	Electrical Service Vehicle	LHD1	244	0.25	30	8	1,830
	Equipment/Material Delivery	MDV	244	0.07	30	2	512
					Totals	***176***	***43,017***

Operational Criteria Emissions

Activity	Vehicle Type	Pounds per Day				
		ROG	CO	NO_X	PM_{10}	$PM_{2.5}$
On-site	Pickup Trucks	0.000	0.021	0.002	0.001	0.000
	Utility/Service Vehicles	0.000	0.007	0.001	0.000	0.000
	Water Truck	0.000	0.010	0.001	0.000	0.000
	On-site Total	**0.001**	**0.038**	**0.004**	**0.001**	**0.000**
Off-site	Worker Commute	0.013	0.617	0.059	0.015	0.006
	Carpenter Service Vehicle	0.001	0.031	0.003	0.001	0.000
	Electrical Service Vehicle	0.001	0.031	0.003	0.001	0.000
	Equipment/Material Delivery	0.000	0.009	0.001	0.000	0.000
	Off-site Total	**0.014**	**0.687**	**0.066**	**0.017**	**0.007**
	Totals	***0.02***	***0.73***	***0.07***	***0.02***	***0.01***

Operational GHG Emissions

Activity	Vehicle Type	Total Tonnes			
		CO_2	CH_4	N_2O	CO_2e
On-site	Pickup Trucks	0.53	0.0000	0.0001	0.54
	Utility/Service Vehicles	0.44	0.0003	0.0002	0.52
	Water Truck	0.65	0.0004	0.0003	0.76
Off-site	Worker Commute	12.80	0.0011	0.0012	13.20
	Carpenter Service Vehicle	1.38	0.0001	0.0001	1.41
	Electrical Service Vehicle	1.38	0.0001	0.0001	1.41
	Equipment/Material Delivery	0.30	0.0000	0.0000	0.31
	Totals	***17.5***	***0.0018***	***0.0020***	***18.2***

* *Worker commute trips per day was estimated based on 5 employees*

GHG Emissions Summary

Phase Activity	Category	GHG Emissions (tonnes)			
		CO_2	CH_4	N_2O	CO_2e
Phase 1 - Site Preparation, Fencing, and Ingress/Egress	Offroad	45.56	0.0142	N/A	45.92
	Vendors	2.63	0.0014	0.0013	3.04
	Employees	7.16	0.0006	0.0007	7.38
	Phase 1 Total	***55.4***	***0.016***	***0.002***	***56.3***
Phase 2 - Civil Improvements - Grading/Roads/Earthwork	Offroad	68.08	0.0212	N/A	68.61
	Vendors	2.27	0.0010	0.0009	2.57
	Employees	15.48	0.0013	0.0015	15.95
	Phase 2 Total	***85.8***	***0.023***	***0.002***	***87.1***
Phase 3 - PV Panel Construction	Offroad	202.44	0.0406	N/A	203.46
	Vendors	11.84	0.0055	0.0052	13.52
	Employees	159.17	0.0131	0.0152	164.03
	Phase 3 Total	***373.5***	***0.059***	***0.020***	***381.0***
Phase 4 - Testing and Commissioning	Offroad	0.00	0.0000	N/A	0.00
	Vendors	0.41	0.0002	0.0002	0.48
	Employees	2.06	0.0002	0.0002	2.13
	Phase 4 Total	***2.5***	***0.000***	***0.000***	***2.6***
Grand Total for Construction		***517.1***	***0.099***	***0.025***	***527.1***
	Construction Amortized over 30 Years				*18*
	Annual Operational Emissions				*18*
	Minus Annually Displaced Emissions				*119,291*
	Net Project GHG Emissions				***-119,256***

Mitigated Construction Temporal Summary

Month	Activity	Pounds per Day				
		ROG	CO	NO_X	PM_{10}	$PM_{2.5}$
#1	Phase 1 - Site Preparation, Fencing, and Ingress/Egress	1.17	10.71	13.57	14.04	1.94
	Phase 2 - Civil Improvements - Grading/Roads/Earthwork	1.99	17.41	20.90	22.47	3.12
	Month 1 Maxmum	***3.2***	***28.1***	***34.5***	***36.5***	***5.1***
#2	Phase 1 - Site Preparation, Fencing, and Ingress/Egress	1.17	10.71	13.57	14.04	1.94
	Phase 2 - Civil Improvements - Grading/Roads/Earthwork	1.99	17.41	20.90	22.47	3.12
	Month 2 Maximum	***3.2***	***28.1***	***34.5***	***36.5***	***5.1***
#3	Phase 2 - Civil Improvements - Grading/Roads/Earthwork	1.99	17.41	20.90	22.47	3.12
	Month 3 Maximum	***2.0***	***17.4***	***20.9***	***22.5***	***3.1***
#4	Phase 3 - PV Panel Construction	3.25	44.85	27.97	66.47	8.55
	Month 4 Maximum	***3.3***	***44.9***	***28.0***	***66.5***	***8.5***
#5	Phase 3 - PV Panel Construction	3.25	44.85	27.97	66.47	8.55
	Month 5 Maximum	***3.3***	***44.9***	***28.0***	***66.5***	***8.5***
#6	Phase 3 - PV Panel Construction	3.25	44.85	27.97	66.47	8.55
	Month 6 Maximum	***3.3***	***44.9***	***28.0***	***66.5***	***8.5***
#7	Phase 3 - PV Panel Construction	3.25	44.85	27.97	66.47	8.55
	Month 7 Maximum	***3.3***	***44.9***	***28.0***	***66.5***	***8.5***
#8	Phase 3 - PV Panel Construction	3.25	44.85	27.97	66.47	8.55
	Phase 4 - Testing and Commissioning	0.06	1.73	0.33	5.42	0.60
	Month 9 Maximum	***3.3***	***46.6***	***28.3***	***71.9***	***9.1***
#9	Phase 3 - PV Panel Construction	3.25	44.85	27.97	66.47	8.55
	Phase 4 - Testing and Commissioning	0.06	1.73	0.33	5.42	0.60
	Month 9 Maximum	***3.3***	***46.6***	***28.3***	***71.9***	***9.1***

Laurel 2 Solar Farm Maximum Pounds per Day	***3.3***	***46.6***	***34.5***	***71.9***	***9.1***
ICAPCD Thresholds	*75*	*550*	*100*	*150*	*N/A*
Exceeds?	*N*	*N*	*N*	*N*	

Unmitigated Construction Temporal Summary

Month	Activity	Pounds per Day				
		ROG	CO	NO_X	PM_{10}	$PM_{2.5}$
#1	Phase 1 - Site Preparation, Fencing, and Ingress/Egress	1.17	10.71	13.57	31.88	3.86
	Phase 2 - Civil Improvements - Grading/Roads/Earthwork	1.99	17.41	20.90	51.01	6.20
	Month 1 Maxmum	***3.2***	***28.1***	***34.5***	***82.9***	***10.1***
#2	Phase 1 - Site Preparation, Fencing, and Ingress/Egress	1.17	10.71	13.57	31.88	3.86
	Phase 2 - Civil Improvements - Grading/Roads/Earthwork	1.99	17.41	20.90	51.01	6.20
	Month 2 Maximum	***3.2***	***28.1***	***34.5***	***82.9***	***10.1***
#3	Phase 2 - Civil Improvements - Grading/Roads/Earthwork	1.99	17.41	20.90	51.01	6.20
	Month 3 Maximum	***2.0***	***17.4***	***20.9***	***51.0***	***6.2***
#4	Phase 3 - PV Panel Construction	3.25	44.85	27.97	152.09	17.79
	Month 4 Maximum	***3.3***	***44.9***	***28.0***	***152.1***	***17.8***
#5	Phase 3 - PV Panel Construction	3.25	44.85	27.97	152.09	17.79
	Month 5 Maximum	***3.3***	***44.9***	***28.0***	***152.1***	***17.8***
#6	Phase 3 - PV Panel Construction	3.25	44.85	27.97	152.09	17.79
	Month 6 Maximum	***3.3***	***44.9***	***28.0***	***152.1***	***17.8***
#7	Phase 3 - PV Panel Construction	3.25	44.85	27.97	152.09	17.79
	Month 7 Maximum	***3.3***	***44.9***	***28.0***	***152.1***	***17.8***
#8	Phase 3 - PV Panel Construction	3.25	44.85	27.97	152.09	17.79
	Phase 4 - Testing and Commissioning	0.06	1.73	0.33	12.56	1.37
	Month 9 Maximum	***3.3***	***44.9***	***28.0***	***152.1***	***17.8***
#9	Phase 3 - PV Panel Construction	3.25	44.85	27.97	152.09	17.79
	Phase 4 - Testing and Commissioning	0.06	1.73	0.33	12.56	1.37
	Month 9 Maximum	***3.3***	***46.6***	***28.3***	***164.6***	***19.2***

Laurel 2 Solar Farm Maximum Pounds per Day	***3.3***	***46.6***	***34.5***	***164.6***	***19.2***
ICAPCD Thresholds	*75*	*550*	*100*	*150*	*N/A*
Exceeds?	*N*	*N*	*N*	***Y***	

Criteria Emissions Summary

Mitigated

Phase Activity	Category	Criteria Emissions (lbs/d)				
		ROG	CO	NO_X	PM_{10}	$PM_{2.5}$
Phase 1 - Site Preparation, Fencing, and Ingress/Egress	Off-road	1.02	6.21	12.52	0.46	0.43
	Vendors	0.03	0.37	0.64	0.04	0.03
	Employees	0.12	4.13	0.41	0.07	0.03
	Road Dust	--	--	--	13.46	1.45
	Phase 1 Activity Total	***1.2***	***10.7***	***13.6***	***14.0***	***1.9***
Phase 2 - Civil Improvements - Grading/Roads/ Earthwork	Off-road	1.78	10.66	19.81	0.80	0.74
	Vendors	0.01	0.14	0.43	0.02	0.01
	Employees	0.20	6.61	0.65	0.12	0.05
	Road Dust	--	--	--	21.53	2.32
	Grading Fugitive	--	--	--	1.64	0.18
	Phase 2 Activity Total	***2.0***	***17.4***	***20.9***	***22.5***	***3.1***
Phase 3 - PV Panel Construction	Off-road	2.64	24.69	25.56	1.47	1.40
	Vendors	0.03	0.34	0.46	0.04	0.03
	Employees	0.59	19.83	1.96	0.36	0.15
	Road Dust	--	--	--	64.59	6.97
	Phase 3 Activity Total	***3.3***	***44.9***	***28.0***	***66.5***	***8.5***
Phase 4 - Testing and Commissioning	Off-road	N/A	N/A	N/A	N/A	N/A
	Vendors	0.01	0.08	0.17	0.01	0.01
	Employees	0.05	1.65	0.16	0.03	0.01
	Road Dust	--	--	--	5.38	0.58
	Phase 4 Activity Total	***0.1***	***1.7***	***0.3***	***5.4***	***0.6***

Criteria Emissions Summary

Unmitigated

Phase Activity	Category	Criteria Emissions (lbs/d)				
		ROG	CO	NO_X	PM_{10}	$PM_{2.5}$
Phase 1 - Site Preparation, Fencing, and Ingress/Egress	Off-road	1.02	6.21	12.52	0.46	0.43
	Vendors	0.03	0.37	0.64	0.04	0.03
	Employees	0.12	4.13	0.41	0.07	0.03
	Road Dust	--	--	--	31.30	3.38
	Phase 1 Activity Total	***1.2***	***10.7***	***13.6***	***31.9***	***3.9***
Phase 2 - Civil Improvements - Grading/Roads/ Earthwork	Off-road	1.78	10.66	19.81	0.80	0.74
	Vendors	0.01	0.14	0.43	0.02	0.01
	Employees	0.20	6.61	0.65	0.12	0.05
	Road Dust	--	--	--	50.07	5.41
	Grading Fugitive	--	--	--	1.64	0.18
	Phase 2 Activity Total	***2.0***	***17.4***	***20.9***	***51.0***	***6.2***
Phase 3 - PV Panel Construction	Off-road	2.64	24.69	25.56	1.47	1.40
	Vendors	0.03	0.34	0.46	0.04	0.03
	Employees	0.59	19.83	1.96	0.36	0.15
	Road Dust	--	--	--	150.21	16.22
	Phase 3 Activity Total	***3.3***	***44.9***	***28.0***	***152.1***	***17.8***
Phase 4 - Testing and Commissioning	Off-road	N/A	N/A	N/A	N/A	N/A
	Vendors	0.01	0.08	0.17	0.01	0.01
	Employees	0.05	1.65	0.16	0.03	0.01
	Road Dust	--	--	--	12.52	1.35
	Phase 4 Activity Total	***0.1***	***1.7***	***0.3***	***12.6***	***1.4***

Construction Employee Commute

Construction Employee Vehicle Activity

Activity	Total Work Days	Trips per day *	Round Trip (mi)	VMT per day	Total VMT (mi)
Phase 1 - Site Preparation, Fencing, and Ingress/Egress	28	23	32	727	20,462
Phase 2 - Civil Improvements - Grading/Roads/Earthwork	38	36	32	1,164	44,242
Phase 3 - PV Panel Construction	130	109	32	3,491	455,065
Phase 4 - Testing and Commissioning	20	9	32	291	5,899
			Totals	***5,673***	***525,668***

** Trips per day modified to reflect a conservative 1.1 persons per vehicle carpool rate*

Construction Employee Criteria Emissions

Activity	Pounds per Day				
	ROG	CO	NO_X	PM_{10}	$PM_{2.5}$
Phase 1 - Site Preparation, Fencing, and Ingress/Egress	0.124	4.131	0.408	0.074	0.031
Phase 2 - Civil Improvements - Grading/Roads/Earthwork	0.198	6.609	0.652	0.119	0.049
Phase 3 - PV Panel Construction	0.593	19.827	1.957	0.357	0.148
Phase 4 - Testing and Commissioning	0.049	1.652	0.163	0.030	0.012
Totals	***0.96***	***32.22***	***3.18***	***0.58***	***0.24***

Construction Employee GHG Emissions

Activity	Total Tonnes			
	CO_2	CH_4	N_2O	CO_2e
Phase 1 - Site Preparation, Fencing, and Ingress/Egress	7.16	0.0006	0.0007	7.38
Phase 2 - Civil Improvements - Grading/Roads/Earthwork	15.48	0.0013	0.0015	15.95
Phase 3 - PV Panel Construction	159.17	0.0131	0.0152	164.03
Phase 4 - Testing and Commissioning	2.06	0.0002	0.0002	2.13
Totals	***183.9***	***0.015***	***0.018***	***189.5***

Vendor Activity

Vendors Vehicle Activity

Activity Phase	Vehicle Type (EMFAC)	Days per Phase	Trips per day	Round Trip (mi)	VMT per day	Total VMT (mi)
Phase 1 - Site Preparation, Fencing, and Ingress/Egress	MDV	28	0.50	30	15	422
	LHD1	28	2.00	30	60	1,688
	T6 instate construction small	28	1.50	30	45	1,266
				Phase 1 Total	**120**	**3,376**
Phase 2 - Civil Improvements - Grading/Roads/Earthwork	T7 tractor construction	38	0.25	107	27	1,017
	T6 instate construction small	38	0.16	30	5	185
	MDV	38	0.25	30	8	285
	LHD1	38	0.50	30	15	570
				Phase 2 Total	**54**	**2,057**
Phase 3 - PV Panel Construction	T6 instate construction small	130	2.00	30	60	7,821
	MDV	130	1.00	30	30	3,911
	LHD1	130	0.50	30	15	1,955
				Phase 3 Total	**105**	**13,688**
Phase 4 - Testing and Commissioning	T6 instate construction small	20	0.25	30	8	152
	LHD1	20	0.67	30	20	406
				Phase 4 Total	**28**	**558**
				Big Rock 1 Totals	***307***	***19,679***

For trips for PV panel delivery (which come from Port of San Diego), which use T7 trucks, only 1-way mileage was used due to back haul.

Vendors Criteria Emissions

Activity Phase	Vehicle Type (EMFAC)	Pounds per Day				
		ROG	CO	NO_X	PM_{10}	$PM_{2.5}$
Phase 1 - Site Preparation, Fencing, and Ingress/Egress	MDV	0.003	0.109	0.012	0.002	0.001
	LHD1	0.015	0.213	0.369	0.013	0.007
	T6 instate construction small	0.013	0.048	0.256	0.026	0.018
	Phase 1 Total	***0.03***	***0.37***	***0.64***	***0.04***	***0.03***
Phase 2 - Civil Improvements - Grading/Roads/Earthwork	T7 tractor construction	0.006	0.025	0.307	0.009	0.005
	T6 instate construction small	0.001	0.005	0.028	0.003	0.002
	MDV	0.001	0.054	0.006	0.001	0.000
	LHD1	0.004	0.053	0.092	0.003	0.002
	Phase 2 Total	***0.01***	***0.14***	***0.43***	***0.02***	***0.01***
Phase 3 - PV Panel Construction	T6 instate construction small	0.017	0.064	0.342	0.035	0.024
	MDV	0.005	0.218	0.024	0.003	0.001
	LHD1	0.004	0.053	0.092	0.003	0.002
	Phase 3 Total	***0.03***	***0.34***	***0.46***	***0.04***	***0.03***
Phase 4 - Testing and Commissioning	T6 instate construction small	0.002	0.008	0.043	0.004	0.003
	LHD1	0.005	0.071	0.123	0.004	0.002
	Phase 4 Total	***0.01***	***0.08***	***0.17***	***0.01***	***0.01***
	Big Rock 1 Totals	***0.08***	***0.92***	***1.69***	***0.11***	***0.07***

Vendors GHG Emissions

Activity Phase	Vehicle Type (EMFAC)	Total Tonnes			
		CO_2	CH_4	N_2O	CO_2e
Phase 1 - Site Preparation, Fencing, and Ingress/Egress	MDV	0.25	0.0000	0.0000	0.25
	LHD1	1.03	0.0006	0.0006	1.22
	T6 instate construction small	1.35	0.0008	0.0007	1.58
	Phase 1 Total	***2.6***	***0.001***	***0.001***	***3.0***
Phase 2 - Civil Improvements - Grading/Roads/Earthwork	T7 tractor construction	1.56	0.0006	0.0006	1.74
	T6 instate construction small	0.20	0.0001	0.0001	0.23
	MDV	0.17	0.0000	0.0000	0.18
	LHD1	0.35	0.0002	0.0002	0.41
	Phase 2 Total	***2.3***	***0.001***	***0.001***	***2.6***
Phase 3 - PV Panel Construction	T6 instate construction small	8.34	0.0047	0.0043	9.75
	MDV	2.30	0.0001	0.0002	2.35
	LHD1	1.20	0.0007	0.0007	1.41
	Phase 3 Total	***11.8***	***0.006***	***0.005***	***13.5***
Phase 4 - Testing and Commissioning	T6 instate construction small	0.16	0.0001	0.0001	0.19
	LHD1	0.25	0.0001	0.0001	0.29
	Phase 4 Total	***0.4***	***0.000***	***0.000***	***0.5***
	Big Rock 1 Totals	***17.2***	***0.0081***	***0.0076***	***19.6***

Unmitigated Offroad Equipment Emissions

Phase 1 - Site Preparation, Fencing, and Ingress/Egress

Equipment Type	Activity						Criteria Emissions (lbs/d)					GHG Emissions (tonnes)		
	BHP	Load Factor	Length (wkday)	hrs/ day	Avg Daily Number	total hours	ROG	CO	NO_X	PM_{10}	$PM_{2.5}$	CO_2	CH_4	CO_2e
Crawler Tractors	212	0.43	28	5	1.0	141	0.56	3.44	5.89	0.33	0.30	6.35	0.0020	6.40
Graders	187	0.41	28	6	1.0	169	0.39	1.44	5.35	0.17	0.16	6.44	0.0020	6.49
Off-highway Trucks	402	0.38	28	7	1.0	197	0.68	3.68	7.28	0.27	0.25	14.85	0.0046	14.96
Plate Compactor	8	0.43	28	4	0.8	113	0.02	0.08	0.10	0.00	0.00	0.18	0.0000	0.18
Rubber-tired Loaders	203	0.36	28	8	1.0	225	0.43	1.74	5.32	0.18	0.17	8.03	0.0025	8.09
Scrapers	367	0.48	28	5	0.8	141	0.57	4.39	7.10	0.28	0.26	9.73	0.0030	9.81
						Totals	***1.0***	***6.2***	***12.5***	***0.5***	***0.4***	***45.6***	***0.014***	***45.9***

Phase 2 - Civil Improvements - Grading/Roads/Earthwork

Equipment Type	Activity						Criteria Emissions (lbs/d)					GHG Emissions (tonnes)		
	BHP	Load Factor	Length (wkday)	hrs/ day	Avg Daily Number	total hours	ROG	CO	NO_X	PM_{10}	$PM_{2.5}$	CO_2	CH_4	CO_2e
Crawler Tractors	212	0.43	38	8	1.0	304	0.89	5.50	9.42	0.52	0.48	13.72	0.0043	13.83
Graders	187	0.41	38	6	1.0	228	0.39	1.44	5.35	0.17	0.16	8.70	0.0027	8.77
Off-highway Trucks	402	0.38	38	7	1.0	266	0.68	3.68	7.28	0.27	0.25	20.06	0.0063	20.22
Rollers	80	0.38	38	4	1.0	152	0.13	0.97	0.44	0.09	0.08	2.28	0.0007	2.29
Rubber-tired Loaders	203	0.36	38	5	1.5	190	0.40	1.63	4.99	0.17	0.16	10.17	0.0032	10.25
Scrapers	367	0.48	38	4	1.0	152	0.57	4.39	7.10	0.28	0.26	13.15	0.0041	13.25
						Totals	***1.8***	***10.7***	***19.8***	***0.8***	***0.7***	***68.1***	***0.021***	***68.6***

Phase 3 - PV Panel Construction

Equipment Type	Activity						Criteria Emissions (lbs/d)					GHG Emissions (tonnes)		
	BHP	Load Factor	Length (wkday)	hrs/ day	Avg Daily Number	total hours	ROG	CO	NO_x	PM_{10}	$PM_{2.5}$	CO_2	CH_4	CO_2e
Air Compressors	78	0.48	130	8	1.0	1,043	0.40	2.47	2.67	0.20	0.20	22.19	0.0021	22.24
Crawler Tractors	212	0.43	130	4	0.6	521	0.27	1.65	2.83	0.16	0.14	14.12	0.0044	14.22
Generator Sets	84	0.74	130	8	2.0	1,043	1.01	14.07	8.23	0.52	0.52	73.68	0.0053	73.81
Oher construction equipment	172	0.42	130	2	0.6	261	0.08	0.62	0.91	0.05	0.04	5.58	0.0017	5.62
Rough Terrain Forklifts	100	0.40	130	5	1.3	652	0.12	1.80	1.62	0.07	0.07	16.01	0.0050	16.13
Rubber-tired Loaders	203	0.36	130	5	1.3	652	0.34	1.36	4.16	0.14	0.13	29.05	0.0091	29.28
Trenchers	78	0.50	130	5	2.0	652	0.57	3.31	5.09	0.39	0.36	25.10	0.0078	25.30
Vibratory Post Driver	172	0.42	130	4	0.9	521	0.25	1.87	2.73	0.14	0.13	16.73	0.0052	16.86
						Totals	***2.6***	***24.7***	***25.6***	***1.5***	***1.4***	***202.4***	***0.041***	***203.5***

Phase 4 - Testing and Commissioning - *(no offroad activity)*

Equipment Type	Activity						Criteria Emissions (lbs/d)					GHG Emissions (tonnes)		
	BHP	Load Factor	Length (wkday)	hrs/ day	Avg Daily Number	total hours	ROG	CO	NO_x	PM_{10}	$PM_{2.5}$	CO_2	CH_4	CO_2e
None			20				0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.00
						Totals	***0.0***	***0.0***	***0.0***	***0.0***	***0.0***	***0.0***	***0.000***	***0.0***

GHG Emissions (tonnes)		
CO_2	CH_4	CO_2e
316.1	***0.076***	***318.0***

Entrained Road Dust

Entrained road dust emissions are generated by vehicles traveling on both paved and unpaved roads. These equations are based on the paved and unpaved roads emission factors found in AP-42. Defaults are from URBEMIS.

Emission Factors - Paved Roads

EF PM_{10} = $k \times (sL \div 2) \times 0.65 \times (W \div 3) \times 1.5 =$ 0.000057 lbs PM_{10}/VMT

Constant	Description	Value
k =	*particle size multiplier for particle size range and units of interest*	*0.016*
sL =	*road surface silt loading in g/m^2 (allowable range is 0.02 to 400 g/m^2)*	*0.1*
W =	*average weight of the vehicles traveling the road in megagrams (mean average fleet vehicle weight ranging from 1.8 - 39 megagrams or 2.0 - 42 tons)*	*2.2*

Emission Factors - Unpaved Roads

EF PM_{10} = $(k \times (s \div 12) \times 1.0 \times (S \div 30) \times 0.5) \div ((M \div 0.5) \times 0.2 =$ 0.086 lbs PM_{10}/VMT

Constant	Description	Value
k =	*the fraction of particles less than or equal to the particle size cutoff of 10 microns*	*1.8*
s =	*surface material silt content (%) (allowable range [1.8 - 25.2 %])*	*4.3%*
S =	*the average vehicle speed (mph) (allowable range [10 - 43 mph])*	*40*
M =	*surface moisture content (%) (allowable range 0.03 – 13 %)*	*0.5%*

Entrained Road Dust Emissions

Phase/Category		VMT/d		Paved Roads (lbs/d)		Unpaved Roads (lbs/d)		Total Roads (lbs/d)		Mitigated (lbs/d)	
		(paved)	(unpaved)	PM_{10}	$PM_{2.5}$	PM_{10}	$PM_{2.5}$	PM_{10}	$PM_{2.5}$	PM_{10}	$PM_{2.5}$
Phase 1 - Site Preparation, Fencing, and Ingress/Egress	Employee	364	364	0.021	0.002	31.273	3.377	31.294	3.379	13.456	1.453
	Vendor	120	0	0.007	0.001	0.000	0.000	0.007	0.001	0.003	0.000
	TOTAL	**484**	**364**	**0.03**	**0.00**	**31.27**	**3.38**	**31.30**	**3.38**	**13.46**	**1.45**
Phase 2 - Civil Improvements - Grading/Roads/Earthwork	Employee	582	582	0.033	0.004	50.036	5.403	50.070	5.406	21.530	2.325
	Vendor	54	0	0.003	0.000	0.000	0.000	0.003	0.000	0.001	0.000
	TOTAL	**636**	**582**	**0.04**	**0.00**	**50.04**	**5.40**	**50.07**	**5.41**	**21.53**	**2.32**
Phase 3 - PV Panel Construction	Employee	1,745	1,745	0.100	0.011	150.109	16.208	150.209	16.219	64.590	6.974
	Vendor	105	0	0.006	0.001	0.000	0.000	0.006	0.001	0.003	0.000
	TOTAL	**1,850**	**1,745**	**0.11**	**0.01**	**150.11**	**16.21**	**150.21**	**16.22**	**64.59**	**6.97**
Phase 4 - Testing and Commissioning	Employee	145	145	0.008	0.001	12.509	1.351	12.517	1.352	5.382	0.581
	Vendor	28	0	0.002	0.000	0.000	0.000	0.002	0.000	0.001	0.000
	TOTAL	**173**	**145**	**0.01**	**0.00**	**12.51**	**1.35**	**12.52**	**1.35**	**5.38**	**0.58**
GRAND TOTAL		***3,143***	***2,836***	***0.2***	***0.0***	***243.9***	***26.3***	***244.1***	***26.4***	***105.0***	***11.3***

Notes: Mitigation of 57% for traffic speed restriction

Per ICAPCD, vehicular travel in Imperial County is 50% on unpaved roads.

Grading Fugitive Dust

Fugitive dust emissions from grading equipment passes are estimated using the methodology described in Section 11.9, Western Surface Coal Mining, of the EPA AP-42.

AP-42 estimates the emission factor of PM_{10} applying a scaling factor to that of PM_{15}. Similarly, the emission factor of $PM_{2.5}$ is scaled from that of total suspended particulates (TSP). The equations used to calculate the emission factors for PM_{15} and TSP and the scaling factor for those of PM_{10} and $PM_{2.5}$ are presented below:

Emission Factors (lbs/day)

EF PM_{15} =	$0.051 \times S^{2.0}$ =	2.571
EF PM_{TSP} =	$0.04 \times S^{2.5}$ =	5.373

S **=** *mean vehicle speed (mph). The AP-42 default value is* *7.1*

EF PM_{10} =	$EF_{PM15} \times F_{PM10}$ =	1.5
EF $PM_{2.5}$ =	$EF_{PMTSP} \times F_{PM2.5}$ =	0.167

F_{PM10} = *PM_{10} scaling factor. The AP-42 default value is* *0.6*

$F_{PM2.5}$ = *$PM_{2.5}$ scaling factor. The AP-42 default value is* *0.031*

Emissions

The grading dust emissions are calculated by multiplying the emission factors with the total vehicle miles traveled (VMT) for the grading equipment (i.e., grader). The VMT for grader (VMT_G) are estimated based on the dimensions of the grading area and the blade width of the grading equipment.

Emissions (lb) = **EF × VMT_G** *# of Days = 38*

Pollutant	Emissions	
	total lbs	lbs/d
PM_{10}	62.25	1.637
$PM_{2.5}$	6.72	0.177

where VMT = $A_S \div W_b \times$ ft^2 per acre ÷ ft per mile = 40.4

A_S = *grading will occur only on approximately 10% of gross acreage for roads* *59*

W_b = *Blade width of the grading equipment. (default based on Caterpillar's 140 Motor Grader.* *12*

EMFAC2014 (v1.0.7) Emission Rates

Calendar Year 2018

EMFAC2011 Vehicle Categories

Imperial COUNTY

Vehicle Info			Emission Factor (grams/mile)											
Type	Fuel	VMT	ROG	CO	NO_X	PM_{10}			$PM_{2.5}$			CO_2	CH_4	N_2O
						Exhaust	TW+BW	Total	Exhaust	TW+BW	Total			
LDA	GAS	2,929,674	0.0878	2.6963	0.2733	0.0014	0.0448	0.0462	0.0013	0.0178	0.0191	320.8	0.0278	0.0294
LDA	DSL	26,370	0.0231	0.2121	0.1369	0.0156	0.0448	0.0603	0.0149	0.0178	0.0327	257.8	0.6037	0.5554
LDT1	GAS	216,975	0.1122	4.5084	0.3571	0.0033	0.0448	0.0481	0.0030	0.0178	0.0208	376.2	0.0315	0.0433
LDT1	DSL	285	0.1618	1.0545	1.1484	0.1273	0.0448	0.1721	0.1218	0.0178	0.1395	359.9	0.6037	0.5554
LDT2	GAS	991,299	0.0390	1.8655	0.1783	0.0016	0.0448	0.0463	0.0014	0.0178	0.0192	432.2	0.0315	0.0433
LDT2	DSL	1,512	0.0126	0.1077	0.0727	0.0060	0.0448	0.0507	0.0057	0.0178	0.0235	332.3	0.6037	0.5554
Weighted Average for Employees LDV			***0.077***	***2.576***	***0.254***	***0.002***	***0.045***	***0.046***	***0.002***	***0.018***	***0.019***	***349.8***	***0.0289***	***0.0334***
LHD1	GAS	57,787	0.0930	2.5119	0.4813	0.0015	0.0844	0.0859	0.0013	0.0348	0.0361	754.2	0.0315	0.0433
LHD1	DSL	76,401	0.1279	0.9233	4.5365	0.0295	0.0844	0.1140	0.0282	0.0348	0.0630	504.2	0.6037	0.5554
Weighted Average for LHD1			***0.113***	***1.607***	***2.790***	***0.017***	***0.084***	***0.102***	***0.017***	***0.035***	***0.051***	***611.9***	***0.3573***	***0.3349***
MDV	GAS	857,127	0.0823	3.2951	0.3584	0.0016	0.0448	0.0464	0.0015	0.0178	0.0192	587.8	0.0315	0.0433
T6 instate construction small	DSL	20,975	0.1282	0.4870	2.5832	0.1246	0.1423	0.2669	0.1192	0.0589	0.1780	1,066.6	0.6037	0.5554
T7 tractor construction	DSL	11,121	0.1050	0.4205	5.2026	0.0497	0.0977	0.1474	0.0475	0.0355	0.0830	1,532.5	0.6037	0.5554

Notes: - Criteria and CO_2 factors come from 2014 EMFAC2014 (v1.0.7) and represent Estimated 2018 Annual Emission Rates for Imperial County

2018 Offroad Emission Factors - Unmitigated

Equipment Type	BHP	Load Factor	Emission Factor (g/bhp-hr)						
			ROG	CO	NO_X	PM_{10}	$PM_{2.5}$	CO_2	CH_4
Air Compressors	78	0.48	0.603	3.744	4.050	0.304	0.304	568.3	0.054
Crawler Tractors	212	0.43	0.555	3.421	5.859	0.325	0.299	494.9	0.154
Generator Sets	84	0.74	0.461	6.418	3.752	0.239	0.239	568.3	0.041
Graders	187	0.41	0.384	1.416	5.271	0.171	0.156	497.4	0.155
Off-highway truck	402	0.38	0.287	1.560	3.090	0.113	0.104	493.5	0.154
Other Construction Equipment	172	0.42	0.436	3.263	4.755	0.250	0.230	493.4	0.154
Plate Compactor	8	0.43	0.661	3.469	4.142	0.161	0.161	568.3	0.059
Rollers	80	0.38	0.481	3.610	1.650	0.320	0.294	492.2	0.153
Rough Terrain Forklifts	100	0.40	0.222	3.270	2.945	0.136	0.125	491.2	0.153
Rubber Tired Loaders	203	0.36	0.333	1.346	4.131	0.140	0.129	487.9	0.152
Scrapers	367	0.48	0.369	2.828	4.568	0.180	0.166	490.8	0.153
Trenchers	78	0.50	0.658	3.855	5.915	0.450	0.414	493.7	0.154
Vibratory post driver *	158	0.38	0.273	3.093	2.924	0.142	0.13	490.7	0.153

* *A vibratory post driver is mounted on an excavator, so excavator emission factors are used*

Emissions Associated with Power Generation Using Natural Gas as Fuel

Constants

PC =	140	MW	*project capacity*
OP =	8,760	hrs/yr	*annual operating hours*
CF =	26%		*Capacity Factor for NG*

Project Energy Generated (EG)

$$EG = PC \times OP \times CF$$

EG =	318,864	MWh/yr	*Project Energy Generated*

Natural Gas Equivalent (NG_{eq})

HR =	6,940	Btu/kWh	*Combined Cycle Heat Rate for NG*

$$NG_{eq} = HR \times EG \times 1000\ (kWh/MWh)$$

NG_{eq} =	2.21E+12	Btu/yr	*or*
	2,212,916	MMBtu/yr	

Emission Factors (EF)

CO_2 =	53.02	kg/MMBtu	*Climate Registry Default Factors*
CH_4 =	0.0009		
N_2O =	0.0028		
CO_2e =	53.91		

GHG Emissions

$$Emissions = EF \times NG_{eq} \times 0.100\ (t/kg)$$

117,329	tCO_2/yr
1.992	tCH_4/yr
6.196	tN_2O/yr
119,291	***tCO_2e/yr***