APPENDIX D-1
AIR QUALITY TECHNICAL REPORT

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Administrative Draft

Air Quality Technical Report

Daggett Solar Power Facility

San Bernardino County, California

March 1, 2019

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Acronyms and Abbreviations

AB	Assembly Bill
AC	alternating current
Applicant	NRG Energy, Inc.
AQMD	Air Quality Management District
asml	above mean sea level
CAA	Federal Clean Air Act
CAAQS	California Ambient Air Quality Standards
CAPCOA	California Air Pollution Control Officers Association
CARB	California Air Resources Board
CEQA	California Environmental Quality Act
CO	carbon monoxide
CO_{2e}	carbon dioxide equivalent
DC	direct current
EO	Executive Order
DPM	Diesel Particulate Matter
EPA	Environmental Protection Agency
GHG	greenhouse gas
HRA	Health Risk Assessment
µg/m3	micrograms per cubic meter
MDAB	Mojave Desert Air Basin
MDAQMD	Mojave Desert Air Quality Management District
MW	Megawatt
NAAQS	National Ambient Air Quality Standards
NO_x/NO_2	Nitrogen oxides/nitrogen dioxide
O_3	Ozone
Pb	Lead
NED	National Elevation Dataset
OEHHA	Office of Environmental Health Hazard Assessment
$PM_{2.5}$	fine particulate matter
PM_{10}	respirable particulate matter
ppm	parts per million
PSD	Prevention of Significant Deterioration
PV	Photovoltaic
REL	Reference Exposure Level
ROG	reactive organic gases
RPS	Renewable Portfolio Standard
SB	Senate Bill
SIP	state implementation plan
SO_x/SO_2	sulfur oxides/sulfur dioxide

TACs	toxic air contaminants
USEPA	U.S. Environmental Protection Agency
VOCs	volatile organic compounds

1 Introduction

This document presents an air quality and greenhouse gas assessment for the proposed Daggett Solar Power Facility (project), conducted by HDR Engineering, Inc. on behalf of the project proponent, Daggett Solar Power 1 LLC, a subsidiary of NRG Renew LLC (Applicant). The Applicant seeks to construct and operate a utility-scale photovoltaic (PV) solar installation on the subject property, in San Bernardino County, California east of the City of Daggett (**Error! Reference source not found.**, Project Location). This assessment is necessary to comply with the California Environmental Quality Act (CEQA).

1.1 Purpose of the Report

The purpose of this report is to provide information to the Applicant to aide in evaluation of the potential air quality impacts associated with construction and operation of the project.

1.2 Project Description

1.2.1 Project Overview and Location

The project site is flat and is generally bounded by the town of Daggett approximately 0.5 miles to the west; the Mojave River, Yermo, and Interstate 15 to the north; Barstow Daggett Airport, Route 66, and Interstate 40 to the south; and Newberry Springs and Mojave Valley to the east in San Bernardino County (Figure 1, Project Location).

The project area is in proximity to existing high voltage electrical infrastructure, existing energy generation facilities, and other industrial uses. These include the existing non-operating Coolwater Generating Station, a 626 MW natural gas–fired power plant, the 44 MW photovoltaic Sunray Solar Project, several high voltage substations and transmission lines owned by Southern California Edison (SCE), the Los Angeles Department of Water and Power (LADWP) high-voltage transmission corridor of approximately 1,000 feet in width, major highway and railroad infrastructure, and Barstow Daggett Airport.

The proposed project would construct and operate a utility scale, solar photovoltaic (PV) electricity generation and energy storage facility that would produce up to 650 megawatt (MW) of power and include up to 450 MW of battery storage capacity on approximately 3,500 acres of land (Figure 2, Project Site). The project would use existing electrical transmission infrastructure adjacent to the Coolwater Generating Station, a recently retired natural gas-fired power plant, to deliver renewable energy to the electric grid.

The applicant selected the project site based on its proximity to existing electrical transmission infrastructure in order to repurpose former fossil fuel–based electricity generation capacity with renewable energy. The project is being designed in accordance with San Bernardino County's Solar Ordinance (an ordinance amending Development Code Chapter 84.29, Renewable Energy Generation Facilities) and the General Plan Renewable Energy and Conservation Element (RECE), which strives to preserve the character of the project area and surrounding communities.

Figure 1. Project Location

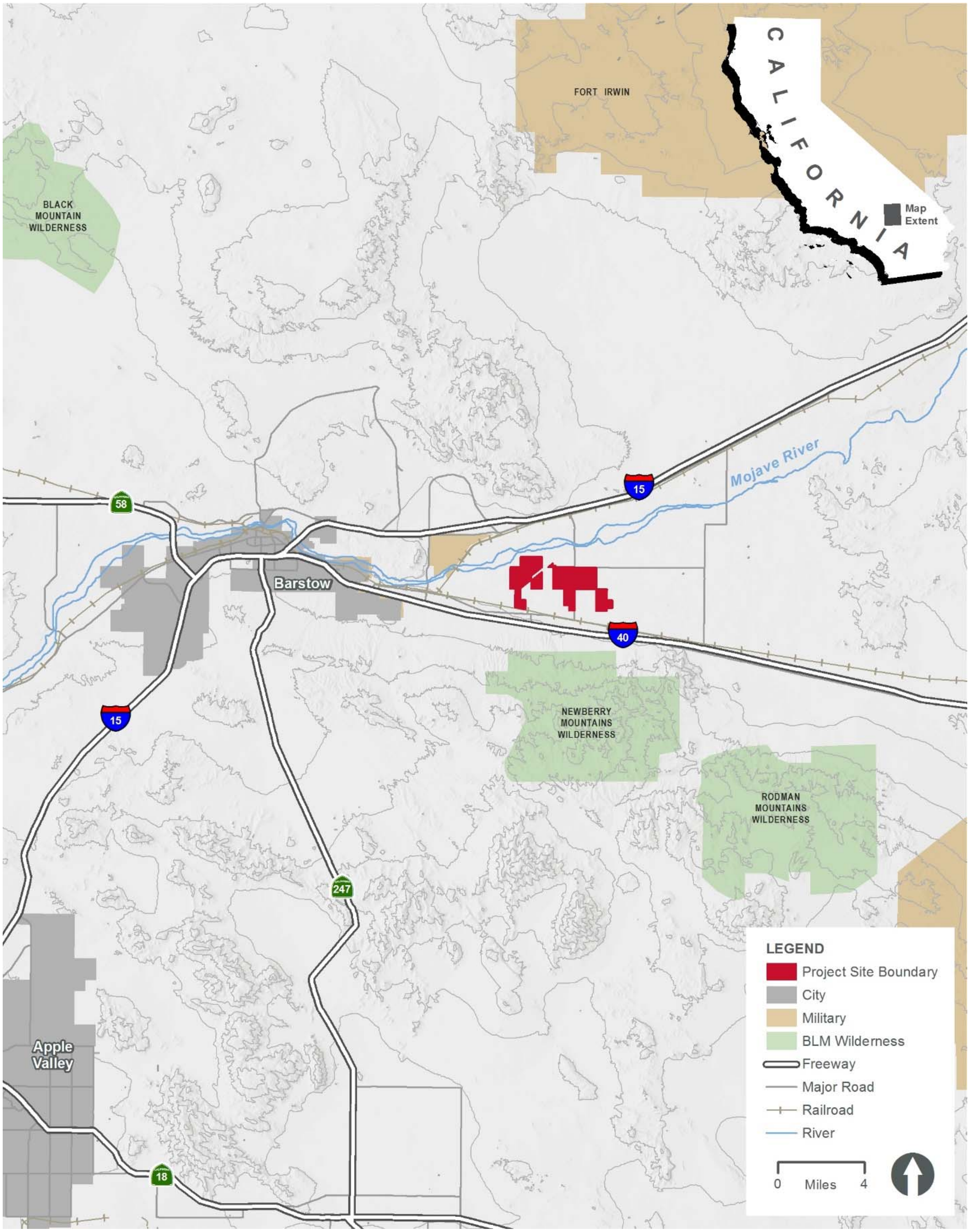
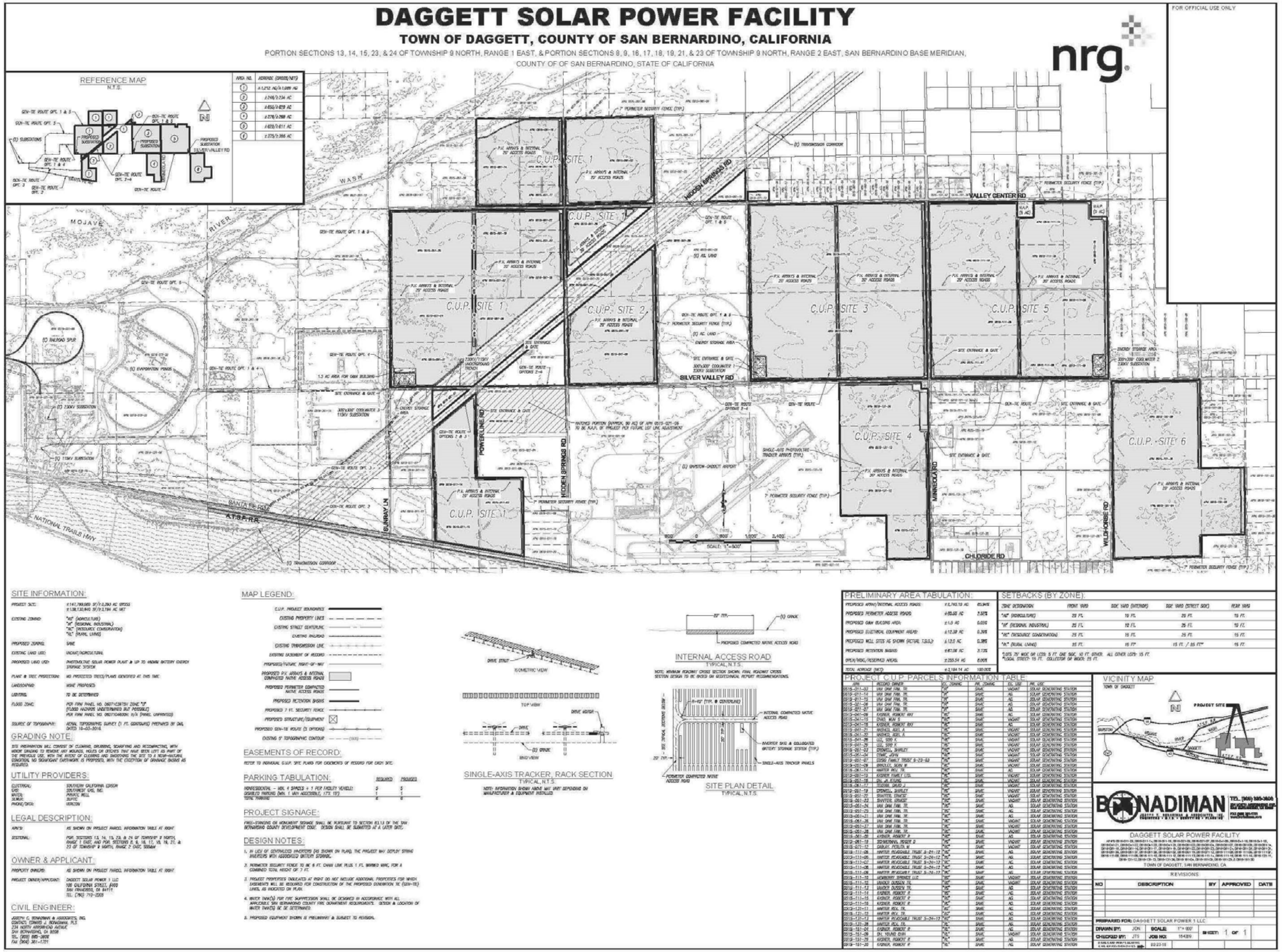


Figure 2. Project Site



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County zoning for the project site allows for development of renewable energy generation facilities with a Conditional Use Permit (CUP) in each of the zoning districts currently applicable to the project site. However, the County is considering amendments to the RECE, which, if adopted, could require rezoning a portion of the project site. If the County adopts changes to the zoning or General Plan that prohibit development of renewable energy generation facilities in the Rural Living zone and does not grandfather proposals on RL land for which the County has accepted a complete application, the project may seek to rezone the lands currently zoned Rural Living (RL) to Resource Conservation (RC).

The project is anticipated to be constructed in three phases and is seeking six separate CUPs to facilitate project phasing and financing. The phases would share certain facilities, such as the on-site project substations and generation tie (gen tie) line. Development would occur on privately owned land.

1.2.2 Project Objectives

California Environmental Quality Act (CEQA) Guidelines Section 15124(b) requires the project description to contain a statement of objectives that includes the underlying purpose of the proposed project. The project objectives are identified below.

1. Assist the State of California in achieving or exceeding its Renewables Portfolio Standard (RPS) and greenhouse gas (GHG) emissions reduction objectives by developing and constructing new California RPS-qualified solar power generation facilities producing approximately 650 MWs.
2. Produce and transmit electricity at a competitive cost.
3. Provide a new source of energy storage that assists the state in achieving or exceeding its energy storage mandates.
4. Use the existing interconnection at the Coolwater Substation that provides approximately 650 MW of capacity.
5. Utilize existing energy infrastructure to the extent possible by locating solar power generation facilities in close proximity to existing infrastructure, such as electrical transmission facilities.
6. Site solar power generation facilities in areas of San Bernardino County by 2020 that have the best solar resource to maximize energy production and the efficient use of land.
7. Develop a solar power generation facility in San Bernardino County, which would support the economy by investing in the local community, creating local construction jobs, and increasing tax and fee revenue to the County.

1.2.3 Regional Setting

In addition to the existing Coolwater Generating Station, the surrounding area includes transportation infrastructure, agricultural lands, undeveloped land, the Sunray Solar Project (built in 2016), and Barstow Daggett Airport, a County owned general aviation airport, located directly south of the project site. Route 66, the National Trails Highway, is to the south of the project site and Interstate 15 is to the north. Route 66 is located between Interstate 40 and the project site. The BNSF (Burlington Northern Santa Fe) railroad tracks are to the south of the project site, and the Union Pacific tracks are to the north. An approximately 1,000-foot-wide LADWP high voltage transmission corridor traverses the project site. In addition, many existing 60-foot high voltage transmission structures and electrical substations are located in the project area. Private lands near the central and eastern portions of the project site consist of agricultural lands that produce primarily alfalfa and pistachios, sparsely spaced rural residential dwellings, previously disturbed and now fallow farmland, and some undeveloped desert land.

1.2.4 Facilities and Design

The proposed project would consist of PV solar panels mounted on a single-axis tracking system that follows the sun throughout the day. The tracking system would be supported by steel piles, with the panels arranged into long narrow rows, grouped into regions, referred to as solar arrays or blocks. The proposed design also includes inverters and transformers mounted on small concrete pads or steel foundations, distributed across the site. Inverter equipment pads may be accompanied with distributed Battery Energy Storage System (BESS) equipment. Electricity produced by the solar arrays would be collected and routed to an on-site substation where voltage would be increased to the interconnection voltage.

Each phase would have its own on-site substation, which may also include a Battery Energy Storage System. From the on-site substations, each phase would include a segment of the overhead gen-tie line, which would connect the project to the existing SCE-owned 115-kilovolt (kV) and 230 kV Coolwater substations, which are adjacent to the retired Coolwater Generating Station. The project would also include security fencing for all phases, a Supervisory Control and Data Acquisition system (SCADA), telecommunications equipment and an operations and maintenance (O&M) building to be constructed with the first phase.

Solar Array

Solar panels would be mounted on a tracking system that would be supported, when practical, by driven piers (piles) directly embedded into the ground. Panels would be organized in rows in a uniform grid pattern, with each row separated by approximately 10-20 feet (from post to post). A fixed-tilt racking system, which does not track the sun, may also be used if deemed suitable. Panels are proposed to be a maximum of 20 feet in height.

The specific equipment chosen for the proposed project would be determined prior to final design and construction. However, at this time, the solar panels are expected to be either crystalline silicon or thin-film cadmium telluride.

Inverters and Switchgear

Individual PV panels would be electrically connected in series to create a “string” to carry direct current (DC) electricity. Strings of DC electricity would be routed to inverters, which would take the DC output and convert it to alternating current (AC) electricity.

The system may use either centralized or string inverters. Centralized inverters and transformers would be supported on small concrete or steel equipment pads, on a foundation of either a concrete footing approximately 10 feet by 50 feet in size or foundational piers. The inverters and transformers would be approximately 10 feet in height. Small string inverters would be mounted throughout the solar array and attached to each of the tracker rows. The power from inverters in each phase would be collected and transported to a new project substation. Power from each of the new project substations would be transported via a new gen-tie line to the two existing SCE-owned Coolwater substations, where power would then flow into the utility-owned electric system.

The Battery Energy Storage System (BESS) would be either AC or DC coupled, meaning the battery would be electrically connected either between the DC panels and the inverter input (in the case of a DC coupled system) or further downstream, after the output of the inverters (in the case of an AC coupled system). In a DC-coupled configuration, the BESS would be distributed through the solar array, collocated adjacent to the inverter equipment pads. In an AC-coupled configuration, the BESS would most likely be consolidated, located adjacent to the project substations.

Project Substations

One new substation would be constructed as a part of each of the three project phases for a total of three project substations. The substations (which contain high-voltage equipment) would be unenclosed, occupy an area of approximately 300 feet by 300 feet each, and be protected with security fences. The electrical equipment inside the substation fence would be approximately 70 feet tall at its highest points. A small one-story, rectangular control building, housing the communication and supervisory control and data acquisition (SCADA) equipment would also be located in the substation footprint. From the new project substations, a gen-tie line would be constructed to connect the solar facility to its point of interconnection, which are the two existing substations (115 kV and 230 kV) owned and operated by SCE and adjacent to the retired Coolwater Generating Station. The work SCE will perform to connect the gen-tie line to these substations will occur primarily inside the existing substations; therefore, no expansion of the existing substations' footprints is anticipated.

SCE would conduct a limited scope of work within and surrounding the existing Coolwater substations to facilitate connection of the solar project to the SCE system, including extending the gen-tie from the last pole structure into the substation and installing underground telecom facilities both inside and outside the existing substation fence line.

Battery Storage

The project is anticipated to include up to 450 MW of battery storage to be constructed in three phases corresponding to the phased construction of the solar arrays. The battery storage system is expected to be either located adjacent to each of the substations or distributed throughout the solar array at the inverter equipment pads or tracker rows. Up to 16 acres may be utilized for the battery energy storage system throughout the project site at full build out. The key components of the battery storage system are described below.

- Batteries. Individual lithium ion cells form the core of the battery storage system. Cells are assembled either in series or parallel connection, in sealed battery modules. The battery modules would be installed in self-supporting racks electrically connected either in series or parallel to each other. The operating racklevel DC voltage currently ranges between 700 and 1,500 volts. The individual battery racks are connected in series or a parallel configuration to deliver the battery storage system energy and power rating.

- Battery Storage System Enclosure and Controller. The battery storage system enclosure would house the batteries described above, as well as the battery storage system controller. The battery storage system controller is a multilevel control system designed to provide a hierarchical system of controls for the battery modules, power conversion system (PCS), medium voltage system, and up to the point of connection with the electrical grid. The controllers ensure that the battery storage system effectively mimics conventional turbine generators when responding to grid emergency conditions. The battery storage system enclosure would also house required heating, ventilation, and air conditioning (HVAC) and fire protection systems.
- DC/DC Converter. In a DC-coupled system, the DC/DC converter allows the connection of the battery storage system to the DC side of the photovoltaic inverter. The DC/DC converter manages the battery and PV bus voltage and provides appropriate protections for the PV inverter.
- Power Conversion System (PCS) - Inverter. The PCS consists of an inverter, protection equipment, circuit breakers, air filter equipment, equipment terminals, and cabling. Electricity is transferred from the PV array (or power grid) to the project batteries during a battery charging cycle and from the project batteries to the power grid during a battery discharge cycle. The inverter is bi-directional, with the ability to convert power from AC to DC when the energy is transferred from the grid to the battery and from DC to AC when the energy is transferred from the battery to the grid. The inverter DC operating voltage would be between 700 and 1,500 volts, with a typical power rating of approximately 3,000 kW. The inverter AC operating voltage may be approximately 630 volts AC nominal. Voltage is increased to medium voltage levels (typically approximately 13–34.5 kV) when combined with an MV transformer. Voltage and power ratings are specific to the equipment manufacturer and product model. The installed equipment would be selected at a later date and therefore is subject to change.
- Medium Voltage (MV) Transformer. A separate medium voltage transformer may be present if not integrated into the inverter skid. This would be a pad-mounted transformer used to increase voltage on the AC side of the inverter from low to medium voltage. MV transformers are used to increase the efficiency of power transmission, associated with reduced resistive power losses higher voltage.

If batteries were located adjacent to the substations, they would be contained within either steel enclosures similar to a shipping container or a freestanding building, approximately 10 feet in height. The color of the metal enclosure has not yet been determined; it typically varies by manufacturer. If distributed throughout the solar array, the battery system would likely be contained within metal housings and electrically connected to the inverters at each of the equipment pads.

The battery storage system would likely use one of several available lithium ion technologies, though alternatives may be considered (such as flow batteries) given continuing rapid technological change in the battery industry. In general, a lithium ion battery is a rechargeable battery consisting of three major functional components: a positive electrode made from metal oxide, a negative electrode made from carbon, and an electrolyte made from lithium salt. Lithium ions move from negative to positive electrodes during discharging and in the opposite direction when charging. Five major lithium ion battery sub-chemistries are commercially available:

- Lithium nickel cobalt aluminum (NCA)
- Lithium nickel manganese cobalt (NMC)
- Lithium manganese oxide (LMO)
- Lithium titanate oxide (LTO)
- Lithium iron phosphate (LFP)

Selection of the lithium ion sub-chemistry for the project would take into consideration various technical factors, including safety, life span, energy performance, and cost.

The proposed battery storage system would be designed, constructed, operated, and maintained in accordance with applicable industry best practices and regulatory requirements, including fire safety standards. Current best practices for fire safety use chemical agent suppressant–based systems to detect and suppress fires. If smoke or heat were detected, or if the system were manually triggered, an alarm would sound, strobes would flash, and the system would release suppressant, typically FM 200, NOVEC 1230, or similar, from pressurized storage cylinders. However, final fire safety design would follow applicable standards and would be specific to the chosen battery technology.

Gen-Tie Line

The project is expected to be constructed in three phases. Each phase would include a new substation and segment of aboveground gen-tie transmission line. From each substation, a segment of gen-tie line would be constructed to connect the solar facility's output to the electrical grid at the existing SCE-owned 115-kV and 230-kV substations adjacent to the Coolwater Generating Station. The gen-tie poles are expected to be gray metal structures up to 120 feet in height and would be capable of accommodating both 115-kV and 230 kV electrical circuits. Each phase and its associated CUP(s) would share the substations and gen-tie facilities. The first segment of gen-tie line would be constructed with Phase 1. The second segment would be constructed with Phase 2, connecting it to Phase 1. The third segment of gen-tie line would be constructed with Phase 3, connecting it to Phase 2 such that at full build out, the gen-tie line would be one transmission line serving all phases of the project.

Three primary routes are being considered for the project gen-tie lines, as shown in Exhibit 2.0-2, Project Site. These routes traverse the project site from east to west and would be primarily along Silver Valley Road. The route options deviate on Powerline Road, with one option turning east at approximately the location of Santa Fe Street and the second option turning east using an existing roadway alignment to SCE's Coolwater substations. The gen-tie line poles would be up to 120 feet in height to accommodate engineering requirements and safety clearances required to cross over the existing 60-foot high-voltage transmission lines in the area, however portions of the alternatives may consist of poles shorter than 120 feet and/or may be placed underground where necessary, particularly in the areas of the Barstow-Daggett Airport and the LADWP right-of-way. The gen-tie line would be capable of accommodating both 115-kV and 230-kV electrical circuits. The gen-tie line would be built out in sequences to match the phases of the solar project. The gen-tie right-of-way may also include above- and below-ground communications lines and a dirt road for accessing gen-tie structures where existing access is not available.

Access Roads

On-site access routes, with a minimum width of 20 feet, may be constructed along the project's fence line. All interior access roads would also be a minimum of 20 feet wide. All roads within the site would consist of compacted native soil per San Bernardino County Fire Department requirements. All roads would be stabilized with soil stabilization material, if necessary. Off-site access to the six CUP sites will be via existing or proposed right-of-way dedications of varying widths (as required by the County). Improvements to off-site access roads, including potential paving and widening, will be completed as required per County standards and in consultation with the County.

Perimeter Fencing

Fencing is proposed along the perimeter of the project site or set back a minimum of 15 feet from the existing/proposed right-of-way, as required by the County Development Code. Fencing will be at least 7-feet-tall, in compliance with National Electrical Code (NEC). Chain-link fencing is likely to be used, potentially topped with 1 foot of barbed wire. In consultation with the County, slats or mesh may be added to the chain-link fence, as appropriate and in areas where needed, to manage windblown sand. Access gates would be installed at each site entry point. Substation sites and/or battery storage sites may be separately fenced.

Lighting and Signage

Manual, timed, and motion sensor lights may be installed at access gates, equipment pads and substations for maintenance and security purposes. Lighting would be shielded and aimed downward to the ground. In addition, remote-controlled cameras and other security measures would be installed. No other lighting is planned. Signage is proposed in compliance with all County's regulations.

Stormwater Facilities

Site drainage is designed to follow natural drainage patterns. None of the on-site facilities, including fences and panel posts, are expected to prevent stormwater flow. Therefore, the applicant anticipates that the project would have limited impact to on-site drainage. Long shallow strip retention basins are proposed to capture the anticipated 100-year, 24-hour increase in runoff volume resulting from clearing of vegetation, compacting of soil, and any limited impervious (paved or structural) improvements.

Other Infrastructure

An Operations and Maintenance building would be constructed on approximately 1.5 acres within the project footprint during the first phase of the project. The building would serve to store spare parts and vehicles and to accommodate full- and part-time staff associated with the project. Water would come from on-site wells.

Telecommunications equipment, such as a fiber optic line, a SCADA system, and auxiliary power, would be installed throughout the project site at each inverter equipment pad, substation, and security system. Telecommunications equipment would be brought to the project from existing telecommunications infrastructure in the project vicinity and may be co-located on aboveground structures such as transmission lines. Trenching could be required to install some of this telecommunications equipment. Fire protection would also be included per applicable requirements.

1.2.5 Construction

Site Preparation and Grading

Site preparation would consist of clearing, grubbing, scarifying, recompacting, and grading to level the site and remove any mounds or holes that remain from the previous land use. Though grading is expected to occur throughout the site, the site's cut and fill would balance and no importing or exporting of materials would be necessary.

The following is a general estimate of the project's required grading by phase: Phase 1: 1,753,143 cubic yards; Phase 2: 1,888,000 cubic yards; Phase 3: 1,726,171 cubic yards; and gen tie: 532,686 cubic yards. After grading, temporary fences would be placed around the project site, which would allow materials and equipment to be securely stored on the site.

Per Mojave Desert Air Quality Management District (MDAQMD) requirements, the project applicant will develop a dust control plan that describes all applicable dust control measures to address construction-related dust. Components of the plan are likely to include water trucks to spread water as well as road stabilization with chemicals, gravel, or asphaltic pavement to mitigate visible fugitive dust from vehicular travel and wind erosion

Construction Access Routes and Laydown Area

Construction vehicles would access the project site from Interstates 40 and 15. During construction, materials would be placed within the project boundaries adjacent to the then-current phase of construction. To prevent theft and vandalism, materials would be secured within fenced areas at all times. Storage containers might be used to house tools and other construction equipment. In addition, security guards would regularly monitor the site.

Construction Activities and Equipment

Construction of the project would be accomplished in three phases. While construction of each phase could occur separately, this EIR conservatively assumes that construction of two phases would overlap. The applicant anticipates that construction would occur over a 27-month period for Phases 1 and 2 (together a 400 MW facility) and a 19 month period for Phase 3 (250 MW facility).

An average of 300 workers would be on-site during each phase of construction, depending on the activities. The peak number of workers on the project site at any one time is anticipated to be 500. The workforce would consist of laborers, craftspeople, supervisory personnel, and support personnel.

On average, it is anticipated that each worker would generate one round trip to the project site per workday. Most workers would commute to the site from nearby communities such as Barstow, with some traveling from more distant areas such as Victorville, Hesperia and San Bernardino. Construction would generally occur during daylight hours, though exceptions may arise due to the need for nighttime work. Workers would reach the site using existing roads.

Portable toilet facilities would be installed for use by construction workers. Waste disposal would occur in a permitted off-site facility. Domestic water for use by employees would be provided by the construction contractor through deliveries to the site or from on-site wells.

Project construction for each phase is expected to consist of two major stages. The first stage would include site preparation, grading, and preparation of staging areas and on-site access routes. The second stage would involve installation of the racking system, foundations, solar panels, equipment pads, electrical components, transmission lines and all other balance of systems equipment.

Placement of solar panels would require driving piles approximately 6 to 10 feet into the ground. In areas where geotechnical analysis has determined that piles might not be feasible or cost effective, conventional foundations (such as isolated spread foundations, continuous footings or ballasted racking) may be used, but this is not anticipated. Alternatively, piles may need to be driven deeper based on further geotechnical analysis.

1.2.6 Operations

The project would generate solar electricity from the PV system during daylight hours and may discharge power from batteries at various times. The site would include an O&M building and would be staffed with full- and part-time employees such as a plant manager, maintenance manager, solar technicians, and environmental specialists. In addition, the operations would be monitored remotely via the SCADA system.

Operations and maintenance vehicles would include light-duty trucks (e.g., flatbed pickup) and other light equipment for maintenance and PV module washing. Heavy equipment would not be used during normal operation. Large or heavy equipment may be brought to the facility infrequently for equipment repair or replacement or for vegetation control.

Water would be required for panel washing activities and general maintenance. The frequency of panel washing would be determined based on soiling of the PV panels and expected benefit from cleaning. Should cleaning be necessary, water would be sprayed on the PV panels to remove dust. An estimated 25 acre-feet per year of water would be necessary for panel washing (for all phases of the project or full 650 MW build out). This water would be obtained from on-site wells.

Sanitary facilities for operations would be provided at the O&M building, located on approximately 1.5 acres within the project footprint.

Decommissioning

If operations at the site were permanently terminated, the facility would be decommissioned. Most components of the proposed system are recyclable or can be resold for scrap value. Panels typically consist primarily of silicon, glass, and an aluminum frame. Tracking systems typically consist of steel and concrete, in addition to motors and control systems. All of these materials can be recycled.

Numerous recyclers, for the various materials to be used on the project site, operate in San Bernardino and Riverside counties. Metal, scrap equipment, and parts that do not have free-flowing oil can be sent for salvage. Equipment containing any free-flowing oil would be managed as waste and would require evaluation. Oil and lubricants removed from equipment would be managed as used oil, which is a hazardous waste in California. Decommissioning would comply with federal, state and local standards and all regulations that exist when the project is decommissioned, including the requirements of San Bernardino County Development Code Section 84.29.060.

2 Existing Conditions

2.1 Climate and Meteorology

The project is located in the Mojave Desert Air Basin (MDAB), which is composed of a 21,000-square-mile area encompassing the majority of San Bernardino County, the eastern portion of Kern County, the eastern portion of Riverside County, and the northeastern portion of Los Angeles County. The analysis of existing conditions related to air quality summarizes pollutant levels that exist prior to implementation of each component of the project. All components of the project are located within the MDAB; therefore, all air quality data and analysis are presented as an aggregate of the entire project area.

The MDAB is composed of four California air districts: the Mojave Desert Air Quality Management District (discussed below), the Antelope Valley Air Quality Management District, the Eastern Kern Air Pollution Control District, and the eastern portion of the South Coast Air Quality Management District. The climate of the project area (that is, the MDAB) is characterized by hot, dry summers; mild winters; infrequent rainfalls; moderate- to high-wind episodes; and low humidity. The majority of the MDAB is relatively rural and sparsely populated. The MDAB contains many mountain ranges interspersed with long, broad valleys that often contain dry lakes. The Sierra Nevada Mountains provide a natural barrier to the north, preventing cold air masses from Canada and Alaska from moving down into the MDAB. Prevailing winds in the MDAB are out of the west and southwest, caused by air masses pushed onshore in Southern California by differential heating and channeled inland through mountain passes. During the summer months, the MDAB is influenced by the Eastern Pacific High-Pressure Area (a semi-permanent feature of the general hemispheric circulation pattern), which inhibits cloud formation and encourages daytime solar heating. The San Gabriel and San Bernardino mountain ranges block the majority of cool, moist costal air from the south; as such, the MDAB experiences infrequent rainfalls

Temperature and precipitation data within the project site and vicinity have been recorded at a National Weather Service Station in Daggett since December 1, 1943. A summary of annual minimum and maximum temperature data for Daggett is contained in Table 1. The area is characterized by very hot summer temperatures, with the mean maximum temperatures in July and August exceeding 100°F. Winter temperatures are more moderate, with mean maximum temperatures in the 60s, and lows in the 30s. Minimum temperatures below freezing (32°F) occur on an average of about 30 days per year.

Table 1. Annual Minimum and Maximum Air Temperature

Year	Maximum	Minimum
1945	111	20
1946	110	22
1947	112	16
1948	111	13
1949	112	14
1950	112	12
1951	110	18
1952	109	21
1953	110	18
1954	113	20
1955	112	19
1956	113	17
1957	110	21
1958	113	24
1959	113	22
1960	115	18
1961	115	21
1962	109	17
1963	109	8
1964	108	22
1965	107	21
1966	110	21
1967	111	21
1968	109	17
1969	112	25
1970	113	17
1971	112	17
1972	117	18
1973	113	22
1974	111	18
1975	115	20
1976	113	22
1977	113	30
1978	111	17
1979	114	22
1980	113	28
1981	112	30
1982	109	21
1983	109	26
1984	115	22
1985	114	22
1986	117	27
1987	111	19
1988	112	20
1989	116	19

Table 1. Annual Minimum and Maximum Air Temperature

Year	Maximum	Minimum
1990	111	7
1991	117	23
1992	112	22
1993	115	21
1994	118	21
1995	117	27
1996	114	28
1997	115	24
1998	117	21
1999	113	21
2000	114	27
2001	115	24
2002	113	21
2003	115	25
2004	112	24
2005	117	28
2006	114	21
2007	118	14
2008	113	25
2009	114	25
2010	112	23
2011	113	20
2012	114	23
2013	116	15
2014	112	24
2015	114	19
2016	114	18
2017	115	27

2.2 Existing Setting

The project area is located in the Mojave Desert, at an elevation of approximately 2,014 feet above mean sea level (amsl). The local climate is influenced by regional topography, as well as by large scale synoptic weather patterns.

Weather patterns in the area are generally influenced by moderately intense anticyclonic circulation (e.g., associated with high pressure systems). During the summer, a large subtropical high pressure system off the coast of California keeps the Mojave Desert area sunny and dry. However, the presence of a thermal low pressure area above the Mojave Desert promotes atmospheric transport from the Los Angeles Basin. During the winter months, the strength of the Pacific high pressure area wanes, and 20 to 30 frontal systems may pass through the area each year. Some of these frontal systems are sufficiently strong to produce rain in the area. The most significant large-scale phenomena affecting air quality in the project area are the transport winds from the south and the west. These winds are responsible for bringing ozone and other pollutants through the mountain passes from the Los Angeles Basin and the San Joaquin Valley.

2.3 Regulatory Setting

Responsibility for regulation of air quality in California is held by the California Air Resources Board (CARB), the multi-county Air Quality Management Districts, and single-county Air Pollution Control Districts, with oversight responsibility held by the U.S. Environmental Protection Agency (USEPA). The CARB is responsible for regulation of mobile source emissions, establishment of state ambient air quality standards, research and development, and oversight and coordination of the activities of the regional and local air quality agencies. The regional and local air quality agencies are primarily responsible for regulating stationary source emissions and for monitoring ambient pollutant concentrations. The CARB also classifies air basins, or portions thereof, as “unclassified”, “attainment,” or “non-attainment” with respect to the federal and state standards, based on air quality monitoring data. Specific air quality standards are described below.

2.3.1 Federal

Clean Air Act. The federal Clean Air Act (CAA), which was initially established by the U.S. Congress in 1970 and substantially revised in 1977 and 1990, is located at Title 42, Chapter 85 of the United States Code. An important aspect of the CAA is its requirement for the USEPA to establish National Ambient Air Quality Standards (NAAQS). There are NAAQS in place for seven “criteria” pollutants: carbon monoxide (CO), lead (Pb), nitrogen dioxide (NO_2), ozone (O_3), particle pollution—further defined as particles having diameters equal to or less than 10 micrometers (PM_{10}) and particles having diameters equal to or less than 2.5 micrometers ($PM_{2.5}$)—and sulfur dioxide (SO_2). Standards are classed as “primary” and “secondary.” Primary standards are designed to protect public health, including sensitive individuals, such as children and the elderly, whereas secondary standards are designed to protect public welfare, such as visibility and crop or material damage.

The CAA requires the USEPA to routinely review and update the NAAQS in accordance with the latest available scientific evidence. For example, the USEPA revoked the annual PM_{10} standard in 2006 due to a lack of evidence linking health problems to long-term exposure to PM_{10} emissions. The 1-hour standard for O_3 was revoked in 2005 in favor of a new 8-hour standard that is intended to better protect public health.

The NAAQS are shown in Table 2. For ease of comparison, the California Ambient Air Quality Standards (CAAQS) that have been established by the California Air Resources Board (CARB) are also shown. The CAAQS are discussed in more detail in the discussion of State of California and local regulations in the following subsection.

Table 2. Federal and California Ambient Air Quality Standards

Pollutant	Averaging Time	California Standards[a]	National Standards[b]	
		Concentration[c]	Primary[c,d]	Secondary[c,e]
Ozone (O_3)[f]	1 Hour	0.09 ppm (180 µg/m^3)	—	Same as Primary Standard
	8 Hour	0.070 ppm (137 µg/m^3)	0.070 ppm (137 µg/m^3)	
Respirable Particulate Matter (PM_{10})[g]	24 hour	50 µg/m^3	150 µg/m^3	Same as Primary Standard
	Annual Arithmetic Mean	20 µg/m^3	—	
Fine Particulate Matter ($PM_{2.5}$)[g]	24 Hour	—	35 µg/m^3	Same as Primary Standard
	Annual Arithmetic Mean	12 µg/m^3	12 µg/m^3	
Carbon Monoxide (CO)	1 Hour	20 ppm (23 mg/m^3)	35 ppm (40 mg/m^3)	—
	8 Hour	9.0 ppm (10 mg/m^3)	9 ppm (10 mg/m^3)	—
	8 Hour (Lake Tahoe)	6 ppm (7 mg/m^3)	—	—
Nitrogen Dioxide (NO_2)[h]	1 Hour	0.18 ppm (339 µg/m^3)	100 ppb (188 µg/m^3)	—
	Annual Arithmetic Mean	0.030 ppm (57 µg/m^3)	0.053 ppm (100 µg/m^3)	Same as Primary Standard
Sulfur Dioxide (SO_2)[i]	1 Hour	0.25 ppm (655 µg/m^3)	75 ppb (196 µg/m^3)	—
	3 Hour	—	—	0.5 ppm (1300 µg/m3)
	24 Hour	0.04 ppm (105 µg/m^3)	0.14 ppm (for certain areas)[i]	—
	Annual Arithmetic Mean	—	0.030 ppm (for certain areas)[i]	—
Lead [j, k]	30 Day Average	1.5 µg/m^3	—	—
	Calendar Quarter	—	1.5 µg/m^3 (for certain areas)[j]	Same as Primary Standard
	Rolling 3-month Average	—	0.15 µg/m^3	
Visibility Reducing Particles[l]	8 hour	See Footnote [l]	No National Standard	
Sulfates	24 Hour	25 ug/m^3	No National Standard	
Hydrogen Sulfide	1 Hour	0.03 ppm (42 ug/m^3)	No National Standard	
Vinyl Chloride[j]	24 Hour	0.01 ppm (26 ug/m^3)	No National Standard	

SOURCE: California Air Resources Board. Updated 7 June 20124 May 2016. Ambient Air Quality Standards. Available at: http://www.arb.ca.gov/research/aaqs/aaqs2.pdf

The 1990 amendments to the CAA divide the nation into five categories of planning regions based on the severity of the regions' pollution, and set new timetables for attaining the NAAQS. The categories range from marginal to extreme. Attainment deadlines are from 3 to 20 years, depending on the category. As shown in Table 3, the project site is located in MDAB, a federal non-attainment area for 8-hour O_3 and PM_{10} (the federal 1-hour standard was revoked in 2004) and a state non-attainment area for O_3, PM_{10}, and $PM_{2.5}$.

Table 3. Ambient Air Quality Standards Attainment Status of the Region

Ambient Air Quality Standard	Regional Designation/Classification
Federal Standards	
One-hour O_3[a]	Proposed attainment in 2014; historical classification Severe-17
Eight-hour O_3 (1997 84 ppb standard)	Subpart 2 Nonattainment; classified Severe-15
Eight-hour O_3 (2008 75 ppb-or-lower standard)	Non-attainment; classified "Severe-15"
Eight-hour O_3 (2015 70 ppb-or-lower standard)	Expected nonattainment; classification to be determined
PM10	Non-attainment; classified "Moderate"
PM2.5	Unclassified/attainment
CO	Attainment
NO_2	Unclassified/attainment
SO_2	Unclassified/attainment
Pb	Attainment
California State Standards	
O_3[b]	Non-attainment; classified "Moderate"
PM_{10}	Non-attainment
$PM_{2.5}$	Non-attainment
CO	Attainment
NO_2	Attainment
SO_2	Attainment
Pb	Attainment
Sulfates (State-no federal standard)	Attainment
Hydrogen Sulfide (State-no federal standard)	Unclassified
Visibility-Reducing Particles (State-no federal standard)	Unclassified
Vinyl Chloride	Unclassified

[a]: The 1-hour ozone NAAQS was revoked effective June 15, 2004. This is historical information only.

[b]: Distinction between the State 1-hour standard and 8-hour standard for O3 is not given.

Source: Mojave Desert Air Quality Management District. "California Environmental Quality Act (CEQA) and Federal Conformity Guidelines." August 2016. Available at Available at <http://www.mdaqmd.ca.gov/home/showdocument?id=192index.aspx?page=357>.

Section 182(e)(5) of the CAA allows the USEPA administrator to approve provisions of an attainment strategy in an extreme area that anticipates development of new control techniques or improvement of existing control technologies if the state has submitted enforceable commitments to develop and adopt contingency measures to be implemented if the anticipated technologies do not achieve planned reductions.

Nonattainment areas that are classified as “serious” or “worse” are required to revise their air quality management plans to include specific emission reduction strategies to meet interim milestones in implementing emission controls and improving air quality. The USEPA can withhold certain transportation funds from states that fail to comply with the planning requirements of the CAA. If a state fails to correct these planning deficiencies within two years of federal notification, the USEPA is required to develop a Federal Implementation Plan for the identified nonattainment area or areas.

2.3.2 State

California Clean Air Act

The California Clean Air Act of 1988 requires all air pollution control districts in the state to aim to achieve and maintain state ambient air quality standards for O_3, CO, and NO_2 by the earliest practicable date and to develop plans and regulations specifying how the districts will meet this goal. There are no planning requirements for the state PM_{10} standard. The CARB, which became part of the California EPA in 1991, is responsible for meeting state requirements of the federal Clean Air Act, administrating the California Clean Air Act, and establishing the California Ambient Air Quality Standards (CAAQS). The California Clean Air Act, amended in 1992, requires all air districts in the state to endeavor to achieve and maintain the CAAQS. The CAAQS are generally stricter than national standards for the same pollutants, but there is no penalty for nonattainment. California has also established state standards for sulfates, hydrogen sulfide, vinyl chloride, and visibility-reducing particles, for which there are no national standards.

In addition to setting out primary and secondary AAQS, the State of California has established a set of episode criteria for O_3, CO, NO_2, SO_2, and PM_{10}. These criteria refer to episode levels representing periods of short-term exposure to air pollutants that actually threaten public health. Health effects are progressively more severe as pollutant levels increase from Stage One to Stage Three. Table 4 lists the health effects of these criteria pollutants and their potential sources. Because the concentration standards were set at a level that protects public health with an adequate margin of safety (EPA), these health effects will not occur unless the standards are exceeded by a large margin or for a prolonged period of time. State AAQS are more stringent than federal AAQS. Among the pollutants, ozone (O_3) and particulate matter ($PM_{2.5}$ and PM_{10}) are considered regional pollutants, while the others have more localized effects.

Table 4. Summary of Health Effects of the Major Criteria Air Pollutants

Pollutant	Sources	Primary Effects
Ozone (O_3)	Atmospheric reaction of organic gases with nitrogen oxides in the presence of sunlight.	Aggravation of respiratory and cardiovascular diseases. Irritation of eyes. Impairment of cardiopulmonary function. Plant leaf injury.
Nitrogen Dioxide (NO_2)	Motor vehicle exhaust. High temperature stationary combustion. Atmospheric reactions.	Aggravation of respiratory illness. Reduced visibility. Reduced plant growth. Formation of acid rain.
Carbon Monoxide (CO)	By-products from incomplete combustion of fuels and other carbon containing substances, such as motor exhaust. Natural events, such as decomposition of organic matter.	Reduced tolerance for exercise. Impairment of mental function. Impairment of fetal development. Death at high levels of exposure. Aggravation of some heart diseases (angina).
Suspended Particulate Matter ($PM_{2.5}$ and PM_{10})	Stationary combustion of solid fuels. Construction activities. Industrial processes. Atmospheric chemical reactions.	Reduced lung function. Aggravation of the effects of gaseous pollutants. Aggravation of respiratory and cardiorespiratory diseases. Increased cough and chest discomfort. Soiling. Reduced visibility.
Sulfur Dioxide (SO_2)	Combustion of sulfur-containing fossil fuels. Smelting of sulfur-bearing metal ores. Industrial processes.	Aggravation of respiratory diseases (asthma, emphysema). Reduced lung function. Irritation of eyes. Reduced visibility. Plant injury. Deterioration of metals, textiles, leather, finishes, coatings, etc.
Lead (Pb)	Contaminated soil (e.g., from leaded fuels and lead-based paints).	Impairment of blood function and nerve construction. Behavioral and hearing problems in children.

California Greenhouse Gas Legislation

Greenhouse gases (so called because of their role in trapping heat near the surface of the earth) emitted by human activity are implicated in global climate change, commonly referred to as global warming. These GHGs contribute to an increase in the temperature of the earth's atmosphere by transparency to short wavelength visible sunlight, but near opacity to outgoing terrestrial long wavelength heat radiation in some parts of the infrared spectrum. The principal GHGs are carbon dioxide, methane, nitrous oxide, ozone, and water vapor. For purposes of planning and regulation, Section 15364.5 of the California Code of Regulations defines GHGs to include carbon dioxide, methane, nitrous oxide, hydro fluorocarbons, perfluorocarbons, and sulfur hexafluoride. Fossil fuel consumption in the transportation sector (on-road motor vehicles, off-highway mobile sources, and aircraft) is the single largest source of GHG emissions, accounting for approximately half of GHG emissions globally. Industrial and commercial sources are the second largest contributors of GHG emissions with about one-fourth of total emissions.

California has passed several bills and the Governor has signed at least three executive orders (EOs) regarding greenhouse gases. GHG statues and EOs include SB 375, SB 1078, SB 1368, AB 32, AB 1493, SB 32, EO S-03-05, EO S-20-06 and EO S-01-07.

Senate Bill 1078

Senate Bill (SB) 1078 established California's Renewable Portfolio Standard (RPS) program in 2002. The RPS program requires electrical corporations and electric service providers to purchase a specified minimum percentage of electricity generated by eligible renewable energy resources. The bill requires the California Energy Commission to certify eligible renewable energy resources, to design and implement an accounting system to verify compliance with the RPS by retail sellers, and to allocate and award supplemental energy payments to cover above-market costs of renewable energy. Under SB 1078, each electrical corporation was required to increase its total procurement of eligible renewable energy resources by at least 1 percent per year so that 20 percent of its retail sales were procured from eligible renewable energy resources.

In 2006, SB 107 accelerated the RPS program by establishing a deadline of December 31, 2010, for achieving the goal of having 20 percent of total electricity sold to retail customers in California per year generated from eligible renewable energy resources.

The RPS goal was increased to 33 percent when Governor Schwarzenegger signed EO S-14-08 in November 2008. EO S-14-08 was later superseded by EO S-21-09 on September 15, 2009. EO S-21-09 directed the CARB to adopt regulations requiring 33 percent of electricity sold in the state come from renewable energy by 2020. This EO was superseded by statute SB X1-2 in 2011, which obligates all California electricity providers, including investor-owned utilities and publicly owned utilities, to obtain at least 33 percent of their energy from renewable electrical generation facilities by 2020, with interim targets of 20 percent by 2013 and 25 percent by 2016.

Assembly Bill 32: Global Warming Solutions Act of 2006

Signed by Governor Schwarzenegger in September 2006, Assembly Bill (AB) 32 is one of the most significant pieces of environmental legislation that California has adopted. Among other objectives, it is designed to maintain California's reputation as a "national and international leader on energy conservation and environmental stewardship." It will have wide-ranging effects on California businesses and lifestyles as well as far reaching effects on other states and countries. A unique aspect of AB 32, beyond its broad and wide-ranging mandatory provisions and dramatic GHG reductions, are the short time frames within which it must be implemented. Major components of the AB 32 include:

- Requiring the monitoring and reporting of GHG emissions beginning with sources or categories of sources that contribute the most to statewide emissions.
- Requiring immediate "early action" control programs on the most readily controlled GHG sources.

- Mandating that by 2020, California's GHG emissions be reduced to 1990 levels.
- Complementing efforts to achieve and maintain federal and state ambient air quality standards and to reduce toxic air contaminants.

Statewide, the framework for developing the implementing regulations for AB 32 is under way. Additionally, through the California Climate Action Registry (now called the Climate Action Reserve), general and industry-specific protocols for assessing and reporting GHG emissions have been developed. GHG sources are categorized into direct sources (i.e., company owned) and indirect sources (i.e., not company owned). Direct sources include combustion emissions from on-and off-road mobile sources, and fugitive emissions. Indirect sources include off-site electricity generation and non-company owned mobile sources.

Senate Bill 32

Senate Bill 32 (SB 32) was signed into law on September 8, 2016 and expands upon AB 32 to reduce GHG emissions. SB 32 sets into law the mandated GHG emissions target of 40 percent below 1990 levels by 2030 written into Executive Order B-30-15.

Senate Bill 97

In response to the requirements of SB 97, the state Resources Agency developed guidelines for the treatment of GHG emissions under CEQA. These new guidelines became state laws as part of Title 14 of the California Code of Regulations in March, 2010. The guidelines recommend that projects be evaluated for the following impacts:

- Would the project generate greenhouse gas emissions, either directly or indirectly, that may have a significant impact on the environment?
- Would the project conflict with an applicable plan, policy or regulation adopted for the purpose of reducing the emissions of greenhouse gases?

Individual projects incrementally contribute to the potential for global climate change on a cumulative basis in concert with all other past, present, and probable future projects. While individual projects are unlikely to measurably affect global climate change, each of these projects incrementally contributes to the potential for global climate change on a cumulative basis, in concert with all other past, present, and probable future projects.

Section 15064.4 of the code specifies how significance of GHG emissions is to be evaluated. The process is broken down into quantification of project-related GHG emissions, making a determination of significance, and specification of any appropriate mitigation if impacts are found to be potentially significant. At each of these steps, the new GHG guidelines afford the lead agency with substantial flexibility.

Emissions identification may be quantitative, qualitative or based on performance standards. CEQA guidelines allow the lead agency to "select the model or methodology it considers most appropriate." The most common practice for infrastructure/combustion GHG emissions quantification is to use a computer model such as CalEEMod, as was used in the ensuing analysis.

Senate Bill 350. Senate Bill 350 was signed into law in September 2015. SB 350 establishes tiered increases to the RPS of 40 percent by 2024, 45 percent by 2027, and

50 percent by 2030. SB 350 also set a new goal to double the energy efficiency savings in electricity and natural gas through energy efficiency and conservation measures.

2.3.3 Local

San Bernardino County

San Bernardino County General Plan

The project site is located within unincorporated San Bernardino County; development in such areas is governed by the policies, procedures, and standards set forth in the San Bernardino County General Plan. The portion of the project area south of Community Boulevard is within the "Rural Living—5 Acre Minimum" Land Use Zoning District. The portion north of Community Boulevard is within the "Agriculture" Land Use Zoning District. Per Section 84.29.020 of the San Bernardino County Code, commercial renewable energy facilities (including solar energy facilities) are permitted in both of these Land Use Zoning Districts in conjunction with a CUP for the project. The project will remain consistent with these land-use provisions.

Development of the San Bernardino County General Plan included a consideration of the effects its land-use element would have on air quality (e.g., via the Environmental Impact Report that was developed and adopted in conjunction with the General Plan). As such, any project that conforms to the provisions of the General Plan is consistent with the air quality goals therein. In particular, the nature of this project does not involve increases in population or traffic that differ to any substantial degree from the assumptions used to develop the General Plan.

Specific air quality policies of the San Bernardino County General Plan that are relevant to this project include:

POLICY CO 4.1:

Because developments can add to the wind hazard (due to increased dust, the removal of wind breaks, and other factors), the County will require either as mitigation measures in the appropriate environmental analysis required by the County for the development proposal or as conditions of approval if no environmental document is required, that developments in areas identified as susceptible to wind hazards to address site-specific analysis of:

(a) Grading restrictions and/or controls on the basis of soil types, topography or season.

(b) Landscaping methods, plant varieties, and scheduling to maximize successful revegetation.

(c) Dust-control measures during grading, heavy truck travel, and other dust generating activities.

The project will follow the Mojave Desert Air Quality Management District (MDAQMD) rules concerning fugitive dust listed above.

POLICY CO 4.12:

Provide incentives to promote siting or use of clean air technologies (e.g., fuel cell technologies, renewable energy sources, UV coatings, and hydrogen fuel).

The project represents development of a renewable energy source.

County of San Bernardino Greenhouse Gas Reduction Plan

San Bernardino County has developed a Greenhouse Gas Reduction Plan (GHG Plan) for the unincorporated areas of the county where it has land use authority. The GHG Plan was developed to promote the air quality goals of the County's Master Plan; it is considered a part of that plan. The GHG Plan "presents a comprehensive set of actions to reduce the County's internal and external GHG emissions to 15 percent below current levels by 2020," which is consistent with the requirements and provisions of AB 32. The policies adopted to implement the GHG Plan are policies of the General Plan.

San Bernardino County Code

Section 83.01.040 of the San Bernardino County Code (pertaining to construction air quality) will apply to the construction phase of the project. It is presented in pertinent part below.

(c) Diesel Exhaust Emissions Control Measures. The following emissions control measures shall apply to all discretionary land use projects approved by the County on or after January 15, 2009:

- *(1) On-Road Diesel Vehicles. On-road diesel vehicles are regulated by the State of California Air Resources Board.*
- *(2) Off-Road Diesel Vehicle/Equipment Operations. All business establishments and contractors that use off-road diesel vehicle/equipment as part of their normal business operations shall adhere to the following measures during their operations in order to reduce diesel particulate matter emissions from diesel-fueled engines:*
  - *(A) Off-road vehicles/equipment shall not be left idling on site for periods in excess of five minutes. The idling limit does not apply to:*
    - *(I) Idling when queuing;*
    - *(II) Idling to verify that the vehicle is in safe operating condition;*
    - *(III) Idling for testing, servicing, repairing or diagnostic purposes;*
    - *(IV) Idling necessary to accomplish work for which the vehicle was designed (such as operating a crane);*
    - *(V) Idling required to bring the machine system to operating temperature; and*
    - *(VI) Idling necessary to ensure safe operation of the vehicle.*
  - *(B) Use reformulated ultra-low-sulfur diesel fuel in equipment and use equipment certified by the U.S. Environmental Protection Agency (EPA) or that pre-dates EPA regulations.*
  - *(C) Maintain engines in good working order to reduce emissions.*
  - *(D) Signs shall be posted requiring vehicle drivers to turn off engines when parked.*
  - *(E) Any requirements or standards subsequently adopted by the South Coast Air Quality Management District, the Mojave Desert Air Quality Management District or the California Air Resources Board.*
  - *(F) Provide temporary traffic control during all phases of construction.*

(G) On-site electrical power connections shall be provided for electric construction tools to eliminate the need for diesel-powered electric generators, where feasible.

(H) Maintain construction equipment engines in good working order to reduce emissions. The developer shall have each contractor certify that all construction equipment is properly serviced and maintained in good operating condition.

(I) Contractors shall use ultra-low sulfur diesel fuel for stationary construction equipment as required by Air Quality Management District (AQMD) Rules 431.1 and 431.2 to reduce the release of undesirable emissions.

(J) Substitute electric and gasoline-powered equipment for diesel-powered equipment, where feasible.

2.3.4 Regional

Mojave Desert Air Quality Management District

The MDAQMD has jurisdiction over the project site. The MDAQMD is the air pollution control agency for San Bernardino County's High Desert and Riverside County's Palo Verde Valley. It includes nearly 20,000 square miles and a population of more than 500,000; it is the second largest of California's 35 air districts by area. The MDAQMD has primary responsibility for controlling emissions from stationary sources of air pollution within its jurisdiction. This is accomplished in part by administering air quality programs required by state and federal mandates and enforcing rules and regulations based on air pollution law.

The MDAQMD is responsible for monitoring air quality and for planning, implementing, and enforcing programs designed to attain and maintain federal and state ambient air quality standards in the district. In addition, MDAQMD is responsible for establishing stationary-source permitting requirements and for ensuring that new, modified, or related stationary sources do not create net emission increases.

State Implementation Plans

An important component of the MDAQMD's air quality planning strategy is contained in the State Implementation Plan (SIP) for the State of California. The federal CAA requires all states to submit a SIP to the USEPA. This statewide SIP is often referred to as an "infrastructure" SIP. Infrastructure SIPs are administrative in nature and describe the authorities, resources, and programs a state has in place to implement, maintain, and enforce the federal standards. It does not contain any proposals for emission control measures.

In addition to infrastructure SIPs, the CAA requires submissions of SIPs for areas that are out of compliance with NAAQS. These area attainment SIPs are comprehensive plans that describe how an out-of-compliance area will attain and maintain the particular NAAQS standard(s) it does not conform to. Once an out-of-compliance area has attained the standard in question, a maintenance SIP is required for a period of time to ensure the area will continue to meet the standard.

SIPs are not single documents. They are a compilation of new and previously submitted plans, programs (such as monitoring, modeling, permitting, etc.), district rules, state regulations, and federal controls. Many of California's SIPs rely on the same core set of control strategies, including emission standards for cars and heavy trucks, fuel regulations and limits on emissions from consumer products. State law makes CARB the lead agency for all purposes related to SIPs. Local air districts and other agencies prepare SIP elements and submit them to CARB for review and approval. CARB forwards SIP revisions to the USEPA for approval and publication in the Federal Register.

Some of the most recent MDAQMD SIPs are listed below:

- 2008: Federal 8-hour Ozone Attainment Plan (Western Mojave Desert Non-attainment area)
- 2004: [1-hour] Ozone Attainment Plan (State and Federal)—combined NAAQS and CAAQS plan
- 1995: Mojave Desert Planning Area Federal Particulate Matter (PM_{10}) Attainment Plan

State-level Air Quality Plans

Air quality plans are also required for attaining and maintaining CAAQS. Analogous to SIPs for NAAQS, these plans are required for air districts that do not meet CAAQS standards for O_3, CO, SO_2, and NO_2, as well as for those air districts that are defined by CARB as receptors or contributors of air pollution from or to areas outside the district. These state-level plans are submitted to CARB. Often, these requirements are included in a single document that addresses both California and federal air quality plan requirements.

The most recent state-level air quality plan is the [1-hour] *Ozone Attainment Plan (State and Federal)*, a combined NAAQS and CAAQS plan adopted in 2004.

MDAQMD Rules

The MDAQMD has adopted rules to limit air emissions. Many of these rules were put in place as required measures specified in the various SIPs and air quality plans. This evaluation considered seven MDAQMD rules for regulation of fugitive dust and emissions from fossil fuel combustion. Excerpts of these rules are presented below. The full and official text of these rules is available within the MDAQMD website.[1]

Rule 401: Visible Emissions

A person shall not discharge into the atmosphere from any single source of emission whatsoever any air contaminant for a period or periods aggregating more than three minutes in any one hour which is:

- *As dark or darker in shade as that designated No. 1 on the Ringelmann Chart, as published by the United States Bureau of Mines, or*
- *(b) Of such opacity as to obscure an observer's view to a degree equal to or greater than does smoke described in subsection (a) of this rule.*

[1] http://www.mdaqmd.ca.gov/index.aspx?page=138

Rule 402: Nuisance

A person shall not discharge from any source whatsoever such quantities of air contaminants or other material which cause injury, detriment, nuisance or annoyance to any considerable number of persons or to the public, or which endanger the comfort, repose, health or safety of any such persons or the public, or which cause, or have a natural tendency to cause, injury or damage to business or property.

Rule 403: Fugitive Dust

(a) A person shall not cause or allow the emissions of fugitive dust from any transport, handling, construction or storage activity so that the presence of such dust remains visible in the atmosphere beyond the property line of the emission source. (Does not apply to emissions emanating from unpaved roadways open to public travel or farm roads. This exclusion shall not apply to industrial or commercial facilities).

(b) A person shall take every reasonable precaution to minimize fugitive dust emissions from wrecking, excavation, grading, clearing of land and solid waste disposal operations.

(c) A person shall not cause or allow particulate matter to exceed 100 micrograms per cubic meter when determined as the difference between upwind and downwind samples collected on high volume samplers at the property line for a minimum of five hours.

(d) A person shall take every reasonable precaution to prevent visible particulate matter from being deposited upon public roadways as a direct result of their operations. Reasonable precautions shall include, but are not limited to, the removal of particulate matter from equipment prior to movement on paved streets or the prompt removal of any material from paved streets onto which such material has been deposited.

(e) Subsections (a) and (c) shall not be applicable when the wind speed instantaneously exceeds 40 kilometers (25 miles) per hour, or when the average wind speed is greater than 24 kilometers (15 miles) per hour. The average wind speed determination shall be on a 15 minute average at the nearest official air-monitoring station or by wind instrument located at the site being checked.

(f) The provisions of this rule shall not apply to agricultural operations.

Rule 403.2: Fugitive Dust Control for the Mojave Desert Planning Area

(Pertinent parts of the regulation are listed below.)

(C) Requirements

(1) The owner or operator of a source in an affected source category shall comply with the applicable requirements contained in this subsection unless and until the owner or operator has applied for and obtained a District-approved ACP [Alternative PM10 Control Plan] pursuant to section (G).

(2) The owner or operator of any Construction/Demolition source shall:

(a) Use periodic watering for short-term stabilization of Disturbed Surface Area to minimize visible fugitive dust emissions. For purposes of this Rule, use of a water truck to maintain moist disturbed surfaces and actively spread water

during visible dusting episodes shall be considered sufficient to maintain compliance;

(b) Take actions sufficient to prevent project-related Trackout onto paved surfaces;

(c) Cover loaded haul vehicles while operating on Publicly Maintained paved surfaces;

(d) Stabilize graded site surfaces upon completion of grading when subsequent development is delayed or expected to be delayed more than thirty days, except when such a delay is due to precipitation that dampens the disturbed surface sufficiently to eliminate Visible Fugitive Dust emissions;

(e) Clean-up project-related Trackout or spills on Publicly Maintained paved surfaces within twenty-four hours; and

(f) Reduce non-essential Earth-Moving Activity under High Wind conditions. For purposes of this Rule, a reduction in Earth-Moving Activity when visible dusting occurs from moist and dry surfaces due to wind erosion shall be considered sufficient to maintain compliance.

(3) The owner/operator of a Construction/Demolition source disturbing 100 or more acres shall, in addition to the provisions of subsection (2):

(a) Prepare and submit to the MDAQMD, prior to commencing Earth-Moving Activity, a dust control plan that describes all applicable dust control measures that will be implemented at the project;

(b) Provide Stabilized access route(s) to the project site as soon as is feasible.

For purposes of this Rule, as soon as is feasible shall mean prior to the completion of Construction/Demolition activity;

(c) Maintain natural topography to the extent possible;

(d) Construct parking lots and paved roads first, where feasible; and

(e) Construct upwind portions of project first, where feasible.

(5) The Owner or Operator of a site undergoing weed abatement activity shall not:

(a) Disrupt the soil crust to the extent that Visible Fugitive Dust is created due to wind erosion.

(E) Recordkeeping

The owner or operator of an affected source shall maintain a Dust Control Plan as required by Sections (C)(3) and (C)(7) on site, or readily accessible, for at least two years after the date of each entry. Such records shall be provided to the District upon request.

Test methods, compliance methods, requirements for alternate PM_{10} Control Plans, and other requirements are detailed in the text of the Rule, which is available at the MDAQMD website.[2]

[2] http://www.mdaqmd.ca.gov/index.aspx?page=138

Rule 404: Particulate Matter Concentration

A person shall not discharge into the atmosphere from any source, particulate matter except liquid sulfur compounds, in excess of the concentration at standard conditions, shown in Table 404(a). Where the volume discharged is between figures listed in the table, the exact concentration permitted to be discharged shall be determined by linear interpolation.

(b) The provisions of this rule shall not apply to emissions resulting from the combustion of liquid or gaseous fuels in steam generators or gas turbines.

(c) For the purposes of this rule, emissions shall be averaged over one complete cycle of operation or one hour, whichever is the lesser time period.

Refer to the official text of the Rule at the MDAQMD website to see Table 404(a).

Rule 405: Solid Particulate Matter Weight

(a) A person shall not discharge into the atmosphere from any source, solid particulate matter including lead and lead compounds, in excess of the rate shown in Table 405 (a). Where the process weight per hour is between figures listed in the table, the exact weight of permitted discharge shall be determined by linear interpolation.

(b) For the purposes of this rule, emissions shall be averaged over one complete cycle of operation or one hour, whichever is the lesser time period.

Refer to the official text of the Rule at the MDAQMD website to see Table 405(a).

Rule 409: Combustion Contaminants

A person shall not discharge into the atmosphere from the burning of fuel, combustion contaminants exceeding 0.23 gram per cubic meter (0.1 grain per cubic foot) of gas calculated to 12 percent of carbon dioxide (CO2) at standard conditions averaged over a minimum of 25 consecutive minutes.

2.4 Background Air Quality

The MDAB is provided with data from 13 air-quality monitoring stations. The closest station to the project site is at 225 East Mountain View Street, Barstow, California 92311, approximately 9.7 miles to the west of the City of Daggett. The station measures concentrations of O_3, NO_X (i.e., NO and NO_2), CO, and PM_{10}. The next closest station is located at 14306 Park Avenue, Victorville, California 92392, approximately 42.7 miles to the southwest of the project site. Here, concentrations of O_3, CO, NO_X, $PM_{2.5}$, PM_{10}, and SO_2, are measured; however, only the concentrations of the constituents not measured at the Barstow station ($PM_{2.5}$ and SO_2) are used from the Victorville station for this analysis. No other air quality data (e.g., lead and vinyl chloride) are available.

2.4.1 Pollutants and Effects

Criteria air pollutants are defined as pollutants for which the federal and state governments have established ambient air quality standards, or criteria, for outdoor concentrations to protect public health. The federal and state standards have been set, with an adequate margin of safety, at levels above which concentrations could be harmful to human health and welfare. These standards are designed to protect the most sensitive persons from illness or discomfort. Pollutants of concern include: O3, NO2, CO, sulfur dioxide (SO_2), PM_{10}, $PM_{2.5}$, and lead. These pollutants are discussed below. In California, sulfates, vinyl chloride, hydrogen sulfide, and visibility-reducing particles are also regulated as criteria air pollutants.

Ozone

O_3 is a colorless gas that is formed in the atmosphere when volatile organic compounds (VOCs), sometimes referred to as reactive organic gases (ROGs), and NOx react in the presence of ultraviolet sunlight. O_3 is not a primary pollutant; it is a secondary pollutant formed by complex interactions of two pollutants directly emitted into the atmosphere. The primary sources of VOCs and NOx, the precursors of O_3, are automobile exhaust and industrial sources. Meteorology and terrain play major roles in O_3 formation and ideal conditions occur during summer and early autumn, on days with low wind speeds or stagnant air, warm temperatures, and cloudless skies. Short-term exposures (lasting for a few hours) to O_3 at levels typically observed in Southern California can result in breathing pattern changes, reduction of breathing capacity, increased susceptibility to infections, inflammation of the lung tissue, and some immunological changes.

Nitrogen Dioxide

Most NO_2, like O_3, is not directly emitted into the atmosphere but is formed by an atmospheric chemical reaction between nitric oxide (NO) and atmospheric oxygen. NO and NO_2 are collectively referred to as NOx and are major contributors to O_3 formation. High concentrations of NO_2 can cause breathing difficulties and result in a brownish-red cast to the atmosphere with reduced visibility. There is some indication of a relationship between NO_2 and chronic pulmonary fibrosis and some increase in bronchitis in children (2 and 3 years old) has also been observed at concentrations below 0.3 parts per million by volume (ppm).

Carbon Monoxide

CO is a colorless and odorless gas formed by the incomplete combustion of fossil fuels. CO is emitted almost exclusively from motor vehicles, power plants, refineries, industrial boilers, ships, aircraft, and trains. In urban areas, such as the project location, automobile exhaust accounts for the majority of CO emissions. CO is a non-reactive air pollutant that dissipates relatively quickly; therefore, ambient CO concentrations generally follow the spatial and temporal distributions of vehicular traffic. CO concentrations are influenced by local meteorological conditions; primarily wind speed, topography, and atmospheric stability. CO from motor vehicle exhaust can become locally concentrated when surface-based temperature inversions are combined with calm atmospheric conditions, a typical situation at dusk in urban areas between November and February. The highest levels of CO typically occur during the colder months of the year when inversion conditions are more frequent. In terms of health, CO competes with oxygen, often replacing it in the blood, thus reducing the blood’s ability to transport oxygen to vital organs. The results of excess CO exposure can be dizziness, fatigue, and impairment of central nervous system functions.

Sulfur Dioxide

SO_2 is a colorless, pungent gas formed primarily by the combustion of sulfur containing fossil fuels. Main sources of SO_2 are coal and oil used in power plants and industries; as such, the highest levels of SO_2 are generally found near large industrial complexes. In recent years, SO_2 concentrations have been reduced by the increasingly stringent controls placed on stationary source emissions of SO_2 and limits on the sulfur content of fuels. SO_2 is an irritant gas that attacks the throat and lungs and can cause acute respiratory symptoms and diminished ventilator function in children. SO_2 can also yellow plant leaves and erode iron and steel.

Particulate Matter

Particulate matter pollution consists of very small liquid and solid particles floating in the air, which can include smoke, soot, dust, salts, acids, and metals. Particulate matter can form when gases emitted from industries and motor vehicles undergo chemical reactions in the atmosphere. $PM_{2.5}$ and PM_{10} represent fractions of particulate matter. Fine particulate matter, or $PM_{2.5}$, is roughly 1/28 the diameter of a human hair. $PM_{2.5}$ results from fuel combustion (e.g., motor vehicles, power generation, and industrial facilities), residential fireplaces, and wood stoves. In addition, $PM_{2.5}$ can be formed in the atmosphere from gases such as sulfur oxides (SOx), NOx, and VOC. Inhalable or coarse particulate matter, or PM_{10}, is about 1/7 the thickness of a human hair. Major sources of PM_{10} include crushing or grinding operations; dust stirred up by vehicles traveling on roads; wood-burning stoves and fireplaces; dust from construction, landfills, and agriculture; wildfires and brush/waste burning; industrial sources; windblown dust from open lands; and atmospheric chemical and photochemical reactions.

$PM_{2.5}$ and PM_{10} pose a greater health risk than larger-size particles. When inhaled, these tiny particles can penetrate the human respiratory system's natural defenses and damage the respiratory tract. $PM_{2.5}$ and PM_{10} can increase the number and severity of asthma attacks, cause or aggravate bronchitis and other lung diseases, and reduce the body's ability to fight infections. Very small particles of substances, such as lead, sulfates, and nitrates, can cause lung damage directly or be absorbed into the blood stream, causing damage elsewhere in the body. Additionally, these substances can transport absorbed gases, such as chlorides or ammonium, into the lungs, also causing injury. Whereas PM_{10} tends to collect in the upper portion of the respiratory system, $PM_{2.5}$ is so tiny that it can penetrate deeper into the lungs and damage lung tissues. Suspended particulates also damage and discolor surfaces on which they settle, as well as produce haze and reduce regional visibility.

Lead

Lead (Pb) in the atmosphere occurs as particulate matter. Sources of lead include leaded gasoline, the manufacturing of batteries, paint, ink, ceramics, and ammunition and secondary lead smelters. Prior to 1978, mobile emissions were the primary source of atmospheric lead. Between 1978 and 1987, the phase-out of leaded gasoline reduced the overall inventory of airborne lead by nearly 95 percent. With the phase-out of leaded gasoline, secondary lead smelters, battery recycling, and manufacturing facilities are becoming lead-emission sources of greater concern.

Prolonged exposure to atmospheric lead poses a serious threat to human health. Health effects associated with exposure to lead include gastrointestinal disturbances, anemia, kidney disease, and in severe cases, neuromuscular and neurological dysfunction. Of particular concern are low-level lead exposures during infancy and childhood. Such exposures are associated with decrements in neurobehavioral performance including intelligence quotient performance, psychomotor performance, reaction time, and growth.

Valley Fever

Valley Fever (coccidioidomycosis or "cocci") is an illness caused by a fungus found in the soil and dirt of some areas of the southwestern United States, and parts of Mexico and Central and South America. It can cause fever, chest pain and coughing, among other signs and symptoms. In California, the fungus is found in many areas of the San Joaquin Valley (Central Valley).

The fungi's spores can be stirred into the air by anything that disrupts the soil, such as farming, construction and wind. The fungi can then be breathed into the lungs and cause valley fever, also known as acute coccidioidomycosis. Mild cases of valley fever usually resolve on their own. In more severe cases, doctors prescribe antifungal medications that can treat the underlying infection.

San Bernardino County is not considered a highly endemic region for Valley Fever. A report prepared by the California Department of Public Health identified that only 87 of the 8,175 suspect, probable, and confirmed annual cases of coccidioidomycosis recorded for California in 2017 occurred in San Bernardino County[3].

Toxic Air Contaminants

A substance is considered toxic if it has the potential to cause adverse health effects in humans, including increasing the risk of cancer upon exposure, or acute and/or chronic noncancer health effects. A toxic substance released into the air is considered a toxic air contaminant (TAC). Examples include certain aromatic and chlorinated hydrocarbons, certain metals, and asbestos. TACs are generated by a number of sources, including stationary sources such as dry cleaners, gas stations, combustion sources, and laboratories; mobile sources such as automobiles; and area sources such as landfills. Adverse health effects associated with exposure to TACs may include carcinogenic (i.e., cancer-causing) and noncarcinogenic effects. Noncarcinogenic effects typically affect one or more target organ systems and may be experienced either on short-term (acute) or long-term (chronic) exposure to a given TAC. CARB has identified diesel engine exhaust particulate matter as the predominant TAC in California. Diesel particulate matter is emitted into the air by diesel-powered mobile vehicles, including heavy-duty diesel trucks, construction equipment, and passenger vehicles. Certain ROGs may also be designated as TACs.

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[3] California Department of Public Health, Coccidioidomycosis in California Provisional Monthly Report January - May 2018 (as of May 31, 2018). https://www.cdph.ca.gov/Programs/CID/DCDC/CDPH%20Document%20Library/CocciinCAProvisionalMonthlyReport.pdf. Accessed June 18, 2018.

2.4.2 Air Quality Monitoring Data

Table 5 shows pollutant levels, the State and federal standards, and the number of exceedances recorded at the Barstow and Victorville stations from 2014 to 2016. As shown in Table 5, there were exceedances of the O3, PM10, and PM2.5 standards.

Table 5. Ambient Air-Quality Monitoring Concentrations

Pollutant	Pollutant Concentration and Standard	Maximum Concentration		
		2014	2015	2016
Carbon Monoxide	Maximum 1-hour Concentration (ppm) Days> 20 ppm (State 1-hr standard) Days> 35 ppm (federal 1-hr standard) Maximum 8-hour Concentration (ppm) Days> 9 ppm (State 8-hr standard) Days> 9 ppm (federal 8-hr standard)	3.1 0 0 2.6 0 0	2.2 0 0 0.6 0 0	3.8 0 0 1.2 0 0
Ozone	Maximum 1-hour Concentration (ppm) Days> 0.09 ppm (State 1-hr standard) Maximum 8-hour Concentration (ppm) Days> 0.070 ppm (State 8-hr standard) Days> 0.070 ppm (federal 8-hr standard)	0.094 0 0.087 33 33	0.090 0 0.082 18 18	0.089 0 0.083 25 25
Nitrogen Dioxide	Maximum 1-hour Concentration (ppm) Days> 0.18 ppm (State 1-hr standard) Days> 0.10 ppm (federal 1-hr standard) Annual Arithmetic Mean (ppm) Exceed 0.030 ppm? (State Annual Standard) Exceed 0.053 ppm? (federal Annual Standard)	0.0693 0 0 0.017 No No	0.0613 0 0 0.016 No No	0.0667 0 0 0.016 No No
Sulfur Dioxide	Maximum 1-hour Concentration (ppb) Days> 250 ppb (State 1-hr standard) Days> 75 ppb (federal 1-hr standard) Maximum 24-hour Concentration (ppb) Days> 40 ppb (State 24-hr standard)	4.8 0 0 NA NA	60.2 0 0 NA NA	26.3 0 0 NA NA
Coarse Particulate Matter (PM_{10})	Maximum 24-hour Concentration (µg/m^3) Days> 50 µg/m^3 (State 24-hr standard) Days> 150 µg/m^3 (federal 24-hr standard) Annual Arithmetic Mean (µg/m^3) Exceed 20 µg/m^3? (State Annual Standard)	305.8 1 NA 27.7 Yes	155.2 1 NA 24.8 Yes	246.9 2 NA 27.0 Yes
Fine Particulate Matter ($PM_{2.5}$)	Maximum 24-hour Concentration (µg/m^3) Days> 35 µg/m^3 (federal 24-hr standard) Annual Arithmetic Mean (µg/m^3) Exceed 12 µg/m^3? (State Annual Standard) Exceed 12 µg/m^3? (federal Annual Standard)	24.1 0 NA NA NA	50.2 1 6.6 No No	415 1 7.5 No No

Note: NA – Not Available.

3 Significant Criteria and Analysis Methodologies

The air quality analysis contained herein would apply to the construction and operation of each phase of the proposed solar farm. Each phase would involve similar construction fleets and would be maintained using a single crew. The only difference is the duration of construction. Phases 1 and 2 would be constructed concurrently over a 27-month period while Phase 3 would be constructed separately over a 19-month period. The following provides a summary of the methodology and significance thresholds to determine project-related impacts.

Criteria Air Pollutants. Emissions of criteria air pollutants were estimated using existing conditions information, Project construction details, and Project operations information, as well as a combination of emission factors from the following sources.

- ARB modeling software EMFAC2014 for estimating exhaust emissions from on-road road motor vehicles
- USEPA re-entrained paved road dust methodology
- USEPA of-road emission factors

Quantification of GHGs. For the purposes of determining whether or not GHG emissions from affected projects are adverse, MDAQMD specifies that Project emissions must include direct and indirect emissions during construction and operation. The construction and operational emissions were calculated using the models and emission factors described above for the criteria air pollutants.

3.1 CEQA Guidelines

The following indicators, based on the significance criteria listed in the CEQA Environmental Checklist included in Appendix G of the CEQA Guidelines, were used to determine the significance of potential impacts. For the purposes of this air quality analysis, the Project would have an adverse effect on air quality or global climate change if it would:

- Conflict with or obstruct implementation of the applicable air quality plan;
- 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;
- Expose sensitive receptors to substantial pollutant concentrations;
- Result in other emissions (such as those leading to odors) adversely affecting a substantial number of people;
- Generate greenhouse gas emissions, either directly or indirectly, that may have an adverse effect on the environment; or
- Conflict with applicable plan, policy, or regulation adopted for the purpose of reducing the emissions of greenhouse gases.

3.1.1 MDAQMD Guidelines

Any project impact is considered to be significant if it triggers or exceeds the most appropriate evaluation criteria. The District will clarify upon request which threshold is most appropriate for a given project; in general, the emissions comparison (criteria number 1) is sufficient:

1. Generates total emissions (direct and indirect) in excess of the thresholds given in Table 6
2. Generates a violation of any ambient air quality standard when added to the local background;
3. Does not conform with the applicable attainment or maintenance plan(s)[4];
4. Exposes sensitive receptors to substantial pollutant concentrations, including those resulting in a cancer risk greater than or equal to 10 in a million and/or a Hazard Index (HI) (non-cancerous) greater than or equal to 1.

Table 6. MDAQMD Air Quality Thresholds of Significance

Pollutant	Annual Threshold (Tons)	Daily Threshold (pounds)
Greenhouse Gases (CO_2e)	100,000	548,000
Carbon Monoxide (CO)	100	548
Oxides of Nitrogen (NO_X)	25	137
Volatile Organic Compounds (VOC)	25	137
Oxides of Sulfur (SO_X)	25	137
Particulate Matter (PM_{10})	15	85
Particulate Matter ($PM_{2.5}$)	12	65
Hydrogen Sulfide (H_2S)	10	54
Lead (Pb)	0.6	3

Source: MDAQMF CEQA and Federal Conformity Guidelines, http://www.mdaqmd.ca.gov/home/showdocument?id=192, accessed October 2017.

[4] A project is deemed to not exceed this threshold, and hence not be significant, if it is consistent with the existing land use plan. Zoning changes, specific plans, general plan amendments and similar land use plan changes which do not increase dwelling unit density, do not increase vehicle trips, and do not increase vehicle miles traveled are also deemed to not exceed this threshold

4 Project Impacts

4.1 Generates Total Emissions (Direct and Indirect) in Excess of the MDAQMD Thresholds

Construction activities associated with implementation of the Project have the potential to create air quality impacts through the use of heavy-duty construction equipment, construction worker vehicle trips, material delivery trips, and heavy-duty haul truck trips generated from construction activities. In addition, earthwork activities would result in fugitive dust emissions. Construction emissions can vary substantially from day to day, depending on the level of activity, the specific type of operation, and, for dust, the prevailing weather conditions. The assessment of construction air quality impacts considers each of these potential sources.

Construction activities produce combustion emissions from various sources such as utility engines, on-site heavy-duty construction vehicles, equipment hauling materials to and from the site, and motor vehicles transporting the construction crew. Exhaust emissions from these sources would vary daily as construction progresses. The use of construction equipment on site would result in localized exhaust emissions.

4.1.1 Construction Impacts

Equipment Exhaust and Related Construction Activities

The Coolwater project is expected to be constructed in three phases, ranging in size from approximately 200 MW to 250 MW. Within each development phase the construction activities are separated into three different stages: site clearing and preparation, solar panel installation, and electrification. While there may be overlap during construction of two of the three phases (i.e., restoration stage of one phase and mobilization stage of the next phase), major construction is expected to occur separately. Project facilities such as the substations, gen tie, and operations and maintenance (O&M) building would be shared among the individual CUPs and phases. Final construction phasing would be determined during financing and prior to construction of that particular phase.

The total exhaust emissions generated within each of the construction stages are listed in Table 7 and detailed in Appendix A. As the same equipment and staging would be used for each phase of the proposed project, the peak daily emissions listed in the Table 7 below are applicable to each phase. Only the total duration of construction would vary; 27 months for Phases 1 and 2 constructed at one time and 19 months for Phase 3. However, there could be overlap between the construction staging within one phase or the concurrent construction of Phases 1 and 2. The peak day emissions shown in Table 7 are calculated using the assumption that stages 1, 2, and 3 would occur simultaneously.

Table 7. Construction Emissions by Stage (Pounds/Day)

Construction Stage	CO	ROGs	NO_X	SO_X	PM_{10}	$PM_{2.5}$	CO_2e
Stage 1	75.8	14.4	127.8	0.2	810.4	178.0	15,844
Stage 2	80.6	4.8	50.4	0.2	10.6	10.2	22,323
Stage 3	20.8	1.2	8.9	0.0	2.8	2.7	4,690
Peak Day	177.2	20.4	187.1	0.4	823.8	190.9	42,857
MDAQMD Thresholds	548	137	137	137	82	65	548,000
Exceedance	No	No	Yes	No	Yes	Yes	No

Source: HDR 2019

Fugitive Dust

Fugitive dust emissions are generally associated with land clearing, exposure, and cut-and-fill operations. Dust generated daily during construction would vary substantially, depending on the level of activity, the specific operations, and weather conditions. Nearby sensitive receptors and on-site workers may be exposed to blowing dust, depending upon prevailing wind conditions. Fugitive dust also would be generated as construction equipment or trucks travel on unpaved areas of the construction site.

$PM_{2.5}$ and PM_{10} emissions from construction operations were calculated using the total acreage that would be disturbed during each construction stage and are included in the emissions listed in Table 7. For this analysis a conservative estimate of 10 acres per day was used for the disturbed area.

As shown in Table 7, peak daily construction emissions would exceed the MDAQMD's thresholds for NO_X, PM_{10}, and $PM_{2.5}$. As the construction emissions will exceed the MDAQMD thresholds, mitigation measures Air-1 and Air-2 are required to minimize the air quality impacts to the extent feasible. Table 8 lists the construction emissions after implementing the proposed mitigation measures. As discussed above, the emissions listed in Table 8 would apply to all Phases of the proposed project. As shown, the emissions would continue to exceed the thresholds for PM_{10} and $PM_{2.5}$.

Table 8. Mitigation Construction Emissions by Stage (Pounds/Day)

Construction Stage	CO	ROGs	NO_X	SO_X	PM_{10}	$PM_{2.5}$	CO_2e
Stage 1	17.1	4.8	82.2	0.2	402.0	86.0	15,844
Stage 2	68.7	3.3	40.0	0.2	9.0	8.7	22,323
Stage 3	17.8	0.7	7.5	0.0	2.2	2.2	4,690
Peak Day	103.6	8.8	129.7	0.4	413.2	96.9	42,857
MDAQMD Thresholds	548	137	137	137	82	65	548,000
Exceedance	No	No	No	No	Yes	Yes	No

Source: HDR 2019

4.1.2 Operational Impacts

As the proposed project would have no major stationary emission sources, operation of the proposed solar farm would result in substantially lower emissions than project construction. The proposed facility is designed to have essentially no moving parts and require no water for electricity generation. Table 9 lists the average daily operation emissions associated with the on-site maintenance equipment and employee commutes. As shown, the operational emissions would not exceed any of the MDAQMD thresholds. Therefore, no mitigation measures are required.

Table 9. Operational Emissions (Pounds/Day)

Emission Source	CO	ROGs	NO_X	SO_X	PM_{10}	$PM_{2.5}$	CO_2e
On-Road Sources	3.2	0.1	0.5	0.0	0.4	0.2	777.1
Off-Road Source	0.4	0.0	0.1	0.0	0.0	0.0	88.3
Maintenance Equipment	4.0	0.8	14.6	0.0	0.3	0.3	1,698
Total	7.5	0.9	15.1	0.0	0.7	0.4	2,563.4
MDAQMD Thresholds	548	137	137	137	82	65	548,000
Exceedance	No	No	No	No	No	No	No

Source: HDR 2019

4.2 Generate a Violation of any Ambient Air Quality Standards when Added to the Local Background

The Proposed Project would be constructed within an area of non-attainment for multiple pollutants. Therefore, the emissions from the Proposed Project's construction would contribute incrementally to existing exceedances of the air quality standards. Proposed mitigation measures Air-1 and Air-2, defined below, would reduce the short-term construction impacts. However, the proposed project's impacts would be considered significant and unavoidable.

4.3 Conflict with or Obstruct Implementation of the Applicable Air Quality Plan

The proposed solar farm is generally consistent with the land uses identified in the San Bernardino County General Plan for the project site; therefore, implementation of the project would not require an amendment to the General Plan for the project site. As the proposed project is consistent with the local General Plan it is also consistent with the MDAQMD Air Quality Attainment Plan (AQAP).

4.4 Exposes Sensitive Receptors to Substantial Pollutant Concentrations

The Federal Clean Air Act requires the EPA to set NAAQS for six criteria air pollutants found all over the United States.[5] The NAAQS are designed to protect human health and the environment. The EPA sets the NAAQS based on a lengthy process that involves science policy workshops, a risk/exposure (REA) assessment that draws on the information and conclusions of the science policy workshops to development quantitative characterizations of exposures and associated risks to human health or the environment, and a policy assessment by EPA staff that bridges the gap between agency scientific assessments and the judgments required of the EPA administrator, who then takes the proposed standards through the federal rulemaking process.[6]

The Federal Clean Air Act permits states to adopt additional or more protective ambient air quality standards if needed. California, through its expert air resource agency, ARB, has set ambient air standards for certain criteria pollutants, such as particulate matter and ozone that are more protective of public health than respective federal standards.[7] Similar to the federal process, these standards are adopted after review by ARB staff of the scientific literature conducted by agencies such as the Office of Environmental Health Hazard Assessment (OEHHA), peer review by the Air Quality Advisory Committee, which is comprised of experts in health sciences, exposure assessment, monitoring methods, and atmospheric sciences appointed by the Office of the President of the University of California, and public review and comment.[8]

While the studies relied on by the EPA and ARB to set ambient air quality standards link poor air quality to adverse health effects, there is no way to determine the precise adverse health impacts associated with a specific number of additional molecules of a given CAP. This is because adverse health impacts are related to a number of factors, including genetics and environmental factors other than air pollution,

Because CAP thresholds are set by the EPA and the ARB under the Clean Air Act to be protective of human health, no local or regional agency has undertaken the process required to unpack the results of the EPA or ARB decision-making process and do their own assessment of potential health impacts from criteria air pollutant emissions, as would be required to establish thresholds of significance based on potential health impacts from an individual development project. Studies related to asthma provide an example of the difficulty related to determining the precise health impacts related to a specific project's increase in a particular CAP. According to the National Institute of Environmental Health Sciences (NIEHS), scientists know that outdoor pollution plays a major role in asthma based in part on NIEHS-funded research studying air pollution in 10 southern California

5 EPA, 2017. Available at https://www.epa.gov/criteria-air-pollutants.

6 EPA, 2017. Available at https://www.epa.gov/criteria-air-pollutants/process-reviewing-national-ambient-air-quality-standards

7 ARB, 2009. Available at https://www.arb.ca.gov/research/aaqs/caaqs/caaqs.htm

8 ARB, 2009. Available at https://www.arb.ca.gov/research/aaqs/ozone-rs/ozone-rs.htm, https://www.arb.ca.gov/research/aaqs/std-rs/std-rs.htm, and https://www.arb.ca.gov/research/aaqs/no2-rs/no2-rs.htm

cities and finding that children living within 150 meters of a freeway were more likely to be diagnosed with asthma than children who lived further away. The researchers also found that children who had higher levels of nitrogen dioxide in the air around their homes were more likely to develop asthma symptoms. Nitrogen dioxide is one of many pollutants emitted from motor vehicles. However, asthma also can be triggered by indoor allergens such as dust mites, cockroaches, dogs, cats, rodents, molds, and fungi, and there is a genetic role too. Thus, scientists know there is a link between asthma and poor air quality, but not the precise role poor air quality plays in any specific case of asthma.[9] The EPA and ARB have used their expertise to take studies showing a link between air quality and adverse health impacts to derive ambient air quality standards that would be are generally protective of human health.

Because it is impossible to isolate the exact cause of a human disease (for example, the role a particular air pollutant plays compared to the role of other allergens and genetics in cause asthma), the County is not aware of any existing scientific tools that accurately estimate individualized health effects of criteria emissions on a local level, let alone a single development project.[10] Therefore, the impact analysis with respect to health effects from criteria pollutants is based on the best available information regarding potential effects on human health and relies on professional judgment of the experts conducting the analysis to reach a conclusion regarding significance in light of CEQA's definition of a significant effect on the environment: a "substantial, or potentially substantial, adverse change" in the environment. (CEQA Guidelines, § 15382).

4.4.1 Construction Impacts

Project construction would result in emissions of diesel particulate matter (DPM) from heavy-duty construction equipment and trucks operating in the Project Study Area (e.g., water trucks and haul trucks). DPM is characterized as a toxic air contaminant (TAC) by ARB. The OEHHA has identified carcinogenic and chronic noncarcinogenic effects from long-term (chronic) exposure, but it has not identified health effects due to short-term (acute) exposure to DPM. There are several farms and rural residences located within close proximity to the proposed construction areas. Therefore, a human health risk assessment (HRA) was conducted to assess the risk associated with the construction emissions. An HRA consists of three parts: (1) a TAC emissions inventory, (2) air dispersion modeling to evaluate off-site concentrations of TAC emissions, and (3) assessment of risks associated with predicted concentrations. The HRA was conducted using the guidelines provided by OEHHA for the Air Toxics Hot Spots Program and the HRA guidelines developed by the California Air Pollution Control Officers Association (CAPCOA).

As discussed in Section 3.2, the MDAQMD's TAC thresholds are as follows:

- Maximum Incremental Cancer Risk ≥ 10 in 1 million

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9 NIEHS, 2017. Available at https://www.niehs.nih.gov/health/topics/conditions/asthma/index.cfm

10 See Cartier, Benmarhnia, Broussell, 2015, discussing the compromises and uncertainties involved in trying to create a tool to facilitate the assessment of health impacts in developed countries of urban outdoor air pollution. Available at http://www.sciencedirect.com/science/article/pii/S0149718915000713

- Chronic & Acute Hazard Index ≥ 1.0

Cancer risks are typically calculated for all carcinogenic TACs and summed to calculate the overall increase in cancer risk to an individual. The calculation procedure assumes that cancer risk is proportional to concentrations at any level of exposure and that risks from various TACs are additive. This is generally considered a conservative assumption at low doses and is consistent with the current OEHHA-recommended approach.

Non-cancer health impact of an inhaled TAC is measured by the hazard quotient, which is the ratio of the ambient concentration of a TAC in units of microgram per cubic meter ($\mu g/m^3$) divided by the reference exposure level (REL), also in units of $\mu g/m^3$. The inhalation REL is the concentration at or below which no adverse health effects are anticipated. The REL is typically based on health effects to a particular target organ system, such as the respiratory system, liver, or central nervous system. Hazard quotients are then summed for each target organ system to obtain a hazard index.

The DPM (PM_{10}) emissions for all emission sources, during the construction period were compiled and added together to represent worst-case emission source for DPM. Due to the long-term nature of health risks, the modeling used the average day emissions instead of the peak day emissions. For the proposed construction activities the DPM rate is 1.51 pounds per day.

DPM impacts due to emissions from diesel trucks and associated construction equipment at the project site were estimated using the EPA's AERMOD v18081 air quality dispersion model. This modeling analysis assumed that emissions are generated uniformly from the entire project site over the entire project duration. Also, the project boundary was simplified and slightly expanded to account for traffic between the construction areas on the western side of the project area. Project emissions were limited to the hours of 7AM – 7PM to simulate dispersion for times of expected construction activities. Concentrations were calculated for a three-year annual average, and listed in units of $\mu g/m^3$.

Terrain elevations for the sources and receptors were obtained from the USGS National Elevation Dataset (NED) at a resolution of 1/3 arc second. The modeling used UTM coordinates relative to the 1983 North American Datum (NAD 83) database. The modeling utilized three years (2011-2013) of hourly surface meteorological data from the Barstow-Daggett County Airport (located adjacent to the project site) and upper-air data from Las Vegas, as provided in preprocessed format on the California Air Resources Board web site. AERMOD was executed to create the 3-year average DPM concentrations at each of the identified sensitive receptor locations.

The cancer risk calculations were performed by multiplying the predicted annual DPM concentrations from AERMOD by the appropriate risk values. The exposure and risk equations that are used to calculate the cancer risk at residential, recreation, and school receptors are taken from the OEHHA Air Toxics Hot Spots Program Guidance Manual (OEHHA 2015).

The potential exposure pathway for DPM includes inhalation only. Cancer risks were evaluated using the inhalation Cancer Potency Factor published by the OEHHA. The cancer risks were calculated using the "derived (adjusted)" approach in the OEHHA risk assessment manual. The cancer potency factor for DPM is 1.1 per milligram per kilogram of body weight per day ($1.1\ (mg/kg\text{-}day)^{-1}$). The potential exposure through other pathways (e.g., ingestion) requires substance and site-specific data, and the specific parameters for DPM are not known for these pathways.

A chronic hazard index is calculated by dividing the annual average concentration of a toxic pollutant by the chronic REL for that pollutant. For DPM the chronic REL is 5.0.

Table 10 identifies the modeled annual average DPM concentration, and the associated cancer risks and chronic hazard index, at the closest land uses to the project site. Figure 3 shows the locations of the sensitive receptors relative to the project site. As shown, the peak cancer risks during construction would be less than the threshold of 10 in 1 million. In addition, the chronic hazard indexes would be less than the threshold of 1.0. Therefore, the project construction would not expose sensitive receptors to substantial pollutant concentrations.

Table 10. Modeled Cancer Risks and Chronic Hazard Indexes

Receptor	Land Use Type	Modeled Annual Concentrations (µg/m^3)	Cancer Risks (per million)	Chronic Hazard Index
ML-1_1	Residential	0.00030	0.1	0.00006
ML-2_2	Residential	0.00251	0.7	0.00050
ML-3_3	Residential	0.00095	0.3	0.00019
ML-4_4	Residential	0.00364	1.1	0.00073
ML-5_5	Residential	0.00138	0.4	0.00028
ML-6_6	Residential	0.00444	1.3	0.00089
ML-7_7	Residential	0.00032	0.1	0.00006
ML-8_8	Residential	0.00314	0.9	0.00063
		Thresholds	**10**	**1.0**

4.4.2 Operational Impacts

The emissions generated by the daily maintenance activities would be below the MDAQMD thresholds. Therefore, the project operations would not expose sensitive receptors to substantial pollutant concentrations.

4.5 Odors

Construction of the Project could result in emission of odors from construction equipment and vehicles (e.g., diesel exhaust). It is anticipated that these odors would be short-term, limited in extent at any given time, and distributed throughout the Project area during the duration of construction, and, therefore, would not affect a substantial number of individuals. This impact is considered less than significant.

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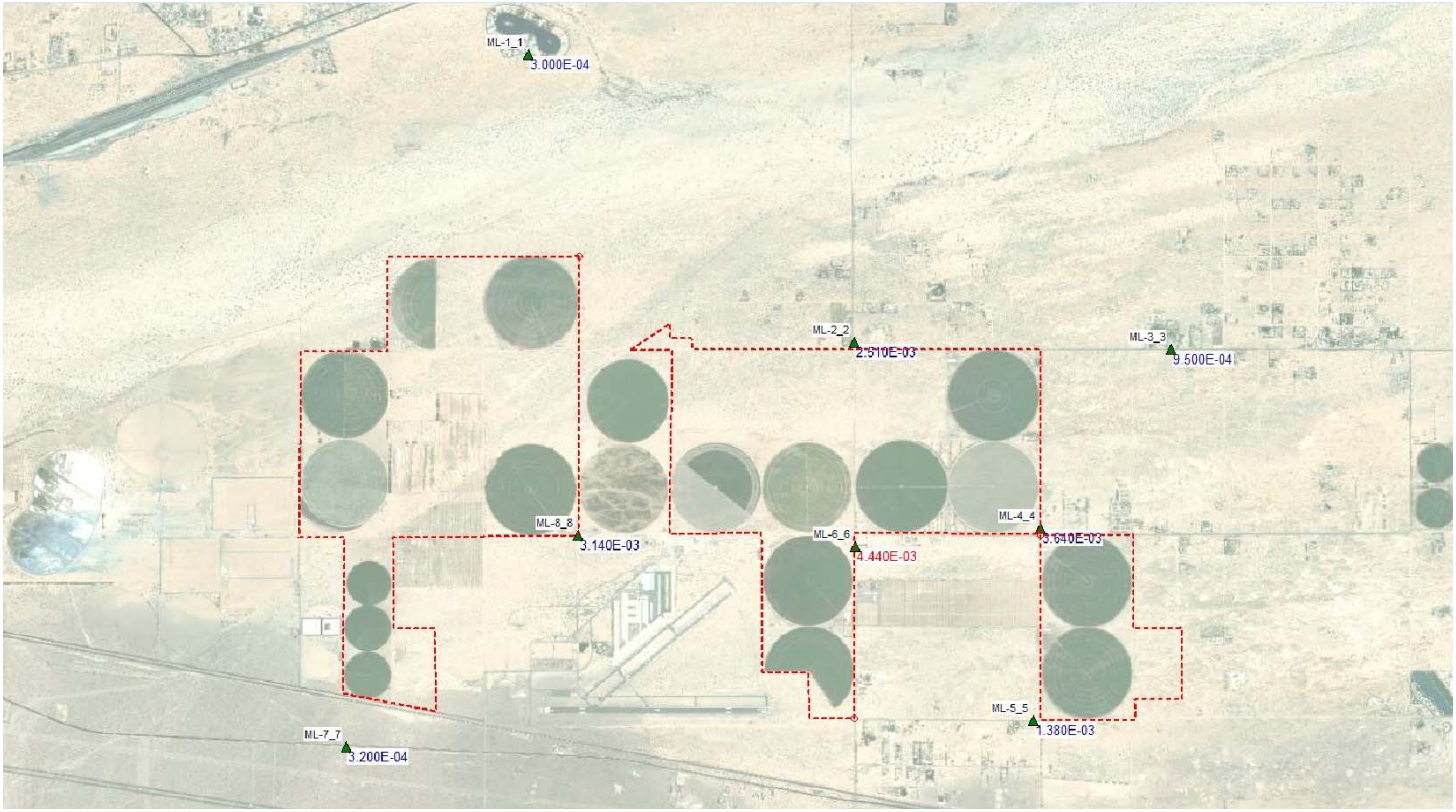
Figure 3. Modeled Receptor Locations



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4.6 Climate Change

4.6.1 Construction Impacts

As discussed in Section 4.1.1, and shown in Table 8, the peak daily construction emissions would not exceed the MDAQMD's 548,000 pound per day threshold for greenhouse gas emissions. Therefore, the short-term construction activities would not generate greenhouse gas emissions, either directly or indirectly, that may have an adverse effect on the environment.

4.6.2 Operational Impacts

As discussed in Section 4.1.2, and shown in Table 9, the peak daily operational emissions would generate 2,563 pounds of carbon dioxide equivalent (CO_2e) per day. Approximately 1,725 acres of cultivated fields and other lands currently used for agricultural production would be cleared of vegetation for development of the project; the remainder of the project site is sparsely vegetated desert and developed or otherwise disturbed land. Of the agricultural areas, most currently are planted with alfalfa, with a smaller amount of pistachio orchards. After accounting for farming activities, alfalfa crops reduce GHG emissions by 2.24 metric tons (MT) of CO_2e per acre per year[11]. Assuming that all of the cleared cropland would be alfalfa, the project would reduce the sequestered carbon by 3,864 MT CO_2e per year or 23,338 pounds of CO_2e per day. Therefore, the total daily GHG emissions of 25,901 pounds per day would not exceed the MDAQMD's 548,000 pound per day threshold. In addition, once operational, the proposed solar farm will offset GHG emissions generated by electricity produced through the burning of fossil fuels. Therefore, the proposed project would not conflict with the GHG reduction goals of AB 32.

[11] https://www.farmlandinfo.org/sites/default/files/AFTCrop-UrbanGreenhouseGasReport-Feburary2015%20Edited%20May2015.pdf

5 Mitigation Measures

5.1 Construction

The following measures will be implemented during construction activities:

5.1.1 Air-1 – Air Quality Construction Management Plan

The project applicant shall implement an Air Quality Construction Management Plan that describes the fugitive dust control measures that would be implemented and monitored at all locations of proposed facility construction. This plan shall comply with the mitigation measures described in the Fugitive Dust Control Rules enforced by MDAQMD (Rule 403.2), as well as the existing SIP available for PM10 and PM2.5. The plan shall be submitted to MDAQMD no less than 60 days prior to the start of construction. The plan shall be incorporated into all contracts and contract specifications for construction work. The plan shall outline the steps to be taken to minimize fugitive dust generated by construction activities by:

- Describing each active operation that may result in the generation of fugitive dust;
- Identifying all sources of fugitive dust, e.g., earth moving, storage piles, vehicular traffic;
- Describing the control measures to be applied to each of the sources identified. The descriptions shall be sufficiently detailed to demonstrate that the best available control measures required by the air quality districts for linear projects are used; and
- Providing the following control measures, in addition to or as listed in the applicable rules but not limited to:
    - All maintenance and access vehicular roads and parking areas shall be stabilized with chemical, gravel or asphaltic pavement sufficient to eliminate visible fugitive dust from vehicular travel and wind erosion. Take actions to prevent project-related track out onto paved surfaces, and clean any project-related track out within 24-hours. All other earthen surfaces within project area shall be stabilized by natural or irrigated vegetation, compaction, chemical or other means sufficient to prohibit visible fugitive dust from wind erosion;
    - All perimeter fencing shall be wind fencing or the equivalent, to a minimum of four feet of height or the top of all perimeter fencing. The owner/operator shall maintain the wind fencing as needed to keep it intact and remove windblown dropout. This wind fencing requirement may be superseded by local ordinance, rule or project-specific design recommendations from the County and/or biological mitigation prohibiting wind fencing;
    - Use a water truck to maintain most disturbed surfaces and actively spread water during visible dusting episodes to minimize visible fugitive dust emissions. For projects with exposed sand or fines deposits (and for projects that expose such soils through earthmoving), chemical stabilization or covering

with a stabilizing layer of gravel will be required to eliminated visible dust/sand from sand/fines deposit;

- o The following signage shall be erected not later than the commencement of construction:

    A minimum 48 inch high by 96 inch wide sign containing the following shall be located within 50 feet of each project site entrance, meeting the specified minimum text height, black text on white background, on one inch A/C laminated plywood board, with the lower edge between six and seven feet above grade, with the contact name of a responsible official for the site and a local or toll-free number that is accessible 24 hours per day:

    "Site Name" (4 inch text)

    "Project Name/Project Number" (4 inch text)

    IF YOU SEE DUST COMING FROM (4 inch text)

    THIS PROJECT CALL: (4 inch text)

    [Contact Name]. PHONE NUMBER: XXX-XXXX (six inch text)

    "If you do not receive a response, Please Call" (three inch text)

    "The MDAQMD at 1-800-635-4617" (three inch text);

- The project applicant or its designated representative shall obtain prior approval from the MDAQMD prior to any deviations from fugitive dust control measures specified in the Air Quality Construction Management Plan. A justification statement used to explain the technical and safety reason(s) that preclude the use of required fugitive dust control measures shall be submitted to the appropriate agency for review.
- The provisions of the Air Quality Construction Management Plan shall also apply to project decommissioning activities.

5.1.2 Air-2

All off-road construction equipment shall comply with EPA's Tier 4 exhaust emission standards.

5.2 Operation

No significant or adverse impacts have been identified and no mitigation measures are required.

5.3 Level of Significance after Mitigation

The proposed Project's construction emissions would continue to exceed the MDAQMD's daily significance thresholds after implementing mitigation measures Air-1 and Air-2. The impact associated with construction emissions will remain significant and unavoidable.

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Appendix A. Detailed Construction Emissions by Stage (Pounds/Day)

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Construction Emissions Unmitigated **Assumes a 400 MW ac**
Revision 2: 02/08/2019

Assumes 11 months (242 working days) for civil and site worl

Stage 1	Specific Construction Activity	Equipment	Original # of Units	Revised # of Units	Hours/day or miles/trip	Original # of Days	Revised # of Days	Adjusted Emission Factors (lb/hr) [g/mile for on-road] ROG	CO	NOX	SOX	PM10	PM2.5	CO2	CH4	Emission (lb) ROG	CO	NOX	SOX	PM10	PM2.5	CO2	CH4	CO2e
Preparation of Laydown Areas,	Equipment Pad Prep	Backhoe	6	6	7	13	198	0.081547	0.242483	0.469309	0.000518	0.045422	0.044059	40.87799	0.000818	678.1	2,016.5	3,902.8	4.3	377.7	366.4	339,941.3	6.8	340,104.5
Construction of Access Roads, PV Field	Site Clearing and Grading, Roads	Bulldozer	70	6	7	197	198	0.06256	0.227937	0.723701	0.000948	0.038063	0.036921	74.81393	0.001496	520.2	1,895.5	6,018.3	7.9	316.5	307.0	622,152.7	12.4	622,451.3
Preparation, Substation Site Preparation,	Site Clearing and Grading, Roads	Front End Loader	8	6	7	77	198	0.060559	0.220648	0.700559	0.000917	0.036845	0.03574	72.42163	0.001448	503.6	1,834.9	5,825.8	7.6	306.4	297.2	602,258.3	12.0	602,547.3
Array Foundation Installation, Conduit	Site Clearing and Grading, Roads	Grader	56	6	7	206	198	0.053387	0.194515	0.617586	0.000809	0.032482	0.031507	63.84412	0.001277	444.0	1,617.6	5,135.8	6.7	270.1	262.0	530,927.7	10.6	531,182.6
Installation, Relay House Construction,	Site Compaction	Roller Compactor	30	6	7	186	198	0.03961	0.152929	0.429377	0.000549	0.030044	0.029142	43.30509	0.000866	329.4	1,271.8	3,570.7	4.6	249.8	242.3	360,125.1	7.2	360,298.0
Perimeter Fence	General, full duration of construction	Skid Steer	12	10	7	200	198	0.050895	0.381004	0.309237	0.000298	0.034812	0.033767	23.49679	0.00047	705.4	5,280.7	4,286.0	4.1	482.5	468.0	325,665.6	6.5	325,821.9
	DC and AC Collection	Trencher	4	4	4	13	198	0.033695	0.327512	0.385623	0.00043	0.031384	0.030442	33.92725	0.000679	106.7	1,037.6	1,221.7	1.4	99.4	96.4	107,481.5	2.1	107,533.1
	General, full duration of construction (trailer no emissions)	Water Buffalo	4	0	4	98	198	0.051148	0.341179	0.646972	0.000685	0.040667	0.039447	54.07481	0.001081	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	General, full duration of construction	Water Truck	116	6	7	226	198	0.013395	0.044963	0.047209	0.000223	0.005103	0.00495	23.41222	0.000547	111.4	373.9	392.6	1.9	42.4	41.2	194,696.1	4.5	194,805.1
	Grading Equipment Only, Mob and De-Mob	Haul truck (on-road)	19	50	80	226	3	0.178697	0.71876	5.439809	0.01656	0.307408	0.298186	1735.735	0.0083	4.7	19.0	143.9	0.4	8.1	7.9	45,918.9	0.2	45,924.2
	Civil and Site Work Workers only during this Stage	Employee Commute (on-road)	300	70	80	226	198	0.031925	1.183478	0.176759	0.002881	0.144739	0.140396	287.6149	0.009042	78.0	2,892.9	432.1	7.0	353.8	343.2	703,058.6	22.1	703,589.1
												lb/acre								Daily Emissions (lbs)				
		Daily Acres										PM								PM10	PM2.5			
Fugitive Dust		10										80								800.0	168.0			
															Total	3,481.7	18,240.4	30,929.7	45.9	2,506.9	2,431.7	3,832,225.7	84.6	3,834,257.1
															Avg Day	14.4	75.4	127.8	0.2	810.4	178.0	15,835.6	0.3	15,844.0
															Threshold	137	548	137	137	82	65			548000
															Exceed?	FALSE	FALSE	FALSE	FALSE	TRUE	TRUE			FALSE

Assumes 11 months (242 working day duration) of Pile Driving
Assumes 27 months (594 workind day duration) of Tracker/PV/Equipment Instal

Stage 2	Specific Construction Activity	Equipment	Original # of Units	Revised # of Units	Hours/day or miles/trip	Original # of Days	Revised # of Days	Adjusted Emission Factors (lb/hr) [g/mile for on-road] ROG	CO	NOX	SOX	PM10	PM2.5	CO2	CH4	Emission (lb) ROG	CO	NOX	SOX	PM10	PM2.5	CO2	CH4	CO2e
Solar Panel Array Installation including pier	Material Receipt and Distribution	Forklift	110	10	6	175	528	0.015379	0.14948	0.176002	0.000196	0.014324	0.013894	15.48474	0.00031	487.2	4,735.5	5,575.8	6.2	453.8	440.2	490,556.7	9.8	490,792.2
supports and racking and tracking system,	Pile Installation	Pile Driver	16	10	7	166	226	0.053623	0.13408	0.685611	0.000853	0.027851	0.027015	67.33254	0.001347	848.3	2,121.2	10,846.4	13.5	440.6	427.4	1,065,200.8	21.3	1,065,712.1
Installation of Conduit in trenches, Wiring	General, full duration of construction, included above	Skid Steer	16	0	7	166	0	0.050895	0.381004	0.309237	0.000298	0.034812	0.033767	23.49679	0.00047	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Installed throughout system to Inverter	DC and AC Collection, included above	Trencher	20	0	4	121	0	0.033695	0.327512	0.385623	0.00043	0.031384	0.030442	33.92725	0.000679	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sites	Miscellaneous Tracker / Racking installation	Welder	40	6	4	177	65	0.070548	0.528129	0.42865	0.000413	0.048254	0.046806	32.57016	0.000651	110.1	823.9	668.7	0.6	75.3	73.0	50,809.4	1.0	50,833.8
	General, full duration of construction, included above	Water Truck	20	0	4	186	0	0.013395	0.044963	0.047209	0.000223	0.005103	0.00495	23.41222	0.000547	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Material and Equipment Delivery	Haul truck (on-road)	11	12	80	186	528	0.178697	0.71876	5.439809	0.01656	0.307408	0.298186	1735.735	0.0083	199.7	803.2	6,078.8	18.5	343.5	333.2	1,939,614.6	9.3	1,939,837.2
	Site Supervision Trucks	Pickup Truck (on-road)	10	10	80	186	528	0.159795	0.878417	1.113111	0.003395	0.256814	0.249109	355.6734	0.007422	148.8	818.0	1,036.5	3.2	239.1	232.0	331,209.1	6.9	331,375.0
	Tracker Erection and Electrician Workers during this Stage	Employee Commute (on-road)	300	350	80	186	528	0.031925	1.183478	0.176759	0.002881	0.144739	0.140396	287.6149	0.009042	1,040.5	38,572.6	5,761.0	93.9	4,717.4	4,575.9	9,374,114.7	294.7	9,381,187.7
															Total	2,834.6	47,874.4	29,967.2	135.9	6,269.7	6,081.6	13,251,505.3	343.0	13,259,738.0
															Avg Day	4.8	80.6	50.4	0.2	10.6	10.2	22,308.9	0.6	22,322.8
															Threshold	137	548	137	137	82	65			548000
															Exceed?	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE			FALSE

Assumes 198 working days MOB to Substation MC

Stage 3	Substation and Gen Tie Construction, Cx, and Close Ou	Equipment	Original # of Units	Revised # of Units	Hours/day or miles/trip	Original # of Days	Revised # of Days	Adjusted Emission Factors (lb/hr) [g/mile for on-road] ROG	CO	NOX	SOX	PM10	PM2.5	CO2	CH4	Emission (lb) ROG	CO	NOX	SOX	PM10	PM2.5	CO2	CH4	CO2e
Inverter Sites Construction, Substation	Substation and Gen Tie	Aerial Lift	8	8	4	99	110	0.021759	0.138326	0.17502	0.000167	0.027735	0.026903	13.21423	0.000264	76.6	486.9	616.1	0.6	97.6	94.7	46,514.1	0.9	46,536.4
Installation Cabling and Terminations,	Foundation Excavation	Backhoe	4	2	7	86	44	0.081547	0.242483	0.469309	0.000518	0.045422	0.044059	40.87799	0.000818	50.2	149.4	289.1	0.3	28.0	27.1	25,180.8	0.5	25,192.9
Gen-Tie Construction, Array and	Setting Equipment Substation and PV array	Crane	8	1	4	108	66	0.048654	0.324548	0.615436	0.000652	0.038685	0.037524	51.43893	0.001029	12.8	85.7	162.5	0.2	10.2	9.9	13,579.9	0.3	13,586.4
Interconnection Commissioning,	see above	Pile Driver	4	0	7	31	0	0.053623	0.13408	0.685611	0.000853	0.027851	0.027015	67.33254	0.001347	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Revegetation, Construction Waste	see above	Skid Steer	2	0	7	61	0	0.050895	0.381004	0.309237	0.000298	0.034812	0.033767	23.49679	0.00047	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Removal and Recycling	Conductor and Conduit install	Trencher	16	1	4	150	66	0.033695	0.327512	0.385623	0.00043	0.031384	0.030442	33.92725	0.000679	8.9	86.5	101.8	0.1	8.3	8.0	8,956.8	0.2	8,961.1
	Material and Equipment delivery	Haul truck (on-road)	3	0.5	80	150	198	0.178697	0.71876	5.439809	0.01656	0.307408	0.298186	1735.735	0.0083	3.1	12.5	95.0	0.3	5.4	5.2	30,306.5	0.1	30,310.0
	Substation and Gen-Tie Workers during this Stage	Employee Commute (on-road)	300	80	80	150	198	0.031925	1.183478	0.176759	0.002881	0.144739	0.140396	287.6149	0.009042	89.2	3,306.2	493.8	8.0	404.3	392.2	803,495.5	25.3	804,101.8
															Total	240.9	4,127.2	1,758.2	9.5	553.8	537.2	928,033.6	27.3	928,688.6
															Avg Day	1.2	20.8	8.9	0.0	2.8	2.7	4,687.0	0.1	4,690.3
															Threshold	137	548	137	137	82	65			548000
															Exceed?	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE			FALSE

Construction Emissions Mitigated

			Hours/day		Adjusted Emission Factors (lb/hr) [g/mile for on-road]								Emission (lb)								
Stage	**Equipment**	**# of Units**	**or miles/trip**	**# of Days**	**ROG**	**CO**	**NOX**	**SOX**	**PM10**	**PM2.5**	**CO2**	**CH4**	**ROG**	**CO**	**NOX**	**SOX**	**PM10**	**PM2.5**	**CO2**	**CH4**	**CO2e**
Preparation of Laydown Areas,	Backhoe	6	7	198	0.013796	0.009693	0.26002	0.000518	0.001178	0.001143	40.87799	0.000818	114.7	80.6	2,162.3	4.3	9.8	9.5	339,941.3	6.8	340,104.5
Construction of Access Roads, PV Field	Bulldozer	6	7	198	0.025249	0.01774	0.475882	0.000948	0.002157	0.002092	74.81393	0.001496	210.0	147.5	3,957.4	7.9	17.9	17.4	622,152.7	12.4	622,451.3
Preparation, Substation Site Preparation,	Front End Loader	6	7	198	0.024442	0.017173	0.460665	0.000917	0.002088	0.002025	72.42163	0.001448	203.3	142.8	3,830.9	7.6	17.4	16.8	602,258.3	12.0	602,547.3
Array Foundation Installation, Conduit	Grader	6	7	198	0.021547	0.015139	0.406104	0.000809	0.001841	0.001785	63.84412	0.001277	179.2	125.9	3,377.2	6.7	15.3	14.8	530,927.7	10.6	531,182.6
Installation, Relay House Construction,	Roller Compactor	6	7	198	0.014615	0.010269	0.275458	0.000549	0.001248	0.001211	43.30509	0.000866	121.5	85.4	2,290.7	4.6	10.4	10.1	360,125.1	7.2	360,298.0
Perimeter Fence	Skid Steer	10	7	198	0.00793	0.015178	0.179352	0.000298	0.000677	0.000657	23.49679	0.00047	109.9	210.4	2,485.8	4.1	9.4	9.1	325,665.6	6.5	325,821.9
	Trencher	4	4	198	0.01145	0.021915	0.258968	0.00043	0.000978	0.000949	33.92725	0.000679	36.3	69.4	820.4	1.4	3.1	3.0	107,481.5	2.1	107,533.1
	Water Buffalo	0	4	198	0.01825	0.03493	0.412756	0.000685	0.001559	0.001512	54.07481	0.001081	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Water Truck	6	7	198	0.013395	0.044963	0.047209	0.000223	0.005103	0.00495	23.41222	0.000547	111.4	373.9	392.6	1.9	42.4	41.2	194,696.1	4.5	194,805.1
	Haul truck (on-road)	50	80	3	0.178697	0.71876	5.439809	0.01656	0.307408	0.298186	1735.735	0.0083	4.7	19.0	143.9	0.4	8.1	7.9	45,918.9	0.2	45,924.2
	Employee Commute (on-road)	70	80	198	0.031925	1.183478	0.176759	0.002881	0.144739	0.140396	287.6149	0.009042	78.0	2,892.9	432.1	7.0	353.8	343.2	703,058.6	22.1	703,589.1
									lb/acre								Daily Emissions (lbs)				
	Daily Acres								PM								PM10	PM2.5			
Fugitive Dust	10								40								400.0	84.0			
												Total	1,169.0	4,147.9	19,893.3	45.9	487.6	473.0	3,832,225.7	84.6	3,834,257.1
												Avg Day	4.8	17.1	82.2	0.2	402.0	86.0	15,835.6	0.3	15,844.0
												Threshold	137	548	137	137	82	65			548000
												Exceed?	FALSE	FALSE	FALSE	FALSE	TRUE	TRUE			FALSE

			Hours/day		Adjusted Emission Factors (lb/hr) [g/mile for on-road]								Emission (lb)								
Stage	**Equipment**	**# of Units**	**or miles/trip**	**# of Days**	**ROG**	**CO**	**NOX**	**SOX**	**PM10**	**PM2.5**	**CO2**	**CH4**	**ROG**	**CO**	**NOX**	**SOX**	**PM10**	**PM2.5**	**CO2**	**CH4**	**CO2e**
Solar Panel Array Installation including pier	Forklift	10	6	528	0.005226	0.010002	0.118196	0.000196	0.000446	0.000433	15.48474	0.00031	165.6	316.9	3,744.4	6.2	14.1	13.7	490,556.7	9.8	490,792.2
supports and racking and tracking system,	Pile Driver	10	7	226	0.022724	0.015966	0.428294	0.000853	0.001941	0.001883	67.33254	0.001347	359.5	252.6	6,775.6	13.5	30.7	29.8	1,065,200.8	21.3	1,065,712.1
Installation of Conduit in trenches, Wiring	Skid Steer	0	7	0	0.00793	0.015178	0.179352	0.000298	0.000677	0.000657	23.49679	0.00047	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Installed throughout system to Inverter	Trencher	0	4	0	0.01145	0.021915	0.258968	0.00043	0.000978	0.000949	33.92725	0.000679	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sites	Welder	6	4	65	0.010992	0.021039	0.24861	0.000413	0.000939	0.000911	32.57016	0.000651	17.1	32.8	387.8	0.6	1.5	1.4	50,809.4	1.0	50,833.8
	Water Truck	0	4	0	0.013395	0.044963	0.047209	0.000223	0.005103	0.00495	23.41222	0.000547	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Haul truck (on-road)	12	80	528	0.178697	0.71876	5.439809	0.01656	0.307408	0.298186	1735.735	0.0083	199.7	803.2	6,078.8	18.5	343.5	333.2	1,939,614.6	9.3	1,939,837.2
	Pickup Truck (on-road)	10	80	528	0.159795	0.878417	1.113111	0.003395	0.256814	0.249109	355.6734	0.007422	148.8	818.0	1,036.5	3.2	239.1	232.0	331,209.1	6.9	331,375.0
	Employee Commute (on-road)	350	80	528	0.031925	1.183478	0.176759	0.002881	0.144739	0.140396	287.6149	0.009042	1,040.5	38,572.6	5,761.0	93.9	4,717.4	4,575.9	9,374,114.7	294.7	9,381,187.7
												Total	1,931.2	40,796.1	23,784.2	135.9	5,346.4	5,186.0	13,251,505.3	343.0	13,259,738.0
												Avg Day	3.3	68.7	40.0	0.2	9.0	8.7	22,308.9	0.6	22,322.8
												Threshold	137	548	137	137	82	65			548000
												Exceed?	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE			FALSE

			Hours/day		Adjusted Emission Factors (lb/hr) [g/mile for on-road]								Emission (lb)								
Stage	**Equipment**	**# of Units**	**or miles/trip**	**# of Days**	**ROG**	**CO**	**NOX**	**SOX**	**PM10**	**PM2.5**	**CO2**	**CH4**	**ROG**	**CO**	**NOX**	**SOX**	**PM10**	**PM2.5**	**CO2**	**CH4**	**CO2e**
Inverter Sites Construction, Substation	Aerial Lift	8	4	110	0.009466	0.055187	0.15896	0.000167	0.008281	0.008033	13.21423	0.000264	33.3	194.3	559.5	0.6	29.2	28.3	46,514.1	0.9	46,536.4
Installation Cabling and Terminations,	Backhoe	2	7	44	0.013796	0.009693	0.26002	0.000518	0.001178	0.001143	40.87799	0.000818	8.5	6.0	160.2	0.3	0.7	0.7	25,180.8	0.5	25,192.9
Gen-Tie Construction, Array and	Crane	1	4	66	0.01736	0.033227	0.392636	0.000652	0.001483	0.001438	51.43893	0.001029	4.6	8.8	103.7	0.2	0.4	0.4	13,579.9	0.3	13,586.4
Interconnection Commissioning,	Pile Driver	0	7	0	0.022724	0.015966	0.428294	0.000853	0.001941	0.001883	67.33254	0.001347	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Revegetation, Construction Waste Removal	Skid Steer	0	7	0	0.00793	0.015178	0.179352	0.000298	0.000677	0.000657	23.49679	0.00047	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
and Recycling	Trencher	1	4	66	0.01145	0.021915	0.258968	0.00043	0.000978	0.000949	33.92725	0.000679	3.0	5.8	68.4	0.1	0.3	0.3	8,956.8	0.2	8,961.1
	Haul truck (on-road)	0.5	80	198	0.178697	0.71876	5.439809	0.01656	0.307408	0.298186	1735.735	0.0083	3.1	12.5	95.0	0.3	5.4	5.2	30,306.5	0.1	30,310.0
	Employee Commute (on-road)	80	80	198	0.031925	1.183478	0.176759	0.002881	0.144739	0.140396	287.6149	0.009042	89.2	3,306.2	493.8	8.0	404.3	392.2	803,495.5	25.3	804,101.8
												Total	141.7	3,533.6	1,480.5	9.5	440.2	427.0	928,033.6	27.3	928,688.6
												Avg Day	0.7	17.8	7.5	0.0	2.2	2.2	4,687.0	0.1	4,690.3
												Threshold	137	548	137	137	82	65			548000
												Exceed?	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE			FALSE

			Hours/day		Adjusted Emission Factors (lb/hr) [g/mile for on-road]								Emission (lb)								
Activity	**Equipment**	**# of Units**	**or miles/trip**	**# of Days**	**ROG**	**CO**	**NOX**	**SOX**	**PM10**	**PM2.5**	**CO2**	**CH4**	**ROG**	**CO**	**NOX**	**SOX**	**PM10**	**PM2.5**	**CO2**	**CH4**	**CO2e**
On-Road Operational Phase (commute to site)																					
Daily O&M	Light Duty Truck	8	30	260	0.032	1.183	0.177	0.003	0.142	0.061	287.615	0.009	4.4	162.8	24.3	0.4	19.6	8.4	39,566.1	1.2	39,595.9
Maintenance	Light Duty Truck	40	80	40	0.032	1.183	0.177	0.003	0.142	0.061	287.615	0.009	9.0	334.0	49.9	0.8	40.1	17.2	81,161.2	2.6	81,222.4
Array Cleaning	Light Duty Truck	40	80	40	0.032	1.183	0.177	0.003	0.142	0.061	287.615	0.009	9.0	334.0	49.9	0.8	40.1	17.2	81,161.2	2.6	81,222.4
Off-Road Operational Phase (on-site operations)																					
Daily O&M	Light Duty Truck	8	30	130	0.032	1.183	0.177	0.003	0.142	0.061	287.615	0.009	2.2	81.4	12.2	0.2	9.8	4.2	19,783.0	0.6	19,798.0
Maintenance	Light Duty Truck	40	2	40	0.032	1.183	0.177	0.003	0.142	0.061	287.615	0.009	0.2	8.3	1.2	0.0	1.0	0.4	2,029.0	0.1	2,030.6
Array Cleaning	Light Duty Truck	15	3	40	0.032	1.183	0.177	0.003	0.142	0.061	287.615	0.009	0.1	4.7	0.7	0.0	0.6	0.2	1,141.3	0.0	1,142.2
On-site Portable Equipment																					
Maintenance	ATVs	4	4	5	0.225	5.131	0.099	0.000	0.000	0.000	7.829	0.000	18.0	410.5	7.9	0.0	0.0	0.0	626.3	0.0	626.6
	Kubota Tractors	4	8	100	0.008	0.044	0.128	0.000	0.007	0.006	10.622	0.000	24.3	142.0	408.9	0.4	21.3	20.7	33,989.9	0.7	34,006.2
	Portable Generators	4	8	60	0.023	0.132	0.379	0.000	0.020	0.019	31.544	0.001	43.4	252.9	728.5	0.8	38.0	36.8	60,563.8	1.2	60,592.9
	Portable Water Trailers with pump	10	8	80	0.018	0.035	0.413	0.001	0.002	0.002	54.075	0.001	116.8	223.6	2,641.6	4.4	10.0	9.7	346,078.8	6.9	346,244.9
												Total	227.5	1,954.1	3,925.2	7.8	180.4	114.7	666,100.6	15.9	666,482.1
												Avg Day	0.9	7.5	15.1	0.0	0.7	0.4	2,561.9	0.1	2,563.4
												Threshold	137	548	137	137	82	65			548000
												Exceed?	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE			FALSE