## 3.1.2 Geology, Soils, and Seismicity

This section discusses potential impacts to existing geology and soils conditions as well as potential exposure to risks associated with those conditions that may result from implementation of the Jacumba Solar Energy Project (Proposed Project). The analysis is based on the review of the Geotechnical Engineering Investigation prepared by Krazan & Associates Inc. (2011) provided as Appendix 3.1.2-1, as well as existing resources, technical data, and applicable laws, regulations, and guidelines.

### *3.1.2.1 Existing Conditions*

#### Geologic Setting

The Proposed Project is located on the eastern portion of the Peninsular Range Geomorphic Province of Southern California. The Peninsular Range Geomorphic Province is typified by northwest to southeast trending mountain ranges approximately parallel to the San Andreas and related regional fault system. The Peninsular Ranges are generally characterized by granitic rocks ranging in the Peninsular Ranges batholith and associated metamorphic rocks; and sedimentary rocks ranging in age from Cretaceous to Pleistocene from the San Diego embayment and coastal terraces west of the batholith (Appendix 3.1.2-1).

#### Soils

A variety of soil types typical of those found in the surrounding geologic region occur within the Project site (please refer to Table 3.1.2-1, Soil Units within the Project Site). Soils within the Project boundary consist of loose silty sand in the upper-most soils (approximately 18–24 inches), known to have low strength characteristics and highly compressible when saturated (Appendix 3.1.2-1). Below the upper soils (approximately 4 to 20 feet below grade), medium-to-very dense soils consisting of sand and silty sand with varying gravel content are present, with strong and slightly compressible characteristics. Weathered sandstone bedrock exists below the medium-to-very-dense soils (Appendix 3.1.2-1).

Soils within the Proposed Project boundary all have similar characteristics; all are primarily coarse sands with some loam,[1] are well-drained with low-to-moderate runoff potential, have a high wind erosion susceptibility, low shrink/swell potential, and low-to-moderate risk of corrosion (NRCS 2014). Site-specific testing within the Proposed Project area indicated the soils would not be classified as corrosive, based on California Department of Transportation (Caltrans) guidelines. The soils on site tend to have significant fractions of gravel and cobbles.

[1] Loam is soil composed of sand, silt, and clay in relatively even concentration (about 40%-40%-20% concentration, respectively). The term is often qualified to indicate a relative abundance of one constituent over others (e.g., a "sandy loam" is a loam, but where sand is more abundant than silt and clay).

The soils are generally poorly developed, meaning they are young, support fairly thin topsoils, and do not differ greatly in character from the underlying weathered bedrock material (which in this case, is also referred to as decomposed granite). None of the soil units identified above are on the County of San Diego's (County's) list of hydric or clay soils (County of San Diego 2007a, Tables 1 and 2).

### Topography

Within the Project boundaries, the Jacumba Solar Energy Project site is gently sloped with a small hill on the southwestern portion of the site. The southwestern quadrant of the solar facility ranges in elevation from approximately 3,110 feet above mean sea level (amsl) to 3,140 feet amsl. The eastern portion of the solar facility ranges from 3,120 feet amsl to 3,140 feet amsl.

### Faults and Seismicity

The Proposed Project is not within a designated Alquist-Priolo earthquake fault zone. The closest designated Alquist-Priolo zone is approximately 17 miles north of the Project (County of San Diego 2007a, Figure 2). The closest mapped faults to the Project site (surrounding the Project area) are pre-Quaternary in age, and are generally considered to have little to no potential to generate an earthquake. Holocene-active faults considered capable of producing a large earthquake include, from closest to farthest, the Laguna Salada Fault; the Borrego Mountain section and the Superstition Hills section of the San Jacinto Fault Zone; Elsinore Fault Zone, the Imperial Fault, the Brawley Seismic Zone, the Newport–Inglewood–Rose Fault Zone, and the San Andreas Fault (CGS 2010). Based on a review of geologic maps, the Project area is not underlain by known active or potentially active faults (i.e., faults that exhibit evidence of ground displacement in the last 11,000 years and 2,000,000 years, respectively). A specific Fault Rupture Hazards Zone Map does not currently exist for the unincorporated Jacumba area.

### Ground Shaking

The Proposed Project site is located in a seismically active area, as is the majority of Southern California, and the potential for strong ground motion is considered substantial during the design life of the Project. The most recent large seismic event to affect the Project vicinity was on April 4, 2010, when a magnitude 7.2 earthquake struck an area approximately 30 miles south of Mexicali (Sierra El Mayor Earthquake). The epicenter of the earthquake was well south of the international border, but resulted in observable surface slip on several faults, or portions of faults, in the southwestern part of the Salton Trough, near Ocotillo (approximately 17 miles west–northwest of the Project area). Most fault offsets were minor in magnitude—less than 20 millimeters (about 0.8 inch)—but offsets observed on the Yuha, Pinto Wash, and Ocotillo faults were 50–60 millimeters (about 2 inches), 40 millimeters (1.5 inches), and 85 millimeters (3.3 inches), respectively (USGS and CGS 2011). These faults, occurring in a

broad area of the Yuha Desert, were not previously zoned under the Alquist–Priolo Earthquake Fault Zoning Act (Alquist-Priolo Act) because it was the first time that surface fractures had been observed in the southwestern Salton Trough. Consequently, in 2012, the California Geological Survey (CGS, formerly California Division of Mines and Geology) updated its Alquist-Priolo maps to identify portions of the Laguna Salada Section of the Elsinore Fault, the Yuha Wells Fault, and other unnamed faults in the vicinity of Ocotillo as active earthquake fault zones under the Alquist-Priolo Act.

The Sierra El Mayor Earthquake is estimated to have resulted in a Modified Mercalli Intensity[2] of VI (strong) to VII (very strong) in the Project area (USGS 2010). Typically, ground shaking associated with intensity of VII is associated with negligible damage in buildings of good design and construction; slight to moderate damage in well-built ordinary structures; and considerable damage in poorly built or badly designed structures (e.g., brick and unreinforced masonry) (USGS 2012). These are only estimates based on correlations between average peak ground accelerations (PGAs) and the observed level of damage in past earthquakes—the actual level of shaking experienced and the level of damage caused in any one place is highly site- and earthquake-specific.

The primary tool that seismologists use to describe potential for future ground shaking hazards is a probabilistic seismic hazard assessment. The probabilistic seismic hazard assessment for the State of California takes into consideration the range of possible earthquake sources (including worst-case scenarios) and estimates their characteristic magnitudes to generate a probability map for ground shaking. The probabilistic seismic hazard assessment maps depict values of PGA[3] with a 10% probability of being exceeded in 50 years (i.e., a 1 in 475 annual chance). Use of this probability level allows engineers to design structures to withstand ground motions with a 90% chance of *not* occurring in the next 50 years, making buildings safer than if they were merely designed for the most probable events.

The probabilistic seismic hazard assessment for the State of California indicates that the Project area is unlikely to experience severe or highly destructive levels of ground shaking, primarily as a result of its distance from historically active faults. In the Project area, there is only a 10% chance of exceeding PGA values of 0.27–0.33 acceleration due to gravity (g) over the next 50

[2] This scale, composed of 12 increasing levels of intensity that range from imperceptible shaking to catastrophic destruction (I–XII), does not have a mathematical basis; instead, it is an arbitrary ranking of shaking intensity based on observed effects.

[3] The PGA for a given component of motion is the largest value of horizontal acceleration obtained from a seismograph. PGA is expressed as a percentage of the constant value of acceleration due to gravity (g) (approximately 980 centimeters per second squared). Unlike measures of magnitude, which provide a single measure of earthquake energy, PGA resulting from an earthquake varies from place to place, depending on distance from the earthquake epicenter and character of the underlying geology (e.g., hard bedrock, soft sediments, or artificial fills).

years, with the lower values corresponding to areas over bedrock, and the higher values corresponding to areas over unconsolidated alluvium (CGS 2003). Values exceeding PGA 0.27–0.33 g are typically associated with an earthquake with a Modified Mercalli Intensity of VIII, which would likely cause substantial damage in buildings not constructed according to modern building standards, with older brick or unreinforced masonry buildings prone to collapse. Structures adequately designed to current standards could also suffer cosmetic or utility damage, but would be unlikely to experience either full or partial structural collapse.

When compared to other areas of California, particularly the urban areas of Southern California and the Bay Area which are close to historically active faults, these levels of PGA are relatively low. This information is consistent with the County's Geologic Hazards Guidelines, which do not identify any of the Project site as being within a near-source shaking zone (County of San Diego 2007a, Figure 3).

### Liquefaction

Liquefaction occurs primarily in saturated, loose, fine to medium-grained soils in areas where the groundwater table is generally 50 feet or less below the surface (County of San Diego 2007a). The areas for potential liquefaction hazard in the San Diego County include the lower San Dieguito, Sweetwater, and San Luis Rey River Valleys; Jacumba; Borrego Valley near the Borrego Sink; and parts of Ramona (County of San Diego 2007a). Soil type, groundwater depth, relative density, initial confining pressure, and intensity and duration of groundshaking were evaluated within the Proposed Project area to determine liquidation potential at the site. Soils encountered at the site consisted of predominantly very dense silty sands, sand with silt, and sandstone. Groundwater was not observed during subsurface exploration (historically located at depths greater than 75 feet within the Project vicinity) and is not anticipated to rise within the zone of structural influence or affect the construction of foundations and pavements (Appendix 3.1.2-1). The potential for liquefaction at the site was determined to be very low (Appendix 3.1.2-1) and therefore is not considered an issue for the Proposed Project.

### Landslides

Previous landslides and landslide-prone sedimentary formations are located in western portions of unincorporated San Diego County; however, landslides can also occur in the granitic terrain in the eastern portion of San Diego County, although they are less prevalent (County of San Diego 2011a; URS 2004). The entire County was screened to profile the risk of landslides in the *Multi-Jurisdictional Hazard Mitigation Plan*, San Diego, CA (County of San Diego 2007; URS 2004). The data used to profile the risk of landslides included steep slopes (greater than 25%); soil series data (SANDAG based on U.S. Geological Survey (USGS) 1970s series); soil-slip susceptibility from USGS; and Division of Mines and Geology Landslide Hazard Zone Maps, and is found on

Figure 5 of the County's *Guidelines for Determining Significance and Report Format and Content Requirements – Geologic Hazards* (Geologic Hazards Guidelines; County of San Diego 2007a). Based on site-specific geotechnical investigations, landslides are not considered an issue at the Proposed Project site because no evidence of landslides was observed and because slope gradients are relatively low (Appendix 3.1.2-1). This finding is consistent with the County's Geologic Hazards Guidelines, which do not identify the Project site as being within a landslide susceptibility area but show areas adjacent to the Project area as having slopes greater than 25% and having localized high slide-prone formations (County of San Diego 2007a, Figure 5).

#### Expansive Soils

Based on the soil survey, the potential for expansive soils to be present on the site is low. Due to the sandy, granular character of the soils and their low organic content, soils are generally non-plastic and therefore not prone to shrink/swell behavior (NRCS 2012; Appendix 3.1.2-1). The southwestern portion of the site is within an area identified as having expansive soils in the County's Geologic Hazards Guidelines (County of San Diego 2007a, Figure 6).

### *3.1.2.2 Regulatory Setting*

#### Federal Regulations

The following federal regulations pertaining to geologic hazards would apply to the Proposed Project.

#### Occupational Safety and Health Administration Regulations

Excavation and trenching are among the most hazardous construction operations. The Occupational Safety and Health Administration's (OSHA's) Excavation and Trenching standard, Title 29 of the Code of Federal Regulations (CFR), Part 1926.650, covers requirements for excavation and trenching operations. OSHA requires that all excavations in which employees could potentially be exposed to cave-ins be protected by sloping or benching the sides of the excavation, supporting the sides of the excavation, or placing a shield between the side of the excavation and the work area. In California, the California Occupational Safety and Health Administration (Cal/OSHA) has responsibility for implementing federal rules relevant to worker safety, including slope protection during construction excavations. Cal/OSHA's requirements are more restrictive and protective than federal OSHA standards.

#### U.S. Geological Survey Landslide Hazard Program

In fulfillment of the requirements of Public Law 106-113, the USGS created the Landslide Hazard Program in the mid-1970s. According to USGS, the primary objective of the National

Landslide Hazards Program is to reduce long-term losses from landslide hazards by improving our understanding of the causes of ground failure and suggesting mitigation strategies (County of San Diego 2011a). The federal government takes the lead role in funding and conducting this research, whereas the reduction of losses due to geologic hazards is primarily a state and local responsibility. In San Diego County, the Unified Disaster Council is the governing body of the Unified San Diego County Emergency Services Organization. The primary purpose of the Unified Disaster Council and the Emergency Services Organization is to provide for the coordination of plans and programs designed for the protection of life and property in the County of San Diego.

## State Regulations

The statewide minimum public safety standard for mitigation of earthquake hazards (as established through the California Building Code (CBC), Alquist–Priolo Earthquake Fault Zoning Act, and the Seismic Hazards Mapping Act) is that the minimum level of mitigation for a Project should reduce the risk of ground failure during an earthquake to a level that does not cause the collapse of buildings for human occupancy,[4] but in most cases, is not required to prevent or avoid the ground failure itself. It is not feasible to design all structures to completely avoid damage in worst-case earthquake scenarios. Accordingly, regulatory agencies have generally defined an "acceptable level" of risk as that which provides reasonable protection of the public safety; although it does not necessarily ensure continued structural integrity and functionality of a project (14 CCR 3721(a)). Nothing in these acts, however, precludes lead agencies from enacting more stringent requirements, requiring a higher level of performance, or applying these requirements to developments other than those that meet the acts' definitions of "project."

### Alquist–Priolo Earthquake Fault Zoning Act

The Alquist-PrioloAct was passed in 1972 to mitigate the hazard of surface faulting to structures for human occupancy. In accordance with this act, the State Geologist established regulatory zones, called "earthquake fault zones," around the surface traces of active faults and has published maps showing these zones. Earthquake fault zones are designated by the CGS and are delineated along traces of faults where mapping demonstrates surface fault rupture has occurred within the past 11,000 years. Construction within these zones cannot be permitted until a geologic investigation has been conducted to prove that a building planned for human occupancy will not be constructed across an active fault. These types of site evaluations address the precise location and recency of rupture along traces of the faults and are typically based on observations made in trenches excavated across fault traces.

[4] A "structure for human occupancy" is any structure used or intended for supporting or sheltering any use or occupancy, which is expected to have a human occupancy rate of more than 2,000 person-hours per year.

The Proposed Project is not within an Alquist-Priolo earthquake fault zone and therefore is not subject to the requirements of this act.

### Seismic Hazards Mapping Act

The Seismic Hazards Mapping Act of 1990 (California Public Resources Code, Chapter 7.8, Section 2690 et seq.) directs the CGS to protect the public from earthquake-induced liquefaction and landslide hazards (note that these hazards are distinct from fault surface rupture hazard regulated by the Alquist-Priolo Act). This act requires the State Geologist to delineate various seismic hazard zones and requires cities, counties, and other local permitting agencies to regulate certain development projects within these zones (i.e., zones of required investigation). Before a development permit may be granted for a site within a Seismic Hazard Zone, a geotechnical investigation of the site must be conducted and appropriate mitigation measures incorporated into the project design. Evaluation and mitigation of potential risks from seismic hazards within zones of required investigation must be conducted in accordance with the CGS Special Publication 117A, adopted March 13, 1997, by the State Mining and Geology Board as updated in 2008.

As of 2012, Seismic Hazard Zone Maps have been prepared for portions of populated areas of Southern California and the San Francisco Bay Area; however, no seismic hazard zones have yet been delineated for the Project area. As a result, the provisions of the Seismic Hazards Mapping Act would not apply to the Project.

### California Building Code

The CBC has been codified in the California Code of Regulations (CCR) as Title 24, Part 2. Title 24 is administered by the California Building Standards Commission, which, by law, is responsible for coordinating all building standards. Under state law, all building standards must be centralized in Title 24 or they are not enforceable. The purpose of the CBC is to establish minimum standards to safeguard the public health, safety, and general welfare through structural strength, means of egress facilities, and general stability by regulating and controlling the design, construction, quality of materials, use and occupancy, location, and maintenance of all building and structures within its jurisdiction. The 2010 edition of the CBC is based on the 2009 International Building Code published by the International Code Conference. The 2010 CBC contains California amendments based on the American Society of Civil Engineers (ASCE) Minimum Design Standards 7-05. ASCE 7-05 provides requirements for general structural design and includes means for determining earthquake loads as well as other loads (such as wind loads) for inclusion into building codes. The provisions of the CBC apply to the construction, alteration, movement, replacement, and demolition of every building or structure or any appurtenances connected or attached to such buildings or structures throughout California.

## Local Regulations

The following local/regional regulations pertaining to geology, soils, and seismicity would apply to the Proposed Project.

## County Special Studies Zones

The Alquist-Priolo Act provides that a city or county may establish more restrictive policies than those within the Alquist-Priolo Act, if desired. The County established Special Study Zones that include late-Quaternary faults mapped by the CGS in the County. Late-Quaternary faults (movement during the past 700,000 years) were mapped based on geomorphic evidence similar to that of Holocene faults except that tectonic features are less distinct. As indicated by the CGS, these faults may be younger, but the lack of younger overlying deposits precludes more accurate age classification. Traces of faults within "Special Study Zones" are treated by the County as active unless a fault investigation can prove otherwise. Before any construction is allowed, a geologic study must be conducted to determine if any active fault lines are located on or within the vicinity of the Project site. For areas where active faulting is identified the County's Fault Displacement Area regulations, which regulate new development in areas subject to potential loss of life and property from earthquake fault displacement in order to mitigate such losses.

## San Diego County General Plan

The 2011 County General Plan guides future growth in the unincorporated areas of the County and considers projected growth anticipated to occur within various communities. The following goals and policies from several General Plan elements were determined to be applicable to the Proposed Project.

### Safety Element

The following goals and policies of the Safety Element are applicable to the Proposed Project.

**Goal S-7: Reduced Seismic Hazards.** Minimized personal injury and property damage resulting from seismic hazards.

- **Policy S-7.1: Development Location**. Locate development in areas where the risk to people or resources is minimized. In accordance with the California Department of Conservation Special Publication 42, require development be located a minimum of 50 feet from active or potentially active faults, unless an alternative setback distance is approved based on geologic analysis and feasible engineering design measures adequate to demonstrate that the fault rupture hazard would be avoided.

- **Policy S-7.2: Engineering Measures to Reduce Risk.** Require all development to include engineering measures to reduce risk in accordance with the CBC, Uniform Building Code, and other seismic and geologic hazard safety standards, including design and construction standards, that regulate land use in areas known to have or potentially have significant seismic and/or other geologic hazards.
- **Policy S-7.3: Land Use Location**. Prohibit high occupancy uses, essential public facilities, and uses that permit significant amounts of hazardous materials within Alquist–Priolo and County special studies zones.

**Goal S-8: Reduced Landslide, Mudslide, and Rock Fall Hazards.** Minimized personal injury and property damage caused by mudslides, landslides, or rock falls.

- **Policy S-8.1: Landslide Risks.** Direct development away from areas with high landslide, mudslide, or rock fall potential when engineering solutions have been determined by the County to be infeasible.
- **Policy S-8.2: Risk of Slope Instability.** Prohibit development from causing or contributing to slope instability.

## San Diego County Code

### Grading Ordinance

Division 7 of Title 8 of the San Diego County Code (County of San Diego 2011b), Grading Ordinance, establishes the requirement to obtain a grading permit prior to grading operations. The grading ordinance requires the submittal of grading plans or improvement plans for review by the County Official (Director of Public Works or his or her authorized representative) prior to issuance of a grading permit. The ordinance contains design standards and performance requirements which must be met to avoid or reduce to an acceptable level the potential for slope instabilities, expansive soils, excessive erosion, and sedimentation to adversely affect the proposed development (Chapter 4). The ordinance sets forth the maximum slope allowed for cut and fill slopes, the requirement for drainage terraces on cut or fill slopes exceeding 40 feet in height, expansive soil requirements for cuts and fills, minimum setback requirements for buildings from cut or fill slopes, and reporting requirements including a soil engineer's report and a final engineering geology report by an engineering geologist, which includes specific approval of the grading as affected by geological factors. The ordinance also contains requirements to reduce effects on air quality (Section 87.428, dust control), native habitat (Section 87.503), cultural and paleontological resources (Sections 87.429 and 87.430), and watercourses (Chapter 6). Upon review of grading plans, the County Official has the authority to approve, attach conditions of approval, or deny the permit application.

The applicant for the Proposed Project would be required to submit a soil investigation report which would include, but would not be limited to, data regarding the nature, distribution, and strength of existing soils and rock on the site; the soil engineer's conclusions and recommendations for grading requirements, including the correction of weak or unstable soil conditions and treatment of any expansive soils that may be present; and their opinions as to the adequacy of building sites to be developed by the proposed grading operations (Section 87.209). The soil engineer shall provide an engineering geology report by an engineering geologist when required by the County Official. Recommendations included in such reports and approved by the County Official shall be incorporated in the grading plan or specifications.

#### On-Site Wastewater Treatment System Ordinance

Chapter 3, Division 8, of Title 6 of the San Diego County Code (County of San Diego 2011c) establishes the requirements for on-site wastewater treatment systems in the County. The purpose of this chapter is to implement state laws and regulations associated with waste discharge requirements (State Water Resources Control Board and the California Regional Water Quality Control Board for the San Diego Region) and implement additional standards for septic systems and graywater systems that are necessary to protect the health and safety of the San Diego County community. It also makes it unlawful for any person to cause, suffer, or permit the disposal of sewage, human excrement, or other liquid wastes, in any place or manner except through and by means of an approved plumbing and drainage system and an approved sewage disposal system.

If no public sanitary sewer system is available, the ordinance allows for installation of on-site wastewater treatment systems provided that the requirements and standards of the ordinance are complied with and a permit issued by the Department of Environmental Health is obtained. Standards and requirements include, but are not limited to soil percolation tests to determine soil suitability, the selection of a treatment system appropriate for the site conditions, and specific setback requirements from lakes, streams, ponds, slopes, and other utilities and structures. Chapter 6, Division 8, of Title 6 of the County Code pertains to Septic Tank and Cesspool Cleaners, which establishes processes, fees, and requirements for the examination, cleaning, and collection of sewage from septic tanks and cesspools.

### *3.1.2.3 Analysis of Project Effects and Determination as to Significance*

This section characterizes the geologic and seismic hazards in the Proposed Project area in order to evaluate their potential adverse effects on the Project as well as the potential for the Project to create or worsen such hazards for the public and/or surrounding properties. For geology and soil conditions, the study area is typically limited to the footprint of the Project, whereas for seismic hazards, the study area is regional, because earthquakes on distant faults can produce ground shaking on the Project site.

The scope of the impact analysis reflects the significance thresholds contained in the County's Geologic Hazards Guidelines (County of San Diego 2007a), which address fault rupture, ground shaking, liquefaction, landslides, and expansive soils. Baseline information against which potential impacts of the Project are compared is derived from a variety of sources, including maps and surveys from the USGS, the U.S. Department of Agriculture, the CGS, and the County General Plan. The impact analysis is based in large part on the preliminary geotechnical investigation completed by Krazan & Associates (see Appendix 3.1.2-1) and the County Geologic Hazards Guidelines.

#### *3.1.2.3.1 Fault Rupture*

##### Guidelines for the Determination of Significance

For the purposes of this Environmental Impact Report (EIR), the County's Geologic Hazards Guidelines (County of San Diego 2007a) apply to both the direct impact analysis and the cumulative impact analysis. These significance guidelines have been developed by the County to address question VI a) i) in the California Environmental Quality Act (CEQA) Guidelines, Appendix G (14 CCR 15000 et seq.), and to ensure compliance with Fault Displacement Area regulations within the County Zoning Ordinance.

A significant impact would result if:

- The project would propose any building or structure to be used for human occupancy over or within 50 feet of the trace of an Alquist–Priolo fault or County Special Study Zone fault.
- The project proposes the following uses within an Alquist-Priolo Zone which are prohibited by the County: i) uses containing structures with a capacity of 300 people or more; ii) uses with the potential to severely damage the environment or cause major loss of life; iii) specific civic uses including police and fire stations, schools, hospitals, rest homes, nursing homes, and emergency communication facilities.

##### Analysis

As discussed in the Existing Conditions section, the Proposed Project would ~~be~~ not be located in a County Special Study Zone fault or a fault rupture hazard zone identified by the Alquist-Priolo Act, nor would it be located within any other area with substantial evidence of an active or potentially active fault. In addition, the Project does not include any building or structure to be used for human occupancy (the site would be unmanned), critical facilities, or specific civic uses. Therefore, the Proposed Project would have **no impact** from the exposure of people or structures to adverse effects from a known fault-rupture hazard zone.

#### *3.1.2.3.2 Ground Shaking*

Guidelines for the Determination of Significance

For the purposes of this EIR, the County's Geologic Hazards Guidelines (County of San Diego, 2007a) applies to both the direct impact analysis and the cumulative impact analysis. These significance guidelines have been developed by the County to address question VI a) ii) in the CEQA Guidelines, Appendix G. A significant impact would result if:

- The project would be located within a County Near-Source Shaking Zone or within Seismic Zone 4 and the project does not conform to the Uniform Building Code (UBC).

Analysis

The Project site could be subject to strong ground shaking in the event of a large earthquake on any of the active or potentially active faults in the greater Southern California region. The entire County is within Seismic Zone 4. However, as discussed in the Existing Conditions section, the chances of the Project vicinity experiencing severe or highly damaging levels of ground shaking is low. The Project site is not within a near-source shaking zone identified on the county hazard maps (County of San Diego 2007a, Figure 4), and the peak ground acceleration with a 2% chance of occurring in the next 50 years (i.e., equivalent to a 1 in 2,475 annual chance) is estimated to be approximately 0.526 g.[5] Such levels of ground shaking have in the past been associated with MMI VI (strong), which can cause substantial damage and possible collapse in old brick and unreinforced-masonry-type structures, but only minor damage to newer buildings constructed in accordance with modern building standards. Building codes currently in effect are intended to prevent substantial damage and structural collapse of buildings in "design earthquakes," which are usually equivalent to earthquakes with a 10% chance of occurring in the next 50 years.

As the Project would consist of arrays of panels, the public safety implications of damage or collapse of these structures would be negligible. The Project site would be off limits to the public, with security fencing approximately 9 feet high surrounding the facility. The surrounding properties are beyond the range of any impact from structural toppling of the panel arrays (which would be highly improbable for properly designed, seismically compliant structures).

To ensure the structural integrity of all structures, the Proposed Project would conform to the seismic design requirements as outlined within the CBC, which contains universal standards for proper site preparation and grading practices, adequate design of foundation, and guidelines for the appropriate selection and use of construction materials. The local agency that enforces the CBC is

[5] Peak ground accelerations are expressed as a percentage of the constant value of acceleration due to gravity (g), which is approximately 980 centimeters per second squared.

the County Department of Planning and Development Services, which reviews applications for building permits for compliance with the CBC, local amendments to the CBC, and County Zoning Ordinance Section 87.209. Grading plans would also be reviewed for compliance with state and local standards (as discussed in Section 3.1.2.2). As part of the development review process, the County requires a soil investigation report which would include, but would not be limited to, data regarding the nature, distribution, and strength of existing soils and rock on the site; the soil engineer's conclusions and recommendations for grading requirements, including the correction of weak or unstable soil conditions and treatment of any expansive soils that may be present; and their opinions as to the adequacy of building sites to be developed by the proposed grading operations. A preliminary version of such a report has been prepared by Krazan (see Appendix 3.1.2-1); the recommendations contained therein will be refined as necessary based on final designs, and incorporated into the Project's plans and specifications as a condition of final Project approval. Further detail regarding soils would be included in the final soils report that would be prepared as site and facility design advances and must be approved by a County Official as part of the grading permit process (County Ordinance No. 9634 (N.S.)).

Because the site would be required to comply with state and local building and grading standards, substantial adverse effects from strong seismic ground shaking would be avoided or reduced to acceptable levels. Potential adverse effects from strong seismic ground shaking would therefore be **less than significant**.

#### *3.1.2.3.3 Liquefaction*

##### Guidelines for the Determination of Significance

For the purposes of this EIR, the County's Geologic Hazards Guidelines (County of San Diego 2007a) apply to both the direct impact analysis and the cumulative impact analysis. The following significance guidelines have been developed by the County to address question a) iii) and the portion of question c) that addresses on-site and off-site lateral spreading or liquefaction in the CEQA Guidelines, Appendix G. A significant impact would result if:

- The project site has potential to expose people or structures to substantial adverse effects because i) the project site has potentially liquefiable soils, ii) the potentially liquefiable soils are saturated or have the potential to become saturated, and iii) in-situ soil densities are not sufficiently high to preclude liquefaction.

##### Analysis

As discussed above in the analysis of ground shaking, the Project vicinity could be subject to strong levels of seismic shaking in the future. Liquefaction is a phenomenon that can occur under a specific set of circumstances that can substantially amplify the normally expected magnitude of

shaking and can lead to loss of bearing pressure in normally competent soils. As indicated in the significance criteria, an area that has low in situ soil densities (which typically include loose sandy soils) and a shallow or perched groundwater table has the potential to liquefy if subject to a strong earthquake. The most severe liquefaction effects occur when the thickness of loose sandy soils is high and when those soils are saturated close to the ground surface; however, the potential for liquefaction to occur in any given area is highly dependent on site-specific conditions. Typical effects of liquefaction include sinking foundations, tilting structures, and rupture and/or substantial damage to underground utility lines.

As discussed in the setting, the concern for liquefaction is very low, due to the soil composition found during geotechnical studies (very dense silty sands, sands with silt, and sandstone) and historical findings for groundwater depths (greater than 75 feet) (Appendix 3.1.2-1). Therefore, measures to mitigate seismic-induced liquefaction were not recommended (Appendix 3.1.2-1) and the impact associated with liquefaction is considered **less than significant** on the Proposed Project site.

#### *3.1.2.3.4 Landslides*

##### Guidelines for the Determination of Significance

For the purposes of this EIR, the County's Geologic Hazards Guidelines (County of San Diego 2007a) apply to both the direct impact analysis and the cumulative impact analysis. The following significance guidelines have been developed by the County to address question VI a) iv) and the portion of question c) that relates to on-site or off-site landslide or collapse in the CEQA Guidelines, Appendix G. A significant impact would result if:

- The project would expose people or structures to substantial adverse effects, including the risk of loss, injury, or death involving landslides.
- The project is located on a geologic unit or soil that is unstable, or would become unstable as a result of the project, potentially resulting in an on-site or off-site landslide.
- The project site lies directly below or on a known area subject to rockfall which could result in collapse of structures.

##### Analysis

The Project site is not within a landslide susceptibility area as identified in the County's Geologic Hazards Guidelines. The topography of the site is flat to gently sloped and is underlain by weathered sandstone bedrock which is not typically prone to substantial slope failure in areas that are not steeply sloped. Since the Project is not located within an identified landslide susceptibility area and the geologic environment has a low probability to become

unstable, the Project would have a **less than significant** impact from the exposure of people or structures to potential adverse effects from landslides.

The Proposed Project involves site grading for installation of panel arrays that would result in the creation of areas of cut and areas underlain by fill. In order to assure that any proposed structures (including those proposed on the Project site) are adequately supported (whether on native soils, cut, or fill), a soils investigation report is required as part of the building permit process. This report would evaluate the strength of underlying soils and make recommendations on the design of building foundation systems. Grading plans must be compliant with standards in the grading ordinance addressing the stability, incline, and compaction of cuts and fills. The soils investigation report must demonstrate that a proposed building meets the structural stability standards required by the CBC and the local grading ordinance. Additionally, during trenching and excavation, the Proposed Project would be required to comply with OSHA standards to protect slopes and prevent cave-ins and other hazards related to soil stability. The report must be approved by the County prior to the issuance of a building permit. With this standard requirement, impacts would be **less than significant**.

#### *3.1.2.3.5 Expansive Soils*

##### Guidelines for the Determination of Significance

For the purposes of this EIR, the County's Geologic Hazards Guidelines (County of San Diego 2007a) apply to both the direct impact analysis and the cumulative impact analysis. The following significance guidelines have been developed by the County to address question d) in the CEQA Guidelines, Appendix G. A significant impact would result if:

- The project would be located on expansive soil, as defined in Table 18-1-B of the Uniform Building Code (1994), and does not conform with the Uniform Building Code.

##### Analysis

The southwestern portion of the site is within an area identified as having expansive soils in the County's Geologic Hazards Guidelines (County of San Diego 2007a, Figure 6). However, the County's Geologic Hazards Guidelines maps are used for basic project screening purposes and are based on regional data as opposed to site specific studies. The site-specific soil study has found that the Project site does not contain expansive soils as defined by Table 18-I-B of the Uniform Building Code (1994). Due to the sandy, granular character of the soils and their low organic content, on-site soils are generally non-plastic and therefore not prone to shrink/swell behavior (Appendix 3.1.2-1). On-site soils also have a shrink/swell behavior classified by the NRCS as low.

Required compliance with the CBC and the County grading ordinance would ensure that potentially expansive soils, if present, are adequately addressed. Standard practices include removing expansive soils and placing a mat of properly compacted, non-expansive fill prior to placing foundations, structures, utilities, or road beds. In some cases, potentially expansive soils can be treated or mixed with other materials to reduce its expansive potential to acceptable levels. Implementation of these standard practices, as required by the CBC and local ordinances, would ensure that potential impacts on the Project due to expansive soils would be **less than significant**.

#### *3.1.2.3.6 Adequate Soils for Septic Systems or Other On-Site Wastewater Systems*

Guidelines for the Determination of Significance

The County's Geologic Hazards Guidelines and *Guidelines for Determining Significance and Report Format and Content Requirements – Water Quality* (County of San Diego 2007a, 2007b) do not contain a significance criterion that addresses adequate soils for septic systems or other on-site wastewater systems. However, the following analysis is provided to address question e) in the CEQA Guidelines, Appendix G, which states that a significant impact would result if:

- The project would have soils incapable of supporting the use of septic tanks or alternative waste water disposal systems where sewers are not available for the disposal of waste water.

Analysis

The Proposed Project does not include any septic or on-site wastewater systems. As such, the Proposed Project would result in **no impact**.

### *3.1.2.4 Cumulative Impact Analysis*

All of Southern California lies within a seismically active region with an extremely diverse range of geologic and soil conditions that can vary substantially within short distances. Thus, the cumulative context for potential impacts to people and structures related to geologic and seismic hazards is more localized or site-specific. The temporal scope includes construction, operation, and maintenance phases of the Project.

#### *3.1.2.4.1 Fault Rupture*

As analyzed earlier in Section 3.1.2.3, the Project would have no impacts related to exposure of people or facilities to ground displacement/fissure due to fault rupture. This issue is not considered in the cumulative context, because the Project **would not contribute, even incrementally, to potential cumulative impacts** related to fault rupture.

#### *3.1.2.4.2 Ground Shaking, Liquefaction, Landslides, and Expansive Soils*

Potential geologic and soils impacts associated with the Project are restricted to potential facility damage from earthquake-related ground shaking, liquefaction, landslides, and expansive soils. In all cases, the impacts were determined to be less than significant because the existing regulatory framework controlling the design and construction of structures in California, and actions required to obtain a grading and/or development permits at the local level are sufficient to avoid or substantially reduce the potential impacts. All other projects in the cumulative scenario would be required to comply with the same or similar set of laws, regulations, and ordinances.

Other projects, that in combination with the Proposed Project could result in a greater severity or extent of liquefaction (during an earthquake) than would have been anticipated in the Project-specific analysis, would be those that (1) permanently saturate previously dry soils, (2) result in a sustained rise of the local groundwater table, and/or (3) perform grading or earth-moving operations that would use liquefiable soils as fill. For effects to compound, other projects in the cumulative scenario would have to be overlapping or in the immediate vicinity of the Proposed Project. In accordance with the CBC, as well as state and local building and grading regulations, use of liquefiable soil for fill material is prohibited where the material would be saturated. Further, none of the other projects in the cumulative scenario (see Table 1-7 and Figure 1-9 in Chapter 1) would result in substantial increases in the local or regional groundwater table. Therefore, there would be no cumulative impact to which the Proposed Project could contribute.

Because all projects in the cumulative scenario would be designed in accordance with seismic design criteria as required by the CBC and with other specific design criteria from state and local building and grading regulations, there would be **no significant cumulative impact** related to ground shaking, liquefaction, landslides, and expansive soils.

#### *3.1.2.4.3 Adequate Soils for Septic Systems or Other On-Site Wastewater Systems*

The Proposed Project does not include any septic or on-site wastewater systems. As such, the Proposed Project **would not contribute to a cumulative impact** related to adequate soils for septic tanks or on-site wastewater systems.

### *3.1.2.5 Conclusion*

Compliance with the CBC, state and local regulations pertaining to geologic and seismic hazards, and standard requirements for the approval of building and grading permits, including preparation and submittal of soil investigation reports, is sufficient to reduce risks from seismic ground shaking, liquefaction, and expansive soils to acceptable levels; therefore, **impacts would be less than significant**.

## Table 3.1.2-1
## Soil Units within the Project Site

| Map Unit, Soil Name | Acres | Depth (inches) | Erosion Factor (Kw)[a] | Wind Erodibility[b] | Risk of Corrosion[c] | Shrink/ Swell Behavior[d] |
|---|---|---|---|---|---|---|
| MnB – Mecca coarse sandy loam, 2% to 5% slopes | 55.7 | 0–62 | 0.20 | 3 | Low to moderate | Low |
| RsC – Rositas loamy coarse sand, 2% to 9% slopes | 18.5 | 0–60 | 0.20 | 2 | Moderate | Low |
| RuG – Rough Broken Land | 2.5 | 0–2 | — | — | — | — |
| SrD – Sloping gullied land | 30.7 | 0–60 | — | — | — | — |

**Source:** NRCS 2014.

**Notes:**

[a] Erosion factor Kw indicates the susceptibility of the whole soil to sheet and rill erosion by water (estimates are modified by the presence of rock fragments). The estimates are based primarily on percentage of silt, sand, and organic matter and on soil structure and Ksat. Values of K range from 0.02 to 0.69. A range of values is given because map units are composed of several soil series.

[b] Wind erodibility groups are made up of soils that have similar properties affecting their susceptibility to wind erosion in cultivated areas. The soils assigned to group 1 are the most susceptible to wind erosion, and those assigned to group 8 are the least susceptible.

[c] Risk of corrosion pertains to potential soil-induced electrochemical or chemical action that corrodes or weakens uncoated steel or concrete. The rate of corrosion of uncoated steel is related to such factors as soil moisture, particle-size distribution, acidity, and electrical conductivity of the soil. The rate of corrosion of concrete is based mainly on the sulfate and sodium content, texture, moisture content, and acidity of the soil. The risk of corrosion also is expressed as low, moderate, or high.

[d] Shrink-swell behavior is the quality of soil that determines its volume change with change in moisture content. The volume-change behavior of soils is influenced by the amount of moisture change and amount and kind of clay in the soil. Linear extensibility is used to determine the shrink-swell potential of soils. The shrink-swell potential is low if the soil has a linear extensibility of less than 3%; moderate if 3% to 6%; high if 6% to 9%; and very high if more than 9%.