

SECTION 4.6

GEOLOGY AND SOILS

This section describes federal, state and local regulations applicable to geology and soils. It also describes the environmental setting with regard to the soils, seismicity and geologic conditions on and in the vicinity of the Solar Energy Center, Electric Collector Line Corridor, and Mount Signal Solar Farm Gen-Tie alignment (i.e. Full Build-out Scenario). A discussion of geology and soil impacts is also provided and mitigation measures are identified to address potential impacts as pertinent to specific Project components and CUP areas (13-0036 thru 13-0052).

The information and analysis in this section is based on the *Soil Survey of Imperial County, California, Imperial Valley Area* (USDA 1981), the *Preliminary Geotechnical and GeoHazards Report: Wistaria Ranch Solar Energy Center, Rockwood Road – Schaniel Road to All American Canal (International Border), Calexico, California*, prepared by LandMark Consultants, Inc. (LandMark 2014a); “Response to Comments Preliminary Geological and Geotechnical Hazard Evaluation Wistaria Ranch Solar energy Center Rockwood Road-Schaniel Road to all American Canal (International Border), Calexico, California LCI Project No. LE 12184” (LandMark 2014b); “Addendum No. 1 - Preliminary Geotechnical and GeoHazards Report: Wistaria Ranch Solar Energy Center, Rockwood Road – Schaniel Road to All American Canal (International Border), Calexico, California, LCI Project No. LE12184” (LandMark 2013); and the *Conceptual Drainage Study and Storm Water Quality Analysis – Wistaria* (Fusco 2014). The Project-specific geotechnical and drainage/water quality reports are provided as **Appendix D** and **Appendix I**, respectively, on the attached CD of Technical Appendices to this EIR.

For the purposes of analyzing geology and soils impacts, the Full-Buildout Scenario represents a worst-case scenario as the greatest amount of construction activity would be involved resulting in the greatest potential for geology and soils impacts to occur over the Project site (e.g. erosion).

4.6.1 REGULATORY FRAMEWORK

A. STATE

Alquist-Priolo Earthquake Fault Zoning Act

The Alquist-Priolo Earthquake Zoning Act (Chapter 7.5, Division 2, Public Resources Code, State of California, effective May 4, 1975) (Act) provides a statewide mechanism for reducing losses from surface fault rupture. The Act promotes public safety by prohibiting siting of most structures for human occupancy across traces of active faults that constitute a hazard to structures from surface faulting or fault creep. In accordance with the Act, the Office of State Geologist delineated Special Study Zones that encompass potentially and recently active traces of four major faults: San Andreas, Calaveras, Hayward and San Jacinto. The County of Imperial is responsible for enforcing the Act by ensuring that homes, offices, hospitals, public buildings, and other structures for human occupancy that are built on or near active faults or within a special study zone, are designed and constructed in compliance with the County of Imperial Codified Ordinance (Imperial County 1993b, p. 6). The Project site does not lie within a State of California, Alquist-Priolo Earthquake Fault Zone (LandMark 2014a, p. 6).

California Building Code

Title 24 of the California Code of Regulations (CCR), commonly referred to as the California Building Code (CBC), is published and updated by the California Building Standards Commission. The most recent version (2013) went into effect as of January 1, 2014. Cities and counties are required by state law to enforce the CBC. The CBC applies to all building occupancies, and related features and equipment throughout the State of California, and contains requirements related to the structural, mechanical, electrical, and plumbing systems, and requires measures for energy conservation, green design, construction and maintenance, fire and life safety, and accessibility. Among other elements, Chapter 16

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of the CBC dictates the design and construction standards applicable to resist seismic shaking on structures. The Project must be designed in compliance with the 2013 CBC.

Seismic Hazards Mapping Act

The Seismic Hazards Mapping Act (SHMA), set forth at Public Resources Code section 2690 *et seq.*, was enacted to protect public safety from the effects of strong ground shaking, liquefaction, landslides, or other ground failure, or other hazards caused by earthquakes. Pursuant to the SHMA, the California Department of Conservation, California Geological Survey (CGS) has delineated seismic hazard zones, but Imperial County has not yet been mapped by the CGS therefore, the Project site is not within a designated seismic hazard zone. Seismic Hazards Mapping Regulations (Seismic Regulations) have also been adopted requiring preparation of a project-specific geotechnical report evaluating seismic hazards and recommending appropriate mitigation. (California Code of Regulations, title 14, §3720 *et seq.*) The State Mining and Geology Board adopted Special Publication 117A, Guidelines for Evaluating and Mitigating Seismic Hazards in California (adopted September 11, 2008) (“Special Publication 117A”), which establishes standards for the evaluation of seismic hazards other than surface fault rupture and also provides recommended mitigation measures. Special Publication 117A provides 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. Special Publication 117A expressly contemplates that a site-specific geotechnical report might be prepared before or after CEQA approval.

Surface Mining and Reclamation Act

The Surface Mining and Reclamation Act of 1975 (SMRA) acknowledges that mineral extraction is essential to California’s economy and that the reclamation of mined lands after extraction is necessary to prevent or minimize adverse effects on the environment and to protect the public health and safety. The SMRA also classifies mineral resources in the State and provides information to local governments. Local governments are responsible for designating lands that contain regionally significant mineral resources in their local General Plans for preserving such areas from encroachment or conversion to other uses. The law has resulted in the preparation of Mineral Land Classification Maps delineating Mineral Resource Zones (MRZ) for aggregate resources (sand, gravel, and stone). Mining occurs throughout the County of Imperial as shown on the Active Surface Mining Operations Map (Imperial County 2003). None of the solar field site parcels are located in an area with any MRZ zones.

B. LOCAL

County Land Use Ordinance

Title 9 Division 15 (Geological Hazards) of the County Land Use Ordinance has established procedures and standards for development within earthquake fault zones. Per County regulations, construction of buildings intended for human occupancy which are located across the trace of an active fault are prohibited. An exception exists when such buildings located near the fault or within a designated Special Studies Zone are demonstrated through a geotechnical analysis and report not to expose a person to undue hazard created by construction of the building. The proposed Project does not include any residential structures nor are any active faults located across any of the solar field site parcels.

Imperial County General Plan

The Imperial County General Plan Seismic and Public Safety Element (Imperial County 1993b) contains goals, objectives, policies and programs to minimize the risks associated with natural and human-made hazards including seismic/geological hazards, flood hazards, and Imperial Irrigation District Lifelines.

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Table 4.6-1 analyzes the consistency of the Project with the applicable goals and objectives relating to seismic hazards and soil conditions in the Imperial County General Plan. While this EIR analyzes the Project's consistency with the General Plan pursuant to CEQA Guidelines section 15125(d), the Imperial County Board of Supervisors ultimately determines consistency with the General Plan.

**TABLE 4.6-1
IMPERIAL COUNTY GENERAL PLAN CONSISTENCY ANALYSIS**

General Plan Goals and Objectives	Consistent with General Plan?	Analysis
SEISMIC AND PUBLIC SAFETY ELEMENT		
Land Use Planning and Public Safety		
Goal 1: Include public health and safety considerations in land use planning.	Yes	The proposed Project is located in a rural industrial area of Imperial County characterized by rural industrial development with very few nearby residences. Public health and safety would not be affected in association with development of a solar generation facility in this area based on its location away from population centers. Therefore, the proposed Project is consistent with this goal.
Objective 1.1 Ensure that data on geological hazards is incorporated into the land use review process, and future development process.	Yes	The proposed Project has prepared a Preliminary Geotechnical and GeoHazards Report identifying potential geologic hazards. Mitigation measures MM 4.6.1, MM 4.6.4, MM 4.6.6 and MM 4.6.8 requires preparation of a Final Geotechnical and GeoHazards Report that will identify site-specific design provisions for mitigating on-site geologic conditions including soil liquefaction; liquefaction settlement and ground fissures along the New River; landsliding along the New River; and expansive and corrosive soils. All measures and design specifications identified in the Final Geotechnical and GeoHazards Report shall be incorporated into and reflected on the Project design and building plans. Therefore, the proposed Project is consistent with this objective.
Objective 1.4 Require, where possessing the authority, that avoidable seismic risks be avoided; and that measures, commensurate with risks, be taken to	Yes	The proposed solar field site parcels are located in an area subject to moderate to strong ground motion from earthquakes in the region. The nearest

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**TABLE 4.6-1
IMPERIAL COUNTY GENERAL PLAN CONSISTENCY ANALYSIS**

General Plan Goals and Objectives	Consistent with General Plan?	Analysis
reduce injury, loss of life, destruction of property, and disruption of service.		mapped Earthquake Fault Zone is an unnamed fault located approximately six to seven miles west of the solar field site parcels. None of the solar field site parcels are within a State of California Alquist-Priolo Earthquake Fault Zone and potential for surface fault rupture is low. Lateral spreading was noted along the embankments of the All American Canal after the April 4, 2010 magnitude 7.2 El Mayor-Cucupah earthquake (LandMark 2014a, pp. 4-5). However, the Project would be designed in accordance with all applicable federal, State and local building codes. Any potential damage to proposed structures (i.e. O&M buildings, PV or CPV modules) can be mitigated through engineering and compliance with building standards (refer to mitigation measure MM 4.6.1, MM 4.6.2a, MM 4.6.2b, MM 4.6.4, MM 4.6.6, MM 4.6.7 and MM 4.6.8). Therefore, the proposed Project is consistent with this objective.
Objective 1.7 Require developers to provide information related to geologic and seismic hazards when siting a proposed project.	Yes	A Preliminary Geological and Geotechnical Hazard Report was prepared for the proposed Project (LandMark 2014a). The Report was used in the analysis of solar field site parcels and regional geology and soils conditions. The Report included recommendations to address potential geologic or seismic hazards that may be associated with the solar field site parcels. These recommendations have been included in this EIR as mitigation measures MM 4.6.1, MM 4.6.2a, MM 4.6.2b, MM 4.6.4, MM 4.6.6, MM 4.6.7 and MM 4.6.8. Therefore, the proposed Project is consistent with this objective.

**TABLE 4.6-1
IMPERIAL COUNTY GENERAL PLAN CONSISTENCY ANALYSIS**

General Plan Goals and Objectives	Consistent with General Plan?	Analysis
Emergency Preparedness		
<p>Goal 2: Minimize potential hazards to public health, safety, and welfare and prevent the loss of life and damage to health and property resulting from both natural and human-related phenomena.</p>	Yes	<p>The Project is subject to compliance with the 2013 CBC in regard to potential for seismic ground shaking and engineering design (MM 4.6.1, MM 4.6.4, MM 4.6.6).). The Applicant would also be required to incorporate design parameters and recommendations of the Final Geological and Geotechnical Report into the final Project design to address seismic and soil conditions at the solar field site parcels (MM 4.6.8). Further, mitigation measure MM 4.6.7 would require site-specific soils studies for the proposed septic systems in order to meet State health standards and protect groundwater quality. Therefore, the proposed Project is consistent with this goal.</p>
<p>Objective 2.2 Reduce risk and damage due to seismic hazards by appropriate regulation.</p>	Yes	<p>As identified in mitigation measure MM 4.6.1, MM 4.6.2a, MM 4.6.2b, MM 4.6.6 and MM 4.6.7 the proposed Project would be constructed in accordance with the 2013 CBC, the Seismic Regulations, Special Publication 117A, and the County of Imperial building requirements. Therefore, the proposed project is consistent with this objective.</p>
<p>Objective 2.6 Maintain, utilize, and provide geologic and seismic information as furnished by the State Geologist as required.</p>	Yes	<p>The Preliminary Geological and Geotechnical Hazard Report prepared for the proposed Project utilized information provided by the State Geologist including Alquist-Priolo Earthquake Fault Zone maps and the 2010 Fault Activity Map of California. Therefore, the proposed Project is consistent with this objective.</p>
<p>Objective 2.8 Prevent and reduce death, injuries, property damage, and economic and social dislocation resulting from natural hazards including flooding, land subsidence, earthquakes, other geologic</p>	Yes	<p>The Project is located in a seismically active area. The Preliminary Geological and Geotechnical Hazard report prepared for the Project includes recommendations that all structures be</p>

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**TABLE 4.6-1
IMPERIAL COUNTY GENERAL PLAN CONSISTENCY ANALYSIS**

General Plan Goals and Objectives	Consistent with General Plan?	Analysis
phenomena, levee or dam failure, urban and wildland fires and building collapse by appropriate planning and emergency measures.		designed in accordance with the 2013 CBC. Recommendations of the Investigation have been included in this EIR as mitigation measures MM 4.6.1, MM 4.6.2a, MM 4.6.2b, MM 4.6.4, MM 4.6.6, MM 4.6.7, and MM 4.6.8 to reduce risks associated with geologic and seismic hazards. Therefore, the proposed Project is consistent with this objective.
Seismic/Geologic Hazards		
Policy 4 Ensure that no structure for human occupancy, other than one-story wood frame structures, shall be permitted within fifty feet of an active fault trace as designated under the Alquist-Priolo Geologic Hazards Zone Act.	Yes	The O&M Buildings are the proposed Project's only habitable structures. The proposed locations for the O&M building(s) are not located within 50 feet of an active fault and none of the solar field site parcels are within a State of California Alquist Priolo Earthquake Fault Zone (LandMark 2014a, p. 6). As noted in mitigation measure MM 4.6.1, MM 4.6.2a, MM 4.6.2b, MM 4.6.6 and MM 4.6.7 the proposed Project would be constructed in accordance with the 2013 CBC, the Seismic Regulations, Special Publication 117A, and the County of Imperial building requirements. Therefore, the proposed Project is consistent with this policy.

4.6.2 ENVIRONMENTAL SETTING

A. SOLAR ENERGY CENTER

Regional Geology

The solar field site parcels are located in the Imperial Valley portion of the Salton Trough physiographic province. The Salton Trough is a topographic and geologic structural depression resulting from large scale regional faulting. The trough is bounded on the northeast by the San Andreas Fault and Chocolate Mountains and the southwest by the Peninsular Range and faults of the San Jacinto Fault Zone. The Salton Trough represents the northward extension of the Gulf of California, containing both marine and non-marine sediments since the Miocene Epoch. Tectonic activity that formed the trough continues at a high rate as evidenced by deformed young sedimentary deposits and high levels of seismicity (LandMark 2014a, p. 2).

The Imperial Valley is directly underlain by lacustrine deposits, which consist of interbedded lenticular and tabular silt, sand, and clay. The Late Pleistocene to Holocene lake deposits are probably less than 100 feet thick and derived from periodic flooding of the Colorado River which intermittently formed a freshwater lake (Lake Cahuilla). Older deposits consist of Miocene to Pleistocene non-marine and marine sediments deposited during intrusions of the Gulf of California. Basement rock consisting of Mesozoic granite and Paleozoic metamorphic rocks are estimated to exist at depths between 15,000 to 20,000 feet (LandMark 2014a, p. 2).

Project Site Geological Conditions

Soil Permeability/On-site wastewater Disposal

The near surface soils at the solar field site parcels generally consist of silty clays and clays having a very low to low infiltration rate (permeability) (LandMark 2014a, p. 3).

Corrosive Soils

All soils within the ancient lake bed in which the Imperial Valley is formed are moderately to highly corrosive to steel and concrete. Any bare steel exposed to the native soils would require corrosion protection (LandMark 2014a, p. 3).

Groundwater

The groundwater in the Project vicinity is brackish and typically encountered at a depth of five to 10 feet below ground surface. There is uncertainty in the accuracy of short-term water level measurements, particularly in fine-grained soil. Groundwater levels may fluctuate with precipitation, irrigation of adjacent properties, drainage, and grading. As such, reported groundwater depths do not represent a permanent condition (LandMark 2014a, p. 3).

Geologic Hazards

Landslides

According to the Preliminary Geotechnical and Geohazards Report (LandMark 2014a), no ancient landslides are shown on geologic maps of the region and no indications of landslides were observed during the site investigation. The solar field site parcels are relatively flat and level. However, the several solar field site parcels in the northeastern margin of the Project site (at proposed CUPs 13-0047, 13-0046 and 13-0045) are located adjacent to the incised New River channel. The bluffs range from 25 to 35 feet high and have potential for small to moderate-scale landslides (LandMark 2014a, p. 3).

Volcanic Hazards

The Project site is not located near a known volcanically active area. Imperial County has not historically experienced volcanic activity. Therefore, the risk of volcanic hazards is considered very low for the solar field site parcels (LandMark 2014a, p. 3).

Tsunamis and Seiches

The solar field site parcels are not located near any large bodies of water. The solar field site parcels are approximately 90-miles inland from the Pacific Ocean and the Salton Sea is approximately 25 miles north of the northern extent of solar field site parcels. As a result, the threat of tsunamis, seiches, or other seismically-induced flooding is considered unlikely (LandMark 2014a, p. 3).

Flooding

The All American Canal abuts the southern-most solar field site parcels (CUPs 00-0050, 00-0051 and 00-0052). The water level in the All American Canal is at or slightly above the Project site elevation. There is a slight potential for sheet flooding of the southern portion of the Project site (at proposed CUPs 13-

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0050, 13-0051 and 13-0052) in the unlikely event the earthen embankments of the All American Canal are breached during a strong seismic event (LandMark 2014a, pp. 3-4).

Expansive Soils

Expansive soils are primarily comprised of clay particles. Clay increases in volume when water is absorbed and shrinks when dry. Expansive soils can damage building foundations, concrete flatwork, and asphaltic concrete pavements as a result of swelling forces that reduce soil strength. In general, much of the near surface soils within the solar field site parcels consist of silty clays and clays having a high to very high expansion potential (LandMark 2014a, p. 4).

Liquefaction/Seismic Settlements

Liquefaction occurs when granular soil below the water table is subjected to vibratory motions, such as those produced by earthquakes. With strong ground shaking, an increase in pore water pressure develops as the soil tends to reduce in volume. If the increase in pore water pressure is sufficient to reduce the vertical effective stress (suspending the soil particles in water), the soil strength decreases and the soil behaves as a liquid (similar to quicksand). Liquefaction can produce excessive settlement, ground rupture, lateral spreading, or failure of shallow bearing foundations. Four conditions are generally required for liquefaction to occur:

- The soil must be saturated (relatively shallow groundwater);
- The soil must be loosely packed (slow to medium relative density);
- The soil must be relatively cohesionless (not clayey); and
- Ground shaking of sufficient intensity must occur to function as a trigger mechanism.

All of these conditions may exist to some degree at the 32 solar field site parcels. Liquefaction settlement and ground fissures are common occurrences in the bottom lands of the incised New River flood channel during strong seismic events (LandMark 2014a, p. 4).

Seismic Hazards

Ground Shaking

The solar field site parcels are located in the seismically active Imperial Valley of Southern California. As such, the entire Project is considered likely to be subjected to moderate to strong ground motion from earthquakes in the region (LandMark 2014a, p. 4).

Imperial Valley has numerous mapped faults of the San Andreas Fault System traversing the region. The San Andreas Fault System is comprised of the San Andreas, San Jacinto, and Elsinore Fault Zones in southern California. The Imperial fault represents a transition from the more continuous San Andreas Fault to a more nearly echelon pattern characteristic of the faults under the Gulf of California. None of the solar field site parcels are located within an Alquist-Priolo earthquake fault zone (LandMark 2014a, pp. 5-6).

A search of known active faults or seismic zones within a 62-mile (100 kilometer) radius of the Project was conducted as a part of the Preliminary Geotechnical and GeoHazards Report (LandMark 2014a). The nearest mapped Earthquake Fault Zone is an unnamed fault located approximately six to seven miles west of the solar field site parcels. The unnamed fault was recently identified and zoned after the April 4, 2010 magnitude 7.2 El Mayor-Cucapah earthquake (LandMark 2014a, p. 5). Other faults close to the solar field site parcels include the Superstition Hills Fault (approximately 10 miles to the north; the Imperial Fault (approximately 15 miles east of the solar field site parcels); and the Elsinore Fault (Laguna Salada Section (approximately 15 miles to the west of the solar field site parcels). **Figure 4.6-1**, Regional Fault Map, shows the location of the Project in relation to regional faults. **Figure 4.6-2**, Map of Local Faults, shows the solar field site parcels in relation to local faults.

Surface Rupture

As mentioned in the State Regulatory Framework discussion, none of the solar field site parcels lie within a State of California Alquist-Priolo Earthquake Fault Zone. Therefore, the potential for surface fault rupture at any of the solar field site parcels is considered low (LandMark 2014a, p. 6).

Lateral Spreading

According to the Preliminary Geotechnical and GeoHazards Report, ground failures (visible lateral spreading) were noted along the embankments of the All American Canal after the April 4, 2010 7.2 magnitude El Mayor-Cucapah earthquake (LandMark 2014a, p. 6). Within a few days after the earthquake, the IID repaired and graded the areas of ground failure that affected the canal banks. No evidence of lateral spreading is visible at present (LandMark 2014b).

Other Hazards

Hydrocollapse

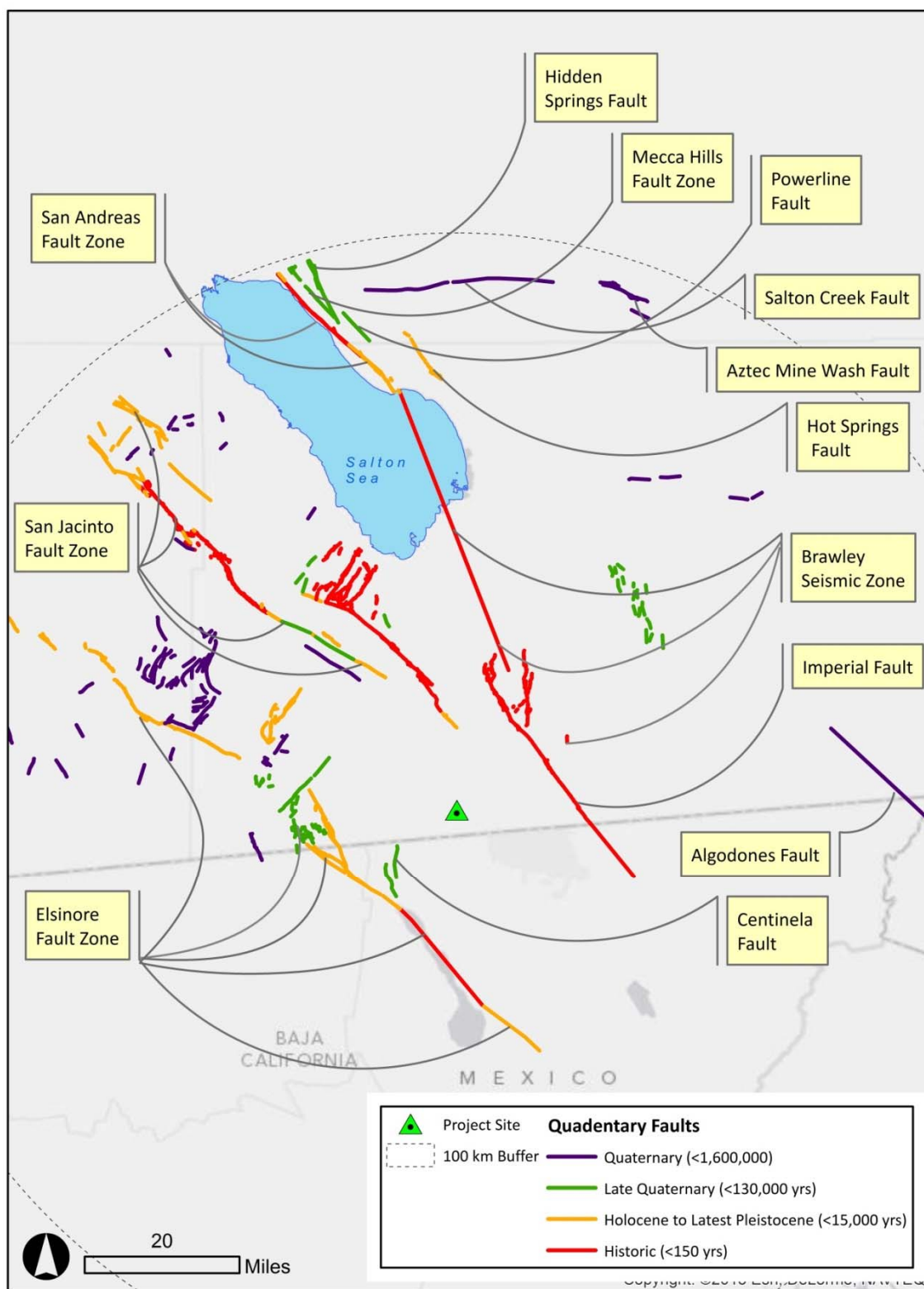
The solar field site parcels are dominantly underlain by clays that are not expected to collapse with the addition of water. The risk of hydrocollapse in these soil types is considered very low (LandMark 2014a, p 6).

Subsidence

Subsidence is the gradual, local settling or sinking of the Earth's surface with little or no horizontal motion. Subsidence is usually the result of gas, oil, or water extraction, hydro-compaction, or peat oxidation, and not the result of a landslide or slope failure. Ground surface effects related to subsidence are generally restricted to long surface structures such as canals, drains, and sewers, which are sensitive to slight changes in elevation. According to the Imperial County Seismic and Public Safety Element, subsidence from earthquakes and other activities can disrupt drainage systems and cause localized flooding. Regional subsidence has not been documented in the area west of the New River. Thus, risk of regional subsidence at any of the solar field site parcels is considered low (LandMark 2014a, p 6).

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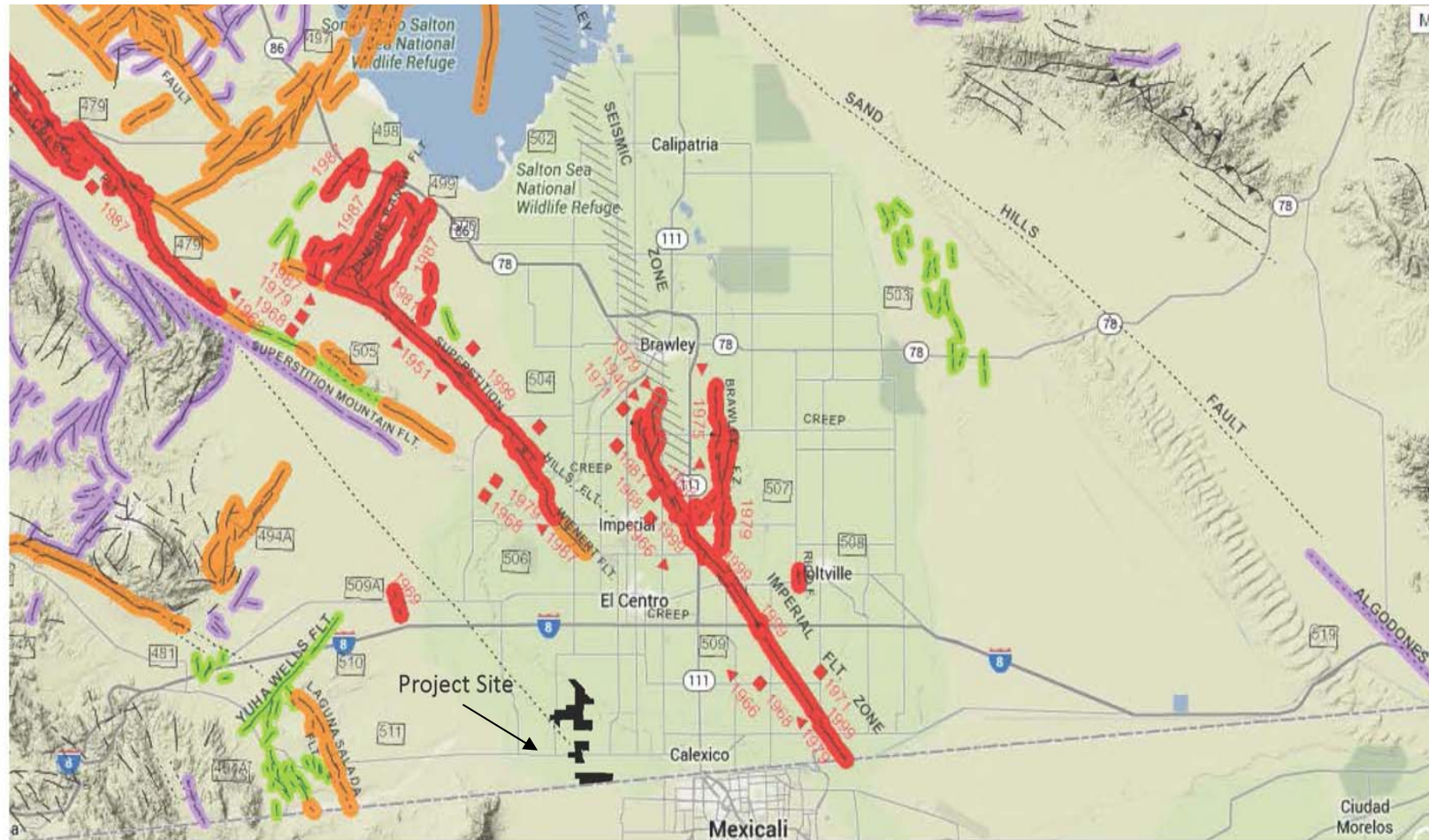


Source: WRS, ESRI, earthquake.usgs.gov 2010.

FIGURE 4.6-1
REGIONAL FAULT MAP

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Source: California Geological Survey 2010 Fault Activity Map of California.
<http://www.quake.ca.gov/gmaps/FAM/faultactivitymap.html#>

FIGURE 4.6-2
LOCAL FAULT MAP

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Soil Map Units

Table 4.6-2 summarizes the soils within the solar field site parcels and associated characteristics. Figure 4.6-3 depicts the 16 soil map units (not including 145 – Water) within the boundaries of the solar field site parcels. A brief description of the soils is provided below.

TABLE 4.6-2
SUMMARY OF PROJECT SITE SOIL MAP UNITS

Soil Name/ Map Symbol	Texture ¹	Depth of Surface Layer ¹	Wind Erodability Group ²	Erosion (K) Factor ³	Erosion Hazard Paths and Trails ⁴	Permeability Inches Per Hour ³
102 - Badland	Clay to Gravelly Sand	10	N/A	N/A	N/A	N/A
104 - Fluvaquents	Saline/Floodplains	N/A	N/A	N/A	N/A	N/A
106 - Glenbar	Clay Loam	0-13	4L	0.37	Slight	0.2-0.6
109 - Holtville	Silty Clay	0-17	4	0.32	Moderate: Too clayey	0.06 - 0.20
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112 - Imperial	Silty Clay	0-12	4	0.43	Moderate: Too clayey	0.06 - 0.20
114 - Imperial	Silty Clay, Wet	0-12	4	0.43	Moderate: Too clayey	0.06 - 0.20
115 – Imperial Glenbar	Silty Clay Loams, Wet	0-13	4L	0.37	Slight	0.2-0.6
116 - Imperial	Silty Clay Loams	0-13	4	0.43	Moderate: Too clayey	0.06 – 0.2
117 - Indio	Loam	0-12	4L	0.55	Slight	0.6-2.0
118 - Indio	Loam, Wet	0-12	4L	0.55	Slight	0.6-2.0
119 - Indio	Vint Complex	0-12	4L	0.55	Moderate: Too Sandy	0.6-2.0
122 Meloland	Loamy Very Fine Sandy Loam, Wet	0-12	4L	.43	Moderate: Wetness	0.6-2.0
123 - Meloland and Holtville	Loams, Wet	0-12	4L	.43	Moderate: Wetness	0.6-2.0
142 – Vint	Loamy Very Fine Sand, Wet	0-10	3	.32	Moderate: Too sandy	2.0 – 6.0
144 – Vint and Indio	Very Fine Sandy Loams, Wet	0-10	4L	0.55	Slight	0.6 – 2.0
145 - Water	N/A	N/A	N/A	N/A	N/A	N/A

Source: USDA 1981, Fuscoe 2014.

Notes: N/A = not applicable or not available.

¹ Taken from Table 11, Engineering Index Properties.

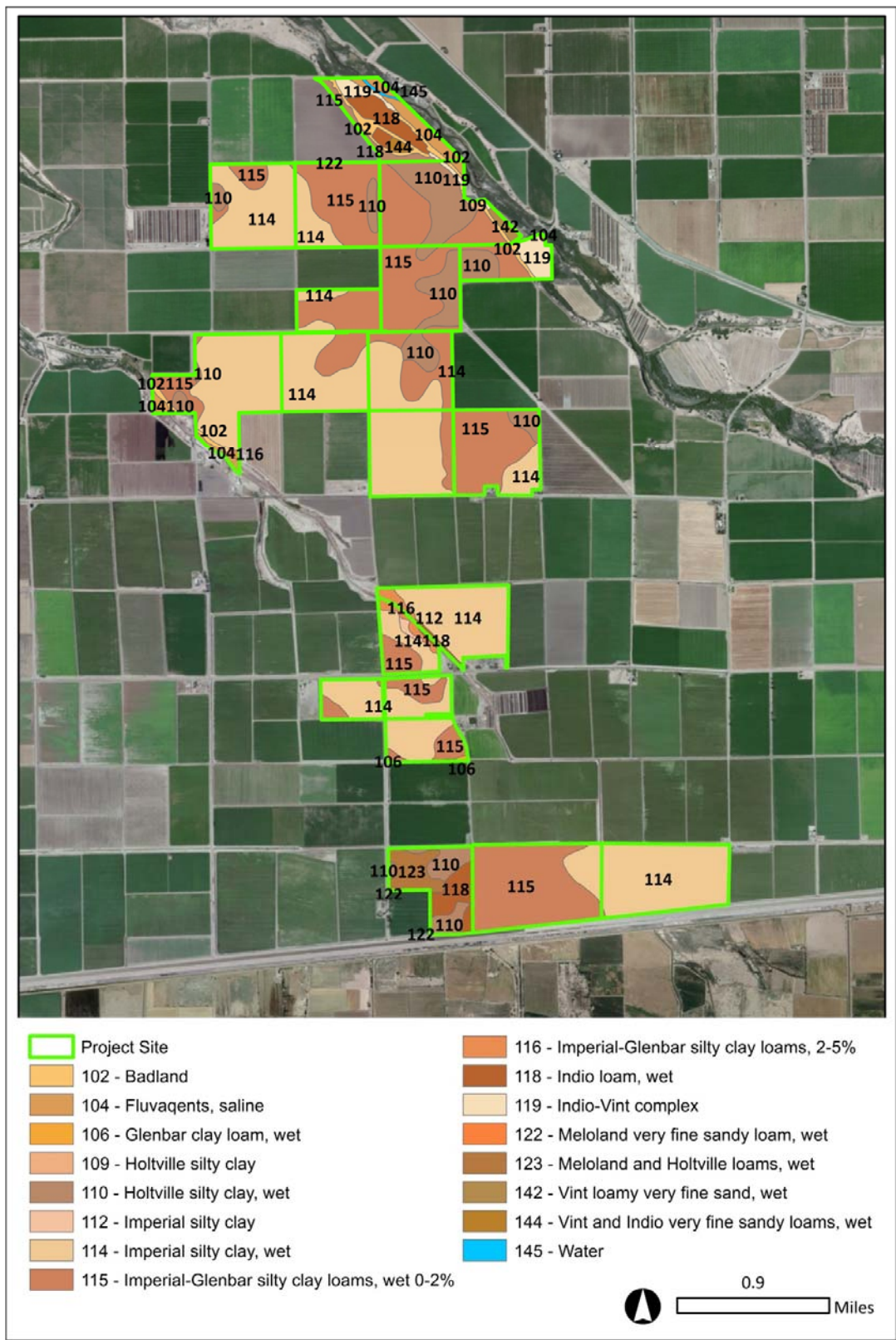
² Wind erodibility groups range from 1 to 8, with 1 being highly erodible and 8 having low erodibility. Taken from Table 12, Physical and Chemical Properties of Soils.

³ This is an index of erodibility for standard condition and includes susceptibility of soil to erosion and rate of runoff. Low K values (below 0.15) indicate low erosion potential. High K values (above 0.4) are highly erodible. Taken from Table 12, Physical and Chemical Properties of Soils

⁴ Qualitative descriptors of erosion hazard: Slight = little or no erosion is anticipated, Moderate = some erosion anticipated, Severe = significant erosion potential exists. Taken from Table 9, Recreational Development (Paths and Trails).

Soil Series Descriptions

Badland soils – Badlands soils occur in steep to very steep barren land soils dissected by drainageways in local steep topography. Texture is clay to gravelly sand. Surface runoff is rapid or very rapid, and the hazard of erosion is high (USDA 1981).



Source: DD&E, ESRI, Imperial County, NRCS 2014 in Fuscoe 2014.

FIGURE 4.6-3
SOILS MAP – SOLAR FIELD SITE PARCELS

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Fluvaquents – Fluvaquents are primarily the stratified, wet soils on floodplains and deltas of middle and low latitudes. The stratification reflects deposition of sediments under changing currents and in shifting channels.

Glenbar Soils - The Glenbar series consists of very deep, well drained soils that formed in stratified stream alluvium. Glenbar soils are on floodplains and alluvial fans and have slopes of 0 to 3 percent. These soils are well-drained; have medium to slow runoff; and have moderately slow permeability (USDA 2014).

Holtville Soils - The Holtville Series consists of very deep, well drained soils formed in mixed and stratified alluvium. Holtville soils are on floodplains and basins and have slopes of 0 to 3 percent. Holtville soils are well drained; have low runoff; and have slow permeability (USDA 2014).

Imperial Soils - The Imperial soils are nearly level to gently sloping and are on floodplains and in old lake beds at elevations of 235 feet below sea level to 300 feet above sea level. Imperial soils are well and moderately well drained; slow or very slow runoff except on low scarps; and have very slow permeability (USDA 2014).

Indio soils – The Indio series consists of very deep, well or moderately well drained soils formed in alluvium derived from mixed rock sources. Indio soils are on alluvial fans, lacustrine basins and floodplains and have slopes of 0 to 3 percent. Indio soils are well or moderately well drained (USDA 2014).

Meloland soils – The Meloland series is a member of the coarse-loamy over clayey, mixed (calcareous), hyperthermic family of Typic Torrifluvents. Meloland soils are naturally well drained, but commonly have perched water tables under irrigation. Surface runoff is low or medium; permeability is slow (USDA 2014).

Vint soils - The Vint series consists of very deep, somewhat excessively drained soils formed in stratified stream alluvium. Vint soils are on floodplains and have slopes of 0 to 3 percent. Vint soils are somewhat excessively drained; have very slow runoff; and have moderately rapid permeability (USDA 2014).

B. GEN-TIE

The existing gen-tie structures constructed by Mount Signal Solar pass through and adjacent to lands that have been permitted for solar energy projects. Environmental analysis under both CEQA and NEPA (for portions on BLM land) have already been completed for these portions of the alignment as a part of the previously-approved and permitted solar projects with which the Gen-Tie line would be shared. The Preliminary Geological and Geotechnical Hazards Report included analysis of the portions of the Gen-Tie alignment to be newly constructed as a part of the proposed Project. Multiple crossings for electrical transmission lines at Imperial Irrigation District irrigation water delivery and drainage facilities as well as County or State roadways. The preferred crossing method is “above-ground” power lines, but in some or all cases may be “underground” crossings made in polyvinyl chloride (PVC) conduits (Lyon 2013). Regional settings such as seismicity described for the solar field site parcels would also apply to the Gen-Tie.

4.6.3 IMPACTS AND MITIGATION MEASURES

A. STANDARDS OF SIGNIFICANCE

The impact analysis provided below is based on the following CEQA Guidelines, as listed in Appendix G. The Project would result in a significant impact to geology and soils if it would result in any of the following:

- a) Expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving:
 - i) Rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map issued by the State Geologist for the area or based on other substantial evidence of a known fault? Refer to Division of Mines and Geology Special Publication 42.
 - ii) Strong Seismic ground shaking.
 - iii) Seismic-related ground failure, including liquefaction and seiche/tsunami.
 - iv) Landslides.
- b) Result in substantial soil erosion or the loss of topsoil.
- c) Be located on a geologic unit or soil that is unstable or that would become unstable as a result of the project, and potentially result in on- or off-site landslides, lateral spreading, subsidence, liquefaction or collapse.
- d) Be located on expansive soil, as defined in the latest Uniform Building Code, creating substantial risk to life or property.
- e) Have soils incapable of adequately supporting the use of septic tanks or alternative waste water disposal systems where sewers are not available for the disposal of waste water.

B. ISSUES SCOPED OUT AS PART OF THE INITIAL STUDY

Several checklist criteria were eliminated from further evaluation as part of the Initial Study and review of the Preliminary Geologic and Geotechnical Hazards Report (LandMark 2014a).

Criterion “a-i” was scoped out because none of the solar field site parcels lie within a State of California Alquist-Priolo Earthquake Fault Zone and potential for surface fault rupture is considered low (LandMark 2014a, p. 6). Therefore, no impact is identified relative to fault rupture and this issue will not be discussed further.

Criterion “a-iii” was scoped out because none of the solar field site parcels are located near any large bodies of water and the threat of tsunamis, seiches, or other seismically-induced flooding is considered unlikely (LandMark 2014a, p. 3). Therefore, no impact is identified with respect to a tsunami or seiche and this issue will not be discussed further.

Portions of criterion “c” were scoped out as follows:

- Regional subsidence has not been documented in the area west of the New River. Risk of regional subsidence at the solar field site parcels is considered low (LandMark 2014a, p. 7). Therefore, no impact is identified relative to subsidence and this issue will not be discussed further.
- The solar field site parcels are dominantly underlain by clays that are not expected to collapse with the addition of water. Hydrocollapse occurs in dry, loosely compacted granular soils or granular soils cemented with carbonates. The native clays or granular soil lenses at depth are very moist or saturated and not susceptible to hydrocollapse (LandMark 2014b). The risk of hydrocollapse at the solar field site parcels is considered very low (LandMark 2014a, p. 7). Therefore, no impact is identified relative to hydrocollapse and this issue will not be discussed further.

4.6 GEOLOGY AND SOILS

- Ground failures (lateral spreading) were noted along the embankments of the All American Canal after the April 4, 2010 7.2 magnitude El Mayor-Cucapah earthquake. However, all recorded lateral spreading failures have been found to be within the right-of-ways for the Imperial Irrigation District canals and drains and river bottom areas. None of these features would be improved as part of the Project (LandMark 2014a, p. 7). Therefore, no impact is identified relative to lateral spreading and this issue will not be discussed further.

One additional issue, corrosive soils, was noted by LandMark (LandMark 2014a, p. 4) and is discussed below.

C. METHODOLOGY

Potential impacts to existing conditions were evaluated based on potential to be affected by construction, operation and maintenance activities, and decommissioning of the Project. Construction, operation, and maintenance activities were identified based on information provided by the Applicant, Wistaria Ranch Solar (WRS 2014). Impacts to geology and soil resources were formulated based on the findings of the *Preliminary Geotechnical and GeoHazards Report: Wistaria Ranch Solar Energy Center, Rockwood Road – Schaniel Road to All American Canal (International Border), Calexico, California*, prepared by LandMark Consultants, Inc. (LandMark 2014a); “Response to Comments Preliminary Geological and Geotechnical Hazard Evaluation Wistaria Ranch Solar energy Center Rockwood Road-Schaniel Road to all American Canal (International Border), Calexico, California LCI Project No. LE 12184” (LandMark 2014b); and “Addendum No. 1 - Preliminary Geotechnical and GeoHazards Report: Wistaria Ranch Solar Energy Center, Rockwood Road – Schaniel Road to All American Canal (International Border), Calexico, California, LCI Project No. LE12184” (LandMark 2013). The Preliminary Geotechnical and GeoHazards Report is provided as **Appendix D** on the attached CD of Technical Appendices to this EIR.

D. PROJECT IMPACTS AND MITIGATION MEASURES

Strong Seismic Ground Shaking

Impact 4.6.1 The solar field site parcels are located in a seismically active region and would be subject to strong seismic ground shaking in the event of an earthquake. This is considered a **potentially significant impact**.

FULL BUILD-OUT SCENARIO/PHASED CUP SCENARIO

Construction

As discussed above, the solar field site parcels are located in the seismically active Imperial Valley in Southern California and could experience moderate to strong ground motion during earthquakes in the region. Imperial County is classified as Seismic Zone 4 by the Uniform Building Code (UBC) (Sections 1626 through 1635). Developments within in Seismic Zone 4 (highest risk on a scale of 0 to 4) are required to incorporate the most stringent earthquake resistant measures. The amount of ground shaking in an area during an earthquake depends on several factors: 1) proximity of the area to the fault; 2) the depth of focus; 3) the location of the epicenter; and 4) the size (magnitude) of the earthquake. Soil type also plays a role in the intensity of shaking. Bedrock or other dense or consolidated materials are less prone to intense ground shaking than alluvial soils.

The solar field site parcels are primarily underlain by fill/crop, lacustrine clays, and alluvial soils. Thus, the solar field site parcels include soils that are susceptible to ground shaking. The proposed O&M building(s), PV panels, substations, etc. could be damaged by strong seismic shaking. Therefore, impacts associated with strong seismic shaking during the Projects construction are considered **potentially significant**.

4.6 GEOLOGY AND SOILS

The Project must comply with the engineering and design standards contained in the 2013 CBC. Project compliance with 2013 CBC requirements would be subject to review and approval by the Imperial County Planning and Development Services Department and Public Works Department prior to issuing building permits.

Operation

Potential issues related to seismic ground shaking would be addressed during Project design and construction in compliance with the mandatory requirements of the 2013 CBC. Therefore, a **less than significant** impact related to seismic ground shaking would occur during Project operations.

Decommissioning

Decommissioning would result in the dismantling and removal of infrastructure constructed as part of the Project. No structures would remain to be potentially disturbed during an earthquake event. Thus, following decommissioning, **no impacts** resulting from exposure to ground shaking would occur.

Mitigation Measures

MM 4.6.1 The proposed Project shall be designed in accordance with the engineering and design standards contained in the 2013 CBC, the Seismic Regulations, Special Publication 117A, and the County of Imperial building requirements. Prior to approval of final building plans, a registered civil engineer or certified engineering geologist, having at least five years of experience in the field of seismic hazard evaluation and mitigation, shall prepare a Final Geotechnical and GeoHazards Report containing site-specific evaluations of the ground shaking hazards affecting the Project, identify the portions of the Project site containing ground shaking hazards, and identify appropriate Project design measures pursuant to the established and proven methodologies set forth in Special Publication 117A and otherwise in compliance with the requirements of Special Publication 117A. All recommended Project design measures as set forth in the Final Geotechnical and GeoHazards Report shall be incorporated into and reflected on the final design and building plans. The Final Geotechnical and GeoHazards Report and Project plans shall be submitted for review and approval by the Imperial County Planning and Development Services Department prior to approval of the final building plans.

Timing/Implementation: Prior to approval of final building plans/As part of Project design.

Enforcement/Monitoring: Imperial County Planning and Development Services Department.

Significance After Mitigation

Pursuant to the SHMA, Seismic Regulations and Special Publication 117A, 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, but not to a level of no ground failure at all. Implementation of MM 4.6.1 reduces the risk of ground failure to this level for both habitable O&M building(s) as well as the other non-habitable project facilities (e.g., solar panels). Implementation of mitigation measure MM 4.6.1 avoids exposing people or structures to potential substantial adverse effects due to ground failure resulting from strong seismic ground shaking through adherence to the appropriate codes and standards of care and therefore mitigates impacts to a **less than significant** level.

4.6 GEOLOGY AND SOILS

Liquefaction/Ground Failure

Impact 4.6.2 Soils throughout the solar field site parcels could be subject to liquefaction. Further, liquefaction settlement and ground fissures are common in the bottom lands of the incised New River flood channel during seismic events. Therefore, a **potentially significant** impact could occur with regard to liquefaction and ground failure.

CUP 13-0047

Construction

According to the Preliminary Geotechnical and GeoHazards Report prepared for the proposed Project, liquefaction settlement and ground fissures are common occurrences in the bottom lands of the incised New River flood channel during strong seismic events (LandMark 2014a, p.4). The eastern boundaries of CUP 13-0047 includes areas adjacent to and/or inclusive of portions of the New River flood channel and floodplain. The Project proposes to install non-habitable solar facilities within these areas. Any improvements placed in the New River floodplain bottom are likely to be damaged by liquefaction settlement and ground fissures during a strong seismic event unless soils and foundations are properly engineered. Therefore, a **potentially significant** impact related to liquefaction settlement and ground fissures at CUP 13-0047 would occur during the Project's construction phase.

Operation

As noted above, the Project proposes to install non-habitable solar facilities within the eastern boundary of CUP 13-0047 within portions of the New River flood channel and floodplain. These areas are vulnerable to liquefaction settlement and ground fissures during a strong seismic event. Any such facilities would likely be damaged during a strong seismic event without proper soil and foundation engineering. Potential issues related to liquefaction settlement and ground fissures would be addressed during Project design and construction, in compliance with the recommendations of the Final Geotechnical and GeoHazards Report. With proper engineering and construction, potential for impacts resulting from liquefaction settlement and ground fissures at CUP 13-0047 would be reduced to **less than significant** levels during Project operation.

Decommissioning

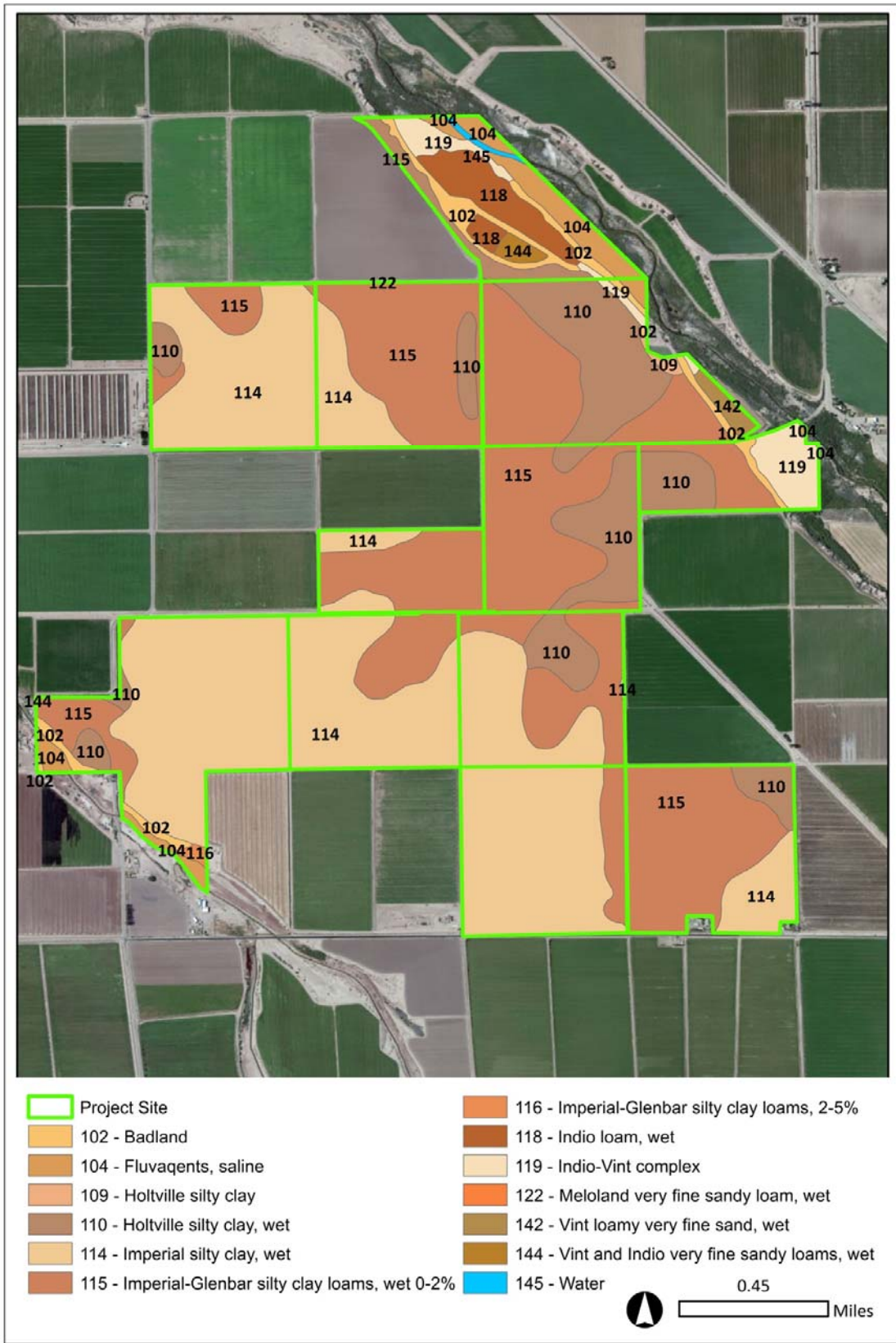
Decommissioning would result in the dismantling and removal of infrastructure constructed as part of the Project. No structures would remain to be potentially disturbed by exposure to liquefiable soils. Thus, following decommissioning, **no impacts** resulting from exposure to liquefiable soils would occur.

FULL BUILD-OUT SCENARIO

Construction

According to the Soil Survey of Imperial County, the proposed solar field site parcels encompass sixteen soil types (refer to **Table 4.6-2** [USDA 1981; Fuscoe 2014] and **Figure 4.6-3**). Some of these soils are prone to liquefaction under certain conditions. The soils which predominantly underlie the solar field site parcels are primarily lean, stiff, clays. Liquefaction is not considered to be a hazard in clays. However, liquefaction is known to occur in saturated or near saturated granular soils at depths shallower than 50 feet. Soil types with liquefaction potential include sandy silts, silty sands and sands which exist below groundwater. These soil types are present on all CUP areas at varying depths and thicknesses (**Figure 4.6-4a** **Figure 4.6-4b**). The independent nature of electrical substation/switchgear equipment and steel posts to support solar panel frames do not generally require mitigation for small seismic settlements typical of the lake bed sediments (LandMark 2014a, p. 5).

4.6 GEOLOGY AND SOILS



Source: DD&E, ESRI, Imperial County, NRCS 2014 in Fuscoe 2014.

FIGURE 4.6-4A
SOILS MAP – NORTHERN CUP CLUSTER (13-0038 THRU 13-0049)

4.6 GEOLOGY AND SOILS



Source: DD&E, ESRI, Imperial County, NRCS 2014 in Fuscoe 2014.

FIGURE 4.6-4B
SOILS MAP – CENTRAL (13-0036 & 13-0037)
& SOUTHERN CUP CLUSTERS (13-0051 & 13-0052)

The soils that predominantly underlie portions of the Gen-Tie line to be constructed generally consist of stiff clays from ancient lake deposits. Liquefiable soil types located within the proposed Gen-Tie alignment include sandy silts, silty sands and sands that exist below groundwater. As a result, liquefaction may occur within discrete soil zones along the proposed new portions of the Gen-Tie alignment. The independent nature of Gen-Tie foundations do not generally require mitigation for small seismic settlements typical of the lake bed sediments (LandMark 2014a, p. 5).

The Project proposes the use of deep drilled pier foundations to support the Gen-Tie structures. The foundations would be 20 to 60 feet deep, depending on the loading on the specific structure, the strength of the soils and the diameter of the drilled pier foundation (Gerking 2014). These foundations would be designed to mitigate any effects of liquefaction (Lyon 2014). Furthermore, there are no gen-tie structures in the flood channel or floodplain.

However, as discussed above, liquefaction settlement and ground fissures are common occurrences in the bottom lands of the incised New River flood channel during strong seismic events. CUP 13-0047 is subject to potential liquefaction settlement and ground fissures associated with the incised New River flood channel and floodplain as a result of the planned installation of non-habitable solar facilities within the channel. Any solar facility improvements placed in the New River flood channel would be engineered in compliance with the recommendations of the Final Geotechnical and GeoHazards Report as reviewed and approved by the Imperial County Public Works Department prior to issuance of a building permit. As CUP 13-0047 is part the Full Build-out Scenario, a **potentially significant** impact related to the presence of liquefiable soils would occur during the construction.

Operation

As noted above, the Project proposes to install non-habitable solar facilities within the eastern boundary of CUP 13-0047. This area includes portions of the New River flood channel and floodplain that are subject to liquefaction settlement and ground fissures during a strong seismic event. Without proper soil engineering and foundation design, any such facilities would likely be damaged during such an event. However, potential impacts related to liquefaction would be addressed during Project design and construction, in compliance with the recommendations of the Final Geotechnical and GeoHazards Report, as reviewed and approved by the Imperial County Public Works Department prior to issuance of a building permit. With proper engineering, impacts associated with soil liquefaction and ground failure at CUP 13-0047 would be reduced to **less than significant**.

Decommissioning

Decommissioning would result in the dismantling and removal of all structures and infrastructure constructed as part of the Project. No structures would remain to be potentially disturbed by exposure to liquefiable soils. Thus, following decommissioning, **no impacts** resulting from exposure to liquefiable soils would occur.

Mitigation Measures

MM 4.6.2a A Final Geotechnical and GeoHazards Report shall be prepared by a licensed professional engineer during the final design phase of the Project. The proposed solar field site parcels and Gen-Tie shall be designed in accordance with the Final Geotechnical and GeoHazards Report. The Report shall be submitted to, and reviewed and approved by, the Imperial County Department of Public Works prior to issuance of building permits. The Geotechnical and GeoHazards Report shall include, but not be limited to, an analysis and recommendations regarding site-specific design provisions for mitigating the following on-site conditions as identified in the Preliminary Geotechnical and GeoHazards Report (LandMark 2014a):

4.6 GEOLOGY AND SOILS

- Soil liquefaction (All solar field site parcels)
- Liquefaction settlement and ground fissures along the New River (CUP 13-0047)
- Sheet flooding along All American Canal earthen embankments (CUPs 13-0050, 13-0051 and 13-0052)
- Landsliding along the New River (CUPs 13-0047; 13-0046 and 13-0045)
- Expansive and corrosive soils (All solar field site parcels)

All measures and design specifications identified in the Final Geotechnical and GeoHazards Report shall be incorporated into and reflected on the Project design and building plans.

Timing/Implementation: Prior to approval of final building plans/As part of Project design/Prior to issuance of building permits.

Enforcement/Monitoring: Imperial County Department of Planning and Development Services / Imperial County Department of Public Works.

Or:

MM 4.6.2b No habitable structures shall be placed within the incised New River flood channel and floodplain.

Timing/Implementation: During construction.

Enforcement/Monitoring: Imperial County Planning and Development Services Department.

Significance After Mitigation

Implementation of mitigation measure MM 4.6.2a or MM 4.6.2b would reduce exposure of Project structures to potential damage caused by soil liquefaction, ground failure, or ground fissures. Mitigation measure MM 4.6.2a would reduce impacts through proper engineering while MM 4.6.2b would preclude habitable structures from being exposed to damage from liquefaction settlement and ground fissures during a strong seismic event. However, any solar facilities within the eastern boundary of CUP 13-0047 that are within the incised New River flood channel and floodplain may be subject to minor damage due to liquefaction settlement and ground fissures during a strong seismic event. Thus, impacts associated with soil liquefaction and ground failure on the solar field site parcel CUP 13-0047 would be **less than significant** after mitigation.

Seismically-Induced Flooding

Impact 4.6.3 Throughout the majority of the solar field site parcels, seismically-induced flooding is considered unlikely. Potential for sheet flooding at CUPs 13-0050, 13-0051 and 13-0052 during a strong seismic event would be addressed through elevating facilities more than 12-inches above-ground level. Therefore, seismically-induced flooding at CUPs 13-0050, 13-0051 and 13-0052 would result in a **less than significant impact**.

CUPs 13-0050, 13-0051 and 13-0052

Construction

According to the Preliminary Geotechnical and GeoHazards Report prepared for the proposed Project, seismically-induced flooding through the majority of the solar field site parcels is considered unlikely (LandMark 2014a, p. 3). There is a small potential for sheet flooding of up to approximately 12 inches at CUPs 13-0050, 13-0051 and 13-0052 if the earthen embankments of the All American Canal are breached during a strong seismic event. . Solar facilities planned within CUPs 13-0050, 13-0051 and 13-0052 will all stand more than two feet above the ground, and therefore are not expected to be submerged or otherwise damaged by such potential sheet flooding. Therefore, a **less than significant**

impact would occur related to seismically-induced flooding at CUPs 13-0050, 13-0051 and 13-0052 during construction.

Operation

Solar facilities installed within CUPs 13-0050, 13-0051 and 13-0052 would be subject to up to 12-inches of sheet flooding during a seismically induced flooding event. Solar facilities will be elevated more than 12-inches above-ground level. As a result, the facilities are not expected to be submerged or otherwise damaged as a result of seismically-induced flooding. Therefore, a **less than significant** impact related to seismically-induced flooding would occur during the operation of CUPs 13-0050, 13-0051 and 13-0052.

Decommissioning

Decommissioning would result in the dismantling and removal of all structures constructed as part of the Project. No structures would remain to be potentially disturbed by seismically-induced flooding. Thus, following decommissioning, **no impacts** resulting from seismically-induced flooding at CUPs 13-0050, 13-0051 and 13-0052 would occur.

FULL BUILD-OUT SCENARIO

Construction

CUPs 13-0050, 13-0051 and 13-0052 are subject to potential seismically-induced flooding associated with potential breach of the All American Canal's earthen berms during a strong seismic event, which could result in up to 12-inches of sheet flooding. Solar facilities installed within CUPs 13-0050, 13-0051 and 13-0052 will be elevated more than 12-inches above ground level and therefore will not be submerged or otherwise damaged by such flooding. No other solar field site parcels or Gen-Tie facilities would be subject to seismically-induced flooding. Therefore, a **less than significant** impact related to seismically-induced flooding would occur at the solar field site parcels during Project construction.

The Project is subject to compliance with the engineering and design standards contained in the 2013 CBC (see MM 4.6.1, above). In addition, during the final design phase, a Final Geotechnical and GeoHazards Report prepared by a licensed professional engineer would be required to address potential seismically-induced flooding impacts. The Final Geotechnical and GeoHazards Report and project plans are subject to review and approval by the Imperial County Planning and Development Services Department and Imperial County Public Works Department (see MM 4.6.2a, above).

Operation

Solar facilities installed within CUPs 13-0050, 13-0051 and 13-0052 might be subject to 12-inches of sheet flooding during a seismically induced flooding event. Solar facilities will be elevated more than 12-inches above-ground level, however, and therefore are not expected to be submerged or otherwise damaged as a result of seismically-induced flooding. Therefore, a **less than significant** impact related to seismically-induced flooding would occur during operation of the Full Build-out Scenario.

Decommissioning

Decommissioning would result in the dismantling and removal of all infrastructure constructed as part of the Full Build-out Scenario. Following decommissioning, no structures would remain to be potentially disturbed by seismically-induced flooding. Thus, **no impacts** resulting from seismically-induced flooding would occur after decommissioning of the Full Build-out Scenario.

Mitigation Measures

None required.

Significance After Mitigation

Not applicable.

4.6 GEOLOGY AND SOILS

Landslides

Impact 4.6.4 Throughout the majority of the solar field site parcels, landslides are unlikely to occur due to the relatively planar topography. However, CUPs 13-0045, 13-0046 and 13-0047 include areas located adjacent to the incised New River channel where bluffs range from 25 to 35 feet high. Therefore, a **potentially significant impact** associated with landslides could occur at CUPs 13-0045, 13-0046 and 13-0047.

CUPs 13-0045, 13-0046, and 13-0047

Construction

According to the Preliminary Geotechnical and GeoHazards Report prepared for the proposed Project, the hazard of landsliding is unlikely due to the relatively planar topography of the area. However, the eastern boundaries of three CUPs 13-0045, 13-0046 and 13-0047 include areas located adjacent to the incised New River channel. The bluffs along the river channel range from 25 to 35 feet high and have potential for small to moderate-scale landslides (LandMark 2014a, p. 3). Therefore, a **potentially significant** impact related to landslides at CUPs 13-0045, 13-0046 and 13-0047 could occur during Project construction.

The Project must implement the methodologies for evaluating landslide risks and recommended mitigation measures for the same, as set forth in Special Publication 117A and the Recommended Procedures For Implementation Of DMG Special Publication 117 Guidelines For Analyzing And Mitigating Landslide Hazards In California published by the Southern California Earthquake Center (June 2002) ("Landslide Guidelines"). Based on the foregoing regulations, it is anticipated that potentially significant landslide hazards might be mitigated along the New River bluff by either re-grading the bluff slope to 2 horizontal to 1 vertical or creating a set-back for permanent structures beyond a 2:1 slope angle projected from the toe of the bluff slope. Typically, solar generation facility structures require a set-back from the top of the bluff equal to the height of the bluff above the New River floodplain (LandMark 2014a, p. 3). During the final design phase, a Final Geotechnical and GeoHazards Report prepared by a licensed professional engineer is required to evaluate and propose Project design measures consistent with the 2013 CBC, Special Publication 117A and Landslide Guidelines for potential construction phase landslide impacts. The Final Geotechnical and GeoHazards Report and project plans are subject to review and approval by the Imperial County Planning and Development Services Department and Imperial County Department of Public Works.

Operation

Potential issues related to landslides would be addressed during Project design and construction in compliance with the requirements of the 2013 CBC (MM 4.6.1) and recommendations of the Final Geotechnical and GeoHazards Report (MM 4.6.2a). Therefore, a **less than significant** impact related to potential for landslides at CUPs 13-0045, 13-0046 and 13-0047 would occur during Project operations.

Decommissioning

Decommissioning would result in the dismantling and removal of all infrastructure constructed as part of the Solar Energy Center. No structures would remain to be potentially disturbed by landslides. Thus, following decommissioning, **no impacts** resulting from landslides would occur at CUPs 13-0045, 13-0046 and 13-0047.

FULL BUILD-OUT SCENARIO

Construction, Operation and Decommissioning

With the exceptions of CUPs 13-0045, 13-0046 and 13-0047, no other solar field site parcels or any portion of the Gen-Tie alignment was identified as having potential for landslides by the Preliminary

Geotechnical and GeoHazards Report (LandMark 2014a, p. 4). Therefore, no additional impact with regard to potential for landslides would occur in association with the Full Build-out Scenario. However, because CUPs 13-0045; 13-0046 and 13-0047 are part of the Full Build-out Scenario, a **potentially significant** impact would occur with regard to landslides during Project construction.

Mitigation Measure

MM 4.6.4 The proposed Project shall be designed in accordance with the engineering and design standards contained in the 2013 CBC, the Seismic Regulations, Special Publication 117A, the Landslide Guidelines and the County of Imperial building requirements. Prior to approval of final building plans, a registered civil engineer or certified engineering geologist, having at least five years of experience in the field of seismic hazard evaluation and mitigation, shall prepare a Final Geotechnical and GeoHazards Report containing site-specific evaluations of the landsliding hazards along the New River (CUPs 13-0047; 13-0046 and 13-0045) and identify appropriate Project design measures pursuant to the established and proven methodologies set forth in the 2013 CBC, Special Publication 117A and the Landslide Guidelines and otherwise in compliance with the requirements of Special Publication 117A. All recommended Project design measures as set forth in the Final Geotechnical and GeoHazards Report shall be incorporated into and reflected on the final design and building plans. The Final Geotechnical and GeoHazards Report and project plans shall be submitted for review and approval by the Imperial County Department of Planning and Development Services prior to approval of the final building plans.

Timing/Implementation: Prior to approval of final building plans/As part of Project design.

Enforcement/Monitoring: Imperial County Department of Planning and Development Services.

Significance After Mitigation

Implementation of mitigation measure MM 4.6.4 would avoid substantial risk to life or property resulting from landslides through adherence to the appropriate codes and standards of care, as set forth in the 2013 CBC, Seismic Regulations, Special Publication 117A and Landslide Guidelines. Thus, potential landslide damage to Project structures developed within CUPs 13-0045; 13-0046 and 13-0047 can be mitigated to a **less than significant** level.

Soil Erosion

Impact 4.6.5 Construction, maintenance, and decommissioning activities would result in earth moving and potential for erosion and loss of top soil. The Project is subject to mandatory compliance with several regulatory requirements established to address erosion. Therefore, this impact is considered **less than significant**.

FULL BUILD-OUT SCENARIO/PHASED CUP SCENARIO

Construction

Soil erosion could result during construction of the proposed Project in association with grading and earth moving activities. The solar field site parcels and individual CUPs consist of agricultural land void of structures with the primary exception of IID and landowner irrigation facilities. A majority of the land is actively being farmed. Existing landowner irrigation ditches within the boundary of each CUP that would conflict with the site's configuration would be demolished and reused on site as recycled base or trucked off site to be recycled or disposed at a landfill. There are no large structures or other facilities that would need to be removed.

4.6 GEOLOGY AND SOILS

At full buildout, most of the proposed solar field site parcels would be disturbed by construction. To the extent feasible, site preparation would be planned and designed to minimize the amount of earth movement. Compaction of the soil to support building and traffic loads as well as the PV module supports may be required and is dependent on final engineering design. During construction, erosion would be controlled in accordance with County standards including preparation, review and approval of a grading plan by the County Engineer; implementation of a Dust Control Plan (Rule 801) (MM 4.4.1a; discussed further in Section 4.4, Air Quality); and compliance with the National Pollutant Discharge Elimination System (NPDES) Construction General Permit (MM 4.11.1b; discussed further in Section 4.11, Hydrology and Water Quality). Applicant-proposed Best Management Practices (BMPs) and Design Features would also include stabilizing all disturbed areas with water, tarps, dust suppressants, or soil binders, and capping construction vehicle speeds at a maximum of 15 miles per hour (mph) on any unpaved surface throughout the solar field site parcels and gen-tie alignment (MM 4.11.1c; discussed further in Section 4.11, Hydrology and Water Quality). Therefore, potential soil erosion impacts occurring during construction would be **potentially significant** prior to mitigation.

Operation

The generally flat topography of the solar field site parcels and the low average annual precipitation for the area would reduce the likelihood of substantial erosion and loss of topsoil. Daily operations and routine maintenance (such as occasional PV panel washing) are not anticipated to increase erosion. As noted in Table 2.0-9 (Applicant Proposed Best Management Practices and Design Features Included as Part of the Proposed Project) the Applicant proposes to control erosion during Project operations and maintenance by stabilizing all disturbed areas with water, tarps, dust suppressants, or soil binders. During operation, soil erosion and sedimentation would be controlled in accordance site design, source control, and treatment control BMPs (MM 4.11.1d; discussed further in Section 4.11, Hydrology and Water Quality). Further, each CUP property owner would be responsible for operation and maintenance of site design, source control, and treatment control BMPs and long-term funding for BMP maintenance. In addition, the County of Imperial would require access to each CUP property for inspection through a formal agreement to ensure that each CUP property owner is properly carrying out the BMPs over the life of the Project. In order to reduce operational impacts related to soil erosion, the Project would require compliance with the previously-identified mitigation measures discussed above. Therefore, potential soil erosion impacts occurring during Project operations would be **potentially significant** prior to mitigation.

Decommissioning

During decommissioning, soil erosion and would be controlled in accordance with NPDES CGP(s) and Project-specific SWPPP(s) prepared for the Full Build-out Scenario and all CUPs, as required by Mitigation measures MM 4.11.1a, MM 4.11.1b and MM 4.11.1c (discussed further in Section 4.11, Hydrology and Water Quality). Decommissioning activities would require earth-moving activities that could contribute to soil erosion and/or release of sediment. Earth-moving activities would be typical of most construction sites and temporary in nature. During decommissioning, each CUP owner would continue to be responsible for implementing and funding BMPs as required by mitigation measure MM 4.11.1d (discussed further in Section 4.11, Hydrology and Water Quality). Further, it is anticipated that regulatory compliance and Best Available Control Technologies (BACTs) at the time of decommissioning would be similar to or more stringent than those currently required. Therefore, a **less than significant impact** regarding soil erosion and sedimentation would occur during decommissioning of both the Full Build-out Scenario and Phased CUP Scenario.

Mitigation Measures

Implement mitigation measures MM 4.4.1a (Section 4.4, Air Quality), MM 4.11.1a, MM 4.11.1b, MM 4.11.1c and 4.11.1d (Section 4.11, Hydrology and Water Quality), and County site design and retention

requirements throughout construction, operations and decommissioning of both the Full Build-out Scenario and Phased CUP Scenario.

Significance After Mitigation

Implementation of mitigation measures MM 4.4.1a (Section 4.4, Air Quality), MM 4.11.1a thru 4.11.1d (Section 4.11, Hydrology and Water Quality), and compliance with County site design and retention requirements would reduce the potential for soil erosion and sedimentation at off-site locations through containment of disturbed soils on-site during construction, operation, and decommissioning activities. Therefore, potential impacts regarding soil erosion and sedimentation would be reduced to **less than significant** throughout construction, operations and decommissioning of both the Full Build-out Scenario and Phased CUP Scenario.

Expansive Soils

Impact 4.6.6 Some of the soils identified within the solar field site parcels have expansive characteristics. This is considered a **potentially significant impact**.

FULL BUILD-OUT SCENARIO/PHASED CUP SCENARIO

Construction

Soils on the Project site predominately consist of clays with imbedded silts and sandy silts. Structures (building/inverter foundations, concrete flatwork, O&M building(s), etc.) proposed on the solar field site parcels could be subject to some potential swelling forces and reduction in soil strength resulting from saturation of the soil. This is considered a **potentially significant impact**.

Expansive soils would not have any effect on deep drilled piers proposed to support Gen-Tie structures (LandMark 2014a, p. 4). Therefore, the Gen-Tie is not expected to be subject to direct impacts resulting from the presence of expansive soils, and **no impact** would occur during construction of the Gen-Tie.

During the final design phase, a Final Geotechnical and GeoHazards Report prepared by a licensed professional engineer is required to address potential construction phase expansive soils impacts pursuant to the standards set forth in the 2013 CBC. The engineer preparing the report shall make recommendations to mitigate potentially adverse impacts associated with expansive soils in conformance with established and proven methodologies set forth in the 2013 CBC. The Final Geotechnical and GeoHazards Report and project plans are subject to review and approval by the Imperial County Planning and Development Services Department and Imperial County Department of Public Works.

Operation

Potential issues related to expansive soils would be addressed during Project design and construction in compliance with the requirements of the 2013 CBC and recommendations of the Final Geotechnical and GeoHazards Report. Therefore, a **less than significant** impact related to expansive soils is anticipated to occur during the operation of both the Full Build-out Scenario and Phased CUP Scenario.

Decommissioning

Decommissioning would result in the dismantling and removal of all structures constructed as part of the Project. The solar facilities on each CUP would be removed and no longer be subject to potential swelling forces and reduction in soil strength resulting from saturation of the soil. Thus, following decommissioning, **no impact** resulting from exposure to expansive soils would occur for both the Full Build-out Scenario and Phased CUP Scenario.

4.6 GEOLOGY AND SOILS

Mitigation Measure

MM 4.6.6 The proposed Project shall be designed in accordance with the engineering and design standards contained in the 2013 CBC relating to expansive soils. Prior to approval of final building plans, a registered civil engineer or certified engineering geologist, having at least five years of experience in the field of expansive soils evaluation and mitigation, shall prepare a Final Geotechnical and GeoHazards Report containing site-specific evaluations of expansive and corrosive soils for all solar field site parcels and identify appropriate Project design measures pursuant to the established and proven methodologies set forth in the 2013 CBC. All recommended Project design measures as set forth in the Final Geotechnical and GeoHazards Report shall be incorporated into and reflected on the final design and building plans. The Final Geotechnical and GeoHazards Report and project plans shall be submitted for review and approval by the Imperial County Department of Planning and Development Services prior to approval of the final building plans.

Timing/Implementation: Prior to approval of final building plans/As part of Project design.

Enforcement/Monitoring: Imperial County Department of Planning and Development Services.

Significance After Mitigation

Implementation of mitigation measure MM 4.6.6 would implement proven and effective measures set forth in the 2013 CBC to avoid substantial risk to life or property caused by expansive soils. Thus, impacts associated with expansive soils on the solar field site parcels would be reduced to **less than significant**.

Soil Capability to Support On-site Wastewater Treatment System (OWTS)

Impact 4.6.7 The Project would generate wastewater from sanitary facilities such as sinks and toilets in the O&M building(s). The Project proposes to construct an On-site wastewater Treatment System (OWTS) to accommodate wastewater flows generated on the solar field site parcels. However, near-surface soils are clay and have very low to low infiltration rates. Further, to meet health standards, vertical separation between OWTS and groundwater would need to be maintained. Therefore, soil capability to support septic systems is considered a **potentially significant impact**.

ALL CUPs WHERE AN O&M BUILDING IS PROPOSED

Construction

The solar field site parcels and surrounding areas are rural with industrial solar developments and not served by municipal wastewater. During construction, waste streams would be generated from on-site construction workers. Temporary septic systems or holding tanks and portable toilets would be used during construction of the Project to provide needed sanitary facilities. These facilities may be located on CUPs where O&M buildings are proposed as needed based upon the location of construction activities. Portable facilities would be self-contained and would not release wastewater or require soils capable of supporting septic systems. Therefore, a **less than significant** impact would occur during the construction phase of the Project in regard to soil capability to support septic systems

Operation

The solar field site parcels and surrounding areas are rural and not served by municipal wastewater. During operations and maintenance activities, the Project proposes to collect wastewater from sinks and

toilets located in the O&M building(s) and convey the waste stream to on-site wastewater treatment systems. The proposed on-site wastewater treatment systems would consist of leachfields, mounds, at-grade, subsurface drip fields and infiltration beds, or other types of systems for final wastewater treatment and subsurface discharge. If on site wastewater treatment systems cannot be utilized in compliance with the OWTS Policy (defined below), then the Project will be required to obtain and discharge wastewater pursuant to an operation and discharge permit issued by the Regional Water Quality Control Board.

Use of on-site wastewater treatment systems are governed by the State Water Resources Control Board's OWTS Policy, Water Quality Control Policy for Siting, Design, Operation and Maintenance of On-site wastewater Treatment Systems ("OWTS Policy"). The OWTS Policy establishes a statewide, risk-based, tiered approach for the regulation and management of on-site wastewater treatment systems and sets the level of performance and protection required from on-site wastewater treatment systems. The OWTS Policy only authorizes subsurface disposal of wastewater and establishes minimum requirements for the permitting, monitoring and operation of on-site wastewater treatment systems for protecting beneficial uses of waters of the State and preventing conditions of pollution and nuisance. The OWTS Policy requires that an on-site wastewater treatment system be supported by soils that provide minimum separation from groundwater (5-feet for the Project); percolation tests demonstrate the effluent dispersal area shall not be faster than one minute per inch or slower than one hundred twenty minutes per inch; minimum horizontal setbacks be maintained from specified land uses (5-feet from property lines and structures, 100-feet from water and monitoring wells, and other specified setbacks for other water sources and public water systems); and that the natural ground slope shall not exceed 25%, among other things. If the wastewater from the O&M buildings is treated by a pressure distribution system, it will also be required to meet the standards established by the Imperial County Division of Environmental Health in Pressure Distribution (2012): Standards and Guidance for Performance, Application, Design and Operation and Maintenance ("Pressure Distribution Guidelines").

According to the Preliminary Geotechnical and GeoHazards Report prepared for the proposed Project, near-surface soils generally consist of silty clays and clays having a very low to low infiltration rate. The near-surface soils are considered poor with regard to supporting on-site wastewater treatment systems, including leach fields for wastewater disposal. In addition, groundwater in the Project vicinity is typically encountered at a depth of 5 to 10 feet below ground surface (LandMark 2014a, p. 3).

Site-specific studies prepared during the final design phase and prior to the issuance of building permits will be required for each O&M building proposing the use of an on-site wastewater treatment system to determine whether compliance with OWTS Policy can be achieved with regard to soil percolation rates, vertical separation from groundwater, and other siting requirements (LandMark 2014a, p. 3). In addition, any on-site wastewater treatment system must be designed and installed in compliance with all applicable provisions of the Imperial County Code, including the Plumbing Code and ordinances governing Regulation of Sewage Disposal Systems and Sanitation Permits, as set forth in Title 9, Division 10, Chapters 4, 12 and 13, and the Imperial County Uniform Policy and Method for Soils Evaluation, Testing and Reporting (Relative to Applications for Private Sewage System Permits).

If site-specific studies conclude that onsite soils are not suitable for use of on-site wastewater treatment systems at O&M building locations, then wastewater generated by the O&M buildings shall be discharged pursuant to an operation and discharge permit issued by the Regional Water Quality Control Board ("Discharge Permit"). If permitted pursuant to the standards and requirements set forth in Title 22 of the California Code of Regulations ("Title 22 Standards"), wastewater will be treated onsite and then used onsite as irrigation water for landscaping or as dust control water. If on site treatment and use of wastewater cannot be permitted, then wastewater will be conveyed to the nearest drain maintained by the Imperial Irrigation District for discharge and treatment.

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Based on the foregoing, impacts regarding soil ability to support the use of on-site wastewater treatment systems or to treat wastewater pursuant to a Discharge Permit at the O&M building(s) are considered **potentially significant** prior to mitigation.

Decommissioning

Temporary septic systems or holding tanks and portable toilets may be used at O&M building(s) during decommissioning to provide needed sanitary facilities for on-site workers. However, temporary and portable restroom facilities would be self-contained and would not release wastewater or require soils capable of supporting on-site wastewater treatment systems. Therefore, a **less than significant** impact would occur during decommissioning of the O&M buildings in regard to soil capability to support septic systems.

FULL BUILD-OUT SCENARIO

Construction

The solar field site parcels and surrounding areas are rural and not served by municipal wastewater. During construction, the Project would generate waste streams from construction on-site workers. As discussed above, septic systems would only be needed on sites with O&M buildings. No other Project components would require soils suitable for septic systems.

Temporary septic systems or holding tanks and portable toilets would be used during Project construction to provide needed sanitary facilities. These facilities may be located throughout the Project site as needed based upon the location of construction activities. However, temporary and portable restroom facilities would be self-contained and would not release wastewater or require soils capable of supporting septic systems. However, because O&M building(s) are part of the Full Build-out Scenario, a **potentially significant** impact would occur with regard to soil capability to support septic systems under the Full Build-out Scenario.

Operation

As discussed above, on-site wastewater treatment systems would only occur on sites with O&M buildings where soils are determined to be suitable pursuant to the standards set forth in the OWTS Policy during the Project design and construction phase. If on-site wastewater discharge treatment systems cannot be established in compliance with the OWTS Policy, then on-site wastewater will be discharged pursuant to a Discharge Permit issued by the Regional Water Quality Control Board. If permitted pursuant to Title 22 Standards, wastewater will be treated onsite and then used for onsite irrigation or landscaping or dust control water.

During periodic major maintenance events, portable restroom facilities may be provided to accommodate additional workers. These facilities may be located throughout the Project site and Gen-Tie alignment as needed based upon the location of maintenance activities. However, portable restroom facilities would be self-contained and would not release wastewater or require soils capable of supporting septic systems. Therefore, a **less than significant** impact would occur with regard to soil capability to support septic systems during Project operations under the Full Build-out Scenario.

Decommissioning

Temporary septic systems or holding tanks and portable toilets would be used during the decommissioning phase of the Project to provide sanitary facilities for on-site workers. These facilities may be located throughout the proposed Project site and Gen-Tie alignment as needed based upon the location of decommissioning activities. However, temporary and portable restroom facilities would be self-contained and would not release wastewater or require soils capable of supporting on-site wastewater treatment systems. Therefore, a **less than significant** impact would occur with regard to soil capability to support on-site wastewater treatment systems during Project decommissioning.

Mitigation Measures

MM 4.6.7 The Project's wastewater treatment and disposal system(s) shall comply with all applicable provisions of the OWTS Policy; Imperial County Code, including the Plumbing Code and ordinances governing Regulation of Sewage Disposal Systems and Sanitation Permits, as set forth in Title 9, Division 10, Chapters 4, 12 and 13; and the Imperial County Uniform Policy and Method for Soils Evaluation, Testing and Reporting (Relative to Applications for Private Sewage System Permits) ("County Policy"); and the Pressure Distribution Guidelines (if a pressure distribution system is used). At each location where on-site wastewater treatment systems associated with the construction of an O&M facility are proposed, a site-specific study shall be prepared by a qualified engineer, as defined in the OWTS Policy and the County Policy to (a) determine the capability of the soils to provide the minimum required 5-foot vertical separation between each on-site wastewater treatment system and groundwater, (b) determine the capability of the soils to satisfy percolation requirements, and (c) perform other soil and site evaluations to determine the capability of the soils to otherwise support on-site wastewater treatment systems. If the soils are determined to be suitable for on-site wastewater treatment systems, the qualified engineer shall design on-site wastewater treatment systems to comply with the OWTS Policy, including with regard to maintenance of minimum setbacks from specified land uses, ensuring that effluent does not surface at any time, that percolation of effluent will not adversely affect beneficial uses of waters of the State, the maintenance of at least 12 inches of soil cover (or 6 inches for pressure distribution systems) above on-site wastewater treatment system, designation of a 100% replacement area that is equivalent and separate and available for future use, and that no impermeable surface cover shall be placed above any on-site wastewater treatment system.

If a qualified engineer determines that soils are not suitable for on-site wastewater treatment systems at O&M building sites, then the applicant shall be required to obtain an operation and discharge permit from the Regional Water Quality Control Board for the discharge of wastewater generated by the Project's O&M buildings. If permitted, wastewater shall be treated onsite and then used onsite as irrigation water for landscaping or as dust control water in compliance with Title 22 Standards. If on site use of wastewater cannot be permitted, then an application will be made to the Imperial Irrigation District to permit treated wastewater to be conveyed to the nearest drain maintained by the Imperial Irrigation District for discharge under Regional Water Quality Control Board Waste Discharge Requirements.

Timing/Implementation: Prior to issuance of building permits.

Enforcement/Monitoring: Imperial County Environmental Health Services.

All recommended design and construction specifications identified in the site specific studies shall be incorporated into and reflected on the Project design and building plans.

Significance After Mitigation

Mitigation measure MM 4.6.7 requires that on-site wastewater treatment systems will only be utilized if soils are determined to be adequate to support such systems pursuant to the standards set forth in the OWTS Policy. If the soils are determined to be unsuitable for an on-site wastewater treatment system pursuant to the OWTS Policy, then wastewater shall be treated pursuant to a Discharge Permit issued by the Regional Water Quality Control Board. Therefore, mitigation measure MM 4.6-7 would reduce

4.6 GEOLOGY AND SOILS

potential impacts regarding soil capacity to support on-site wastewater treatment facilities at O&M building sites to **less than significant**.

Soil Corrosivity

Impact 4.6.8 Soils within the solar field site parcels are severely corrosive. Steel and concrete structures could be damaged through contact with corrosive soil. This is considered a **potentially significant impact**.

FULL BUILD-OUT SCENARIO/PHASED CUP SCENARIO

Construction

All soils within the ancient lake bed in which the Imperial Valley is formed are moderately to highly corrosive to steel and concrete (Lyon 2014). These soils present a potential corrosion threat to substations/switchgear where bare steel or concrete is in contact with soil. Corrosive soils are present on all CUPs (13-0036 thru 13-0052) and along all portions of the Gen-Tie alignment. However, proposed Gen-Tie structures would not place any bare steel in contact with soil because typical Gen-Tie structure foundations are concrete drilled piers. Therefore, corrosive soil impacts are not anticipated to occur in relation to construction of the Gen-Tie (Lyon 2014). Damage to proposed Project foundations as a result of soil chemistry is considered a **potentially significant impact**.

Because all Imperial Valley soils (except the desert margins) are corrosive, standard practices are in place to use higher cement content concrete mixes and protect steel from corrosion. Bare steel exposed to the native soils would require corrosion protection such as epoxy coatings, galvanizing, sacrificial (excess) metal thickness and/or cathodic protection. The application of epoxy coatings or galvanizing (placement of galvanizing plate over base metal) prevent the underlying steel from coming into direct contact with potentially corrosive soils. The use of sacrificial (excess) metal thickness involves designing steel parts to be larger than necessary so that even with corrosion, the steel will continue to be of sufficient thickness to support the associated structures. Cathodic protection contemplates placement of a sacrificial anode (typically a bare wire) into the ground to attract and absorb corrosion that otherwise might affect the steel associated with the Project. Each of these methods is a proven and effective means of protecting steel from corrosive soils. In addition, reinforcing bars could be protected from corrosion by utilizing 3- to 5-inch concrete cover over bars exposed to the native soil. Additionally, concrete mixes would be required to utilize increased quantities of Type II or Type V Portland cement to achieve a minimum strength of 4,500 pounds per square inch (psi) compressive strength and be placed at a low water-cement ratio (0.45 maximum by weight) (LandMark 2014a, p. 4).

Preparation of a Field Resistivity and Ground Potential Rise evaluation during final engineering design would allow for: identification of specific corrosive soil threats; measures to address potential corrosion threats; and incorporation of recommended measures into the final engineering design and construction requirements at all substations/switchgear, and in the solar field areas where bare steel is in contact with soil. Because the Gen-Tie structures would not have any bare steel exposed to soil, there would be no need for field resistivity testing in association with Gen-Tie construction (LandMark 2014a, p. 4) under both the Full Build-out Scenario and Phased CUP Scenario.

Operation

Potential issues related to corrosive soils would be addressed during Project design and construction in compliance with the requirements of the Field Resistivity and Ground Potential Rise Evaluation. Therefore, a **less than significant** impact related to corrosive soils is anticipated to occur during operation of the Project under both the Full Build-out Scenario and Phased CUP Scenario.

Decommissioning

As part of decommissioning, all Solar Energy Center structures and infrastructure would be removed and the solar field site parcels would be reclaimed to pre-Project soil conditions. Therefore, **no impacts** associated with corrosive soils are anticipated to occur under decommissioning of all CUPs (13-0036 thru 13-0052).

As part of decommissioning, all concrete foundations would be removed and demolished. The Gen-Tie structure locations would be reclaimed to their pre-Project condition. Thus, no impacts associated with corrosive soils would occur in association with decommissioning the Gen-Tie.

Mitigation Measures

MM 4.6.8 A Field Resistivity and Ground Potential Rise Evaluation shall be prepared by a qualified engineer having at least five years of experience in the field of corrosive soils evaluation and mitigation during the final design phase of the Project. The Evaluation shall identify Project components potentially subject to corrosive soils, as well as specific, accepted, proven construction engineering practices and measures that could be implemented to avoid adverse corrosion impacts. Potential measures may include, but are not limited to: galvanization, epoxy coatings, thicker steel, and cathodic protection and shall be applied and implemented in a manner that protects the functionality of Project components from being compromised as a result of exposure to corrosive soils. Concrete utilizing mixes of quantities of Type II or Type V Portland cement to achieve a minimum strength of 4,500 pounds per square inch (psi) compressive strength and a low water-cement ratio (0.45 maximum by weight) can also be used to encase steel as an effective measure of protection against corrosive soils. The Field Resistivity and Ground Potential Rise Evaluation shall be submitted for review and approval to the Imperial County Department of Public Works. Measures identified in the Field Resistivity and Ground Potential Rise Evaluation shall be identified on and incorporated into the Project's final design plans.

Timing/Implementation: Prior to issuance of building permits.

Enforcement/Monitoring: Imperial County Department of Planning and Development Services / Imperial County Department of Public Works.

Significance After Mitigation

Implementation of mitigation measure MM 4.6.8 would ensure that the Project is designed and constructed to protect against corrosion. In particular, steel exposed to corrosive soils could be protected from damaging corrosion through the application of epoxy, galvanization, use of sacrificial metal or cathodic protection. Use of higher cement content concrete could also be used to protect steel from corrosive soils. Upon implementation of this measure, impacts resulting from soil corrosivity throughout the Solar Energy Center would be reduced to **less than significant**.

4.6.4 CUMULATIVE SETTING, IMPACTS AND MITIGATION MEASURES

A. CUMULATIVE SETTING

The geographic scope for the cumulative geology and soils setting is the Imperial Valley portion of the Salton Trough physiographic province of Southern California. In general, geology and soils impacts are site-specific and limited to the boundaries of a proposed project rather than cumulative in nature. Project-specific impacts within the geographic scope are based on the soil characteristics and topography of each solar field site parcel. A list of proposed, approved and reasonably foreseeable projects is identified in Table 3.0-1 in Chapter 3.0, Introduction to the Environmental Analysis and Assumptions Used. All of these are located in the geologic scope for geology and soils.

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B. CUMULATIVE IMPACTS AND MITIGATION MEASURES

Cumulative Exposure to Geologic and Seismic Impacts

Impact 4.6.9 Implementation of the proposed Project, in combination with proposed, approved and reasonably foreseeable projects, may result in cumulative exposure to geologic and seismic hazards. However, geologic and seismic hazards are analyzed and mitigated on a project-by-project basis. Therefore, cumulative exposure to geologic and seismic impacts is considered **less than cumulatively considerable**.

FULL BUILD-OUT SCENARIO/PHASED CUP SCENARIO

Construction

Potential exposure to ground-shaking impacts occurring during construction would be addressed at the Project-specific level through compliance with the 2013 CBC as specified in MM 4.6.1. Potential soil liquefaction, liquefaction/settlement, seismic-induced flooding, and landslides occurring during construction would be addressed at the Project-specific level through preparation of a Final Geotechnical and Geohazards Report as specified in MM 4.6.2a. Soil erosion would be controlled on-site with site-specific measures, a grading plan approved by the County Engineer; implementation of a Dust Control Plan for control of fugitive dust during construction as required by ICAPCD Regulation VIII, Fugitive Dust Rules (MM 4.4.1a, Section 4.4, Air Quality); compliance with the NPDES Construction General Permit (MM 4.11.1a); compliance with the required Storm Water Pollution Prevention Plan (SWPPP) (MM 4.11.1b); and implementation of Applicant-proposed erosion control design features and BMPs (MM 4.11.1c). Soil corrosivity issues would be controlled through at the Project-level through implementation of mitigation measure MM 4.6.8.

Geology and soils impacts are primarily considered potentially significant short-term, site-specific impacts under CEQA. Therefore, geology and soils impacts occurring during construction are not expected to combine with similar impacts of proposed, approved and reasonably projects identified in Table 3.0-1 in Chapter 3.0, Introduction to the Analysis and Assumptions Used. Therefore, Project construction would have a **less than cumulatively considerable contribution** to geology and soils impacts. Likewise, cumulative impacts associated with geology and soils occurring during Project construction would be **less than cumulatively considerable** for both the Full Build-out Scenario and Phased CUP Scenario.

Operation

Ground Shaking

As discussed above, the solar field site parcels are located in a seismically active area and are susceptible to seismic ground shaking in the event of an earthquake. Mitigation measure MM 4.6.1, which requires structures to be designed and built in conformance with the 2013 CBC, would be implemented Project construction. As such ground shaking impacts are anticipated to be less than significant during the Project operations. Further, geology and soils impacts are primarily considered potentially significant short-term, site-specific impacts under CEQA. As such, ground shaking impacts associated with Project operations are not expected to combine with proposed, approved, and reasonably foreseeable projects identified in Table 3.0-1 in Chapter 3.0, Introduction to the Environmental Analysis and Assumptions Used. Therefore, the proposed Project would have a **less than cumulatively considerable contribution** to ground shaking impacts. Likewise, cumulative impacts associated with ground shaking during Project operations would be **less than cumulatively considerable** for both the Full Build-out Scenario and Phased CUP Scenario.

Liquefaction/Ground Failure

As discussed above, CUP 13-0047 is located in an area potentially subject to liquefaction and ground failure. Mitigation measure MM 4.6.2a, which requires that all CUPs be designed in accordance with a Final Geologic and GeoHazards Report, would be implemented prior to and during the construction phase of the proposed Project. As such liquefaction impacts would be reduced to less than significant levels during the Project operations as a result of soil and foundation engineering. Alternatively, MM 4.6.2b would avoid development of solar facilities within CUP 13-0047 thereby eliminating any potential for damage as a result of liquefaction and/or ground failure. Geology and soils impacts are primarily considered potentially significant short-term, site-specific impacts under CEQA which are addressed on a project-by-project basis through engineering or avoidance. As such, operation-phase liquefaction and ground failure related impacts are not expected to combine with similar impacts of proposed, approved and reasonably foreseeable projects identified in Table 3.0-1 in Chapter 3.0, Introduction to the Environmental Analysis and Assumptions Used. Therefore, the proposed Project would have a less than cumulatively considerable contribution to exposure to liquefiable soils and result in a **less than cumulatively considerable impact**.

Landslides

As discussed above, CUPs 13-0045, 13-0046 and 13-0047 are located in areas adjacent to the incised New River channel that are susceptible to landslide. Mitigation Measure MM 4.6.4, which requires the Project be designed in accordance with the 2013 CBC, the Seismic Regulations, Special Publication 117A, the Landslide Guidelines and the County of Imperial building code, would be implemented during the construction phase of the Project, and ensures that anticipated landslide impacts will be less than significant during the construction phase of the proposed Project. Landslide impacts are anticipated to be less than significant during the operation-phase of the Project and geology and soils impacts are primarily considered potentially significant short-term, site-specific impacts under CEQA. As such, operation-phase landslide related impacts are not expected to combine with similar impacts of approved, proposed, and reasonably foreseeable projects identified in Table 3.0-1 in Chapter 3.0, Introduction to the Environmental Analysis and Assumptions Used. Therefore, the proposed Project would have a less than cumulatively considerable contribution to exposure to liquefiable soils and landslides and result in a **less than cumulatively considerable impact**.

Flooding

Development of Project facilities at CUPs 13-0050, 13-0051, and 13-0052 may be subject to sheet flooding associated with potential failure of earthen embankments along the All American Canal during strong seismic events. Sheet flooding is expected to be no more than 12-inches and solar facilities within CUPs 13-0050, 13-0051, and 13-0052 will all be raised more than 12-inches above ground level and therefore would not result in a significant impact. Further, geology and soils impacts are primarily considered potentially significant short-term, site-specific impacts under CEQA. Therefore, sheet flooding-related impacts associated with Project operation are not expected to combine with similar impacts of approved, proposed, and reasonably foreseeable projects identified in Table 3.0-1 in Chapter 3.0, Introduction to the Analysis and Assumptions Used. Therefore, the proposed Project would have a less than cumulatively considerable contribution sheet flooding during strong seismic events in the operation phase, and result in a **less than cumulatively considerable impact**.

Soil Erosion

Operation-phase soil erosion would be controlled on site with site-specific measures incorporated into a Project-specific SWPPP (MM 4.11.1b and MM 4.11.1c), implementation of a Dust Control Plan (Rule 801) (MM 4.4.1a), and mandatory on-going BMP maintenance activities by each CUP owner, subject to

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monitoring by the County (MM 4.11.1d). Further, soil erosion impacts are considered potentially significant short-term, site-specific impacts under CEQA. Therefore, operation-phase soil erosion impacts are not expected to combine with similar impacts of approved, proposed, and reasonably foreseeable projects identified in Table 3.0-1 in Chapter 3.0, Introduction to the Environmental Analysis and Assumptions Used. The proposed Project would have a less than cumulatively considerable contribution to soil erosion impacts during the operation phase. Therefore, cumulative operation-phase impacts associated with soil erosion would be **less than cumulatively considerable**.

Expansive Soils

As discussed above, all CUPs (13-0036 thru 13-0052) are located in areas containing expansive soils. Mitigation measure MM 4.6.6, which requires that all CUPs be designed in accordance with a Final Geologic and GeoHazards Report, would be implemented prior to and during the construction phase of the proposed Project. As such ground shaking impacts are anticipated to be less than significant during the operation phase of the Project. Further, geology and soils impacts are primarily considered potentially significant short-term, site-specific impacts under CEQA. As such, Project operation-phase expansive soils impacts are not expected to combine with similar impacts of approved, proposed, and reasonably foreseeable projects identified in Table 3.0-1 in Chapter 3.0, Introduction to the Environmental Analysis and Assumptions Used. Therefore, cumulative operation-phase impacts associated with expansive soils would be **less than cumulatively considerable**.

Soil Capability to Support Septic Systems

As discussed above, development of all CUPs (13-0036 thru 13-0052) where an O&M building is proposed would require site-specific septic soils studies prior to construction, as required under mitigation measure MM 4.6.7. As compliance with MM 4.6.7 would occur prior to and during construction of each CUP, impacts related to septic-capable soils are anticipated to be less than significant during the Project's operation phase. Further, geology and soils impacts are primarily considered potentially significant short-term, site-specific impacts under CEQA. As such, operation-phase septic-capable soils impacts are not expected to combine with similar impacts of approved, proposed, and reasonably foreseeable projects identified in Table 3.0-1 in Chapter 3.0, Introduction to the Environmental Analysis and Assumptions Used. Therefore, cumulative operation-phase impacts associated with septic-capable soils would be **less than cumulatively considerable**.

Corrosive Soils

As discussed above, all CUPs (13-0036 thru 13-0052) are located in areas containing corrosive soils. Mitigation measure MM 4.6.8, which requires that all CUPs be designed in accordance with a Field Resistivity/Ground Potential Rise Report, would be implemented prior to and during the construction phase of the proposed Project. As such corrosive soils impacts are anticipated to be less than significant during the operation phase of the Project. Further, geology and soils impacts are primarily considered potentially significant short-term, site-specific impacts under CEQA. As such, Project operation-phase corrosive soils impacts are not expected to combine with similar impacts of approved, proposed, and reasonably foreseeable projects identified in Table 3.0-1 in Chapter 3.0, Introduction to the Environmental Analysis and Assumptions Used. Therefore, cumulative operation-phase impacts associated with corrosive soils would be **less than cumulatively considerable**.

Decommissioning

Decommissioning would entail removal of all structures from the proposed Project site (all solar site parcels/all CUPs 13-0036 thru 13-0052), and implementation of a Reclamation Plan to return the solar site parcels to agricultural use. Decommissioning of the solar field site parcels would not contribute to

ground shaking, liquefaction/ground failure, seismically-induced flooding, expansive soils, septic-capable soils, or corrosive soils impacts. Soil erosion would occur during decommissioning activities as a result of earth-moving activities. Reestablishment of the solar field site parcels as active farmland could result in dust and soil disturbance similar to levels occurring under the existing active farmland conditions. Soil erosion impacts are primarily considered potentially significant short-term, site-specific impacts under CEQA. All decommissioning activities would be required to implement appropriate fugitive dust control measures consistent with applicable ICAPCD requirements in effect at the time of site closure (i.e. at the end of each CUP or 30 years, whichever is later). Similarly, all decommissioning activities would implement appropriate BMPs and other measures consistent with applicable County and RWQCB requirements in effect at the time of site closure (i.e. at the end of each CUP or 30 years, whichever is later). Thus, decommissioning activities would result in a **less than cumulatively considerable** contribution to soil erosion impacts for both the Full Build-out Scenario and Phased CUP Scenario.

Mitigation Measures

As discussed throughout this analysis, the proposed Project would be subject to all applicable building codes and standards including the 2013 CBC (MM 4.6.1) as well as any further engineering requirements set forth in the Final Geotechnical and GeoHazards Report (MM 4.6.2a). Likewise, the Project would be subject to further engineering with regard to expansive soils (MM 4.6.2a), septic-capable soils (MM 4.6.7) and corrosive soils (MM 4.6.8). Finally, the Project would be required to implement a Dust Control Plan (MM 4.4.1a in Section 4.4, Air Quality), comply with the requirements of the SWRCB's General Construction Stormwater Permit (MM 4.11.1a in Section 4.11, Hydrology and Water Quality), and prepare and implement a Project-specific SWPPP with BMPs incorporated to address potential soil erosion impacts (MM 4.11.1b and 4.11.1c in Section 4.11, Hydrology and Water Quality). Therefore, following mitigation, cumulative geologic and seismic impacts would be reduced to **less than cumulatively considerable**.

Significance After Mitigation

Project-specific impacts are mitigated on a project-by-project basis. Upon compliance with mandatory regulatory requirements (i.e. the CBC), and following implementation of mitigation measures MM 4.4.1a, MM 4.6.1, MM 4.6.2a, MM 4.6.2b, MM 4.6.7, and MM 4.6.8, MM 4.11.1a, MM 4.11.1b, MM 4.11.1c and MM 4.11.1d at the Project-level, geology and soils impacts would be reduced to **less than cumulatively considerable** levels.

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