

APPENDIX B

Geological Desktop Evaluation

Geological Desktop Evaluation Sapphire Solar Project Riverside County, California

Sapphire Solar, LLC/EDF Renewables Development,
Inc.

15445 Innovation Drive | San Diego, CA 92128

March 13, 2023 | Project No. 109514001



Geotechnical | Environmental | Construction Inspection & Testing | Forensic Engineering & Expert Witness

Geophysics | Engineering Geology | Laboratory Testing | Industrial Hygiene | Occupational Safety | Air Quality | GIS

Ninyo & Moore
Geotechnical & Environmental Sciences Consultants

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Katie Kuplevich

Sapphire Solar, LLC/EDF Renewables, Inc.

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Cat



Christina A. Tretnjak, PG, CEG
Senior Project Geologist

Gregory T. Farrand

Gregory T. Farrand, PG, CEG
Principal Geologist

CAT/WRM/GTF/mp



William R. Morrison

William R. Morrison, PE, GE
Principal Engineer

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EXECUTIVE SUMMARY

EDF Renewables Development, Inc. (EDFR) on behalf of Sapphire Solar, LLC (Applicant) proposes to entitle, construct, operate, and maintain the Sapphire Solar Project (Project), located in Riverside County, California. The Project consists of approximately 1,082 acres on private lands that would include a solar site with up to 117-megawatt (MW) of photovoltaic (PV) solar generation and a up to 117-MW AC coupled centralized battery energy storage system (BESS). In addition, the Project would also include up to three options for one 230-kilovolt (kV) generation tie (gen-tie) line alignment, access roads, and collector line routes, collectively referred to as “Linear Facility Routes,” that are located on approximately 110 acres of land administered by the United States Department of Interior, Bureau of Land Management (BLM). Project. The Project has been determined by Riverside County, acting as the California Environmental Quality Act (CEQA) lead agency, to require preparation of an environmental impact report (EIR) to evaluate the proposed impacts of the Project. In addition, the BLM, acting as the National Environmental Policy Act (NEPA) lead agency, will prepare the appropriate documentation to evaluate the proposed impacts of the Project. This Geological Desktop Assessment has been prepared to support preparation of documentation pursuant to CEQA and NEPA, and the discretionary land use decisions that will be undertaken by the Riverside County Board of Supervisors and the BLM.

The proposed Project is located approximately 40 miles west of the City of Blythe and 3½ miles north of Interstate 10 (I-10) near the town of Desert Center in unincorporated Riverside County in southern California. Project. The Project is bounded on the north, east, and west sides by BLM lands and to the south by Belsby Avenue. Melon Street runs along the west side of the Project boundary and Jojoba Street on the east. The east side of the Project site is located adjacent to California State Route 177/Rice Road.

Site elevations range from approximately 560 feet below mean sea level (MSL) in the southeast portion of the Project site to approximately 690 feet below MSL in the west portion of the Project site. The site was formerly utilized for agricultural purposes and a few farm-related structures are located in the western portion of the Project site, which is currently used for agricultural purposes.

Geologic and geotechnical constraints evaluated for the Project include:

- Surface and near-surface soils at the Project site are mapped as alluvial deposits (Dibblee, 2008). Fill materials associated with the construction of the existing roadways and utilities as well as agricultural topsoil are also anticipated at the Project. Geotechnical constraints related to soils at the Project are:
 - *Soft Ground* – Areas with soft ground or loose soils are anticipated throughout the Project.
 - *Expansive Soils* – The Project soils are expected to have moderate to high potential for expansion.

- *Collapsible Soils* – Hydro-consolidation, or soil collapse, typically occurs in recently deposited soils that were deposited in an arid or semi-arid environment. Soils that are subject to collapse can include fills, wind-blown sands and silts, and alluvial fan and mudflow sediments that are deposited during flash floods. These soils generally contain pores/voids and may be supported by clay or silt, or they are weakly cemented. When inundated with water, the water removes or dissolves the cementing material, and relatively quick and noticeable settlement may occur.
- *Fill Soils* – Man-made fill soils placed without engineering supervision may be loosely or inadequately compacted, may contain oversize materials unsuitable for reuse in engineered fills, and may contain unsuitable organic or expansive materials and debris that may preclude their use in engineered fills.
- The active San Andreas Fault Zone is approximately 34 miles west of the site, and the active Blue Cut Fault and the Salton Creek Fault are located approximately 11 miles north and 19 miles south of the site, respectively. Geotechnical constraints related to faulting and seismic events at the Project are:
 - *Ground Shaking* – The Project has potential for strong ground motions due to earthquakes on nearby active faults.
- Shallow groundwater is not anticipated at the Project site.
- The potential for liquefaction at the Project site is considered low due to the absence of a shallow groundwater table,
- The potential for landsliding at the Project site is considered low.
- Dam inundation and significant flooding of the site are not considered to be significant hazards to the Project site.
- Regional land subsidence is not documented within the Project site. However, an area of subsidence associated with groundwater withdrawal is located approximately 40 miles west of the Project site.
- Based on previous uses of the site, corrosive soils may be present at the Project site.
- The conditions described above would increase the cost and duration of grading and construction of the Project but would not preclude development of the Project.

1. INTRODUCTION

Ninyo & Moore has completed a geological desktop evaluation for the proposed Sapphire Solar Project located in unincorporated Riverside County, California (Figure 1). The evaluation is based on review of published and non-published reports, aerial photographs, in-house data, and the assessment of the potential geologic hazards in the Project area. The purpose of this geological desktop study was to evaluate the potential for existing environmental impacts related to geologic or soils conditions to affect the Project, and to discuss measures that can be implemented to reduce or mitigate the potential impacts with respect to the design and construction of the proposed Project.

2. SCOPE OF SERVICES

Ninyo & Moore's scope of services for this geologic reconnaissance have included the activities listed below:

- Review of readily available regional, local, and site-specific geologic and geotechnical reports.
- Review of readily available background information including topographic, soils, mineral resources, geologic, and seismic and geologic hazard maps, and stereoscopic aerial photographs.
- Compilation and analysis of the data obtained from the background review.
- Preparation of this report presenting the findings, conclusions, and preliminary recommendations regarding potential geologic and soil impacts at the site. The findings were evaluated with respect to questions A through E listed in Section 6, "Geology and Soils" within Appendix G, "Environmental Checklist Form" of the "Guidelines for Implementation of the California Environmental Quality Act (CEQA)," as well as Riverside County's Environmental Assessment Checklist Form.

3. REGULATORY FRAMEWORK

Geologic resources and geotechnical hazards within the proposed Project area are governed by the County of Riverside and the Bureau of Land Management. The site is also governed by the regulations of the California Code of Regulations (CCR), 2019 California Building Code (CBC).

The CBC is promulgated under CCR, Title 24, Parts 1 through 12 (also known as the California Building Standards Code), and is administered by the California Building Standards Commission (CBSC). The CBSC is responsible for administering California's building codes.

4. SITE DESCRIPTION AND PROJECT DESCRIPTION

EDFR on behalf of Sapphire Solar, LLC proposes to entitle, construct, operate, maintain, and decommission the Project, located in Riverside County, California. The Project would consist of approximately 1,082 acres on private lands that would include a solar site with up to 117-MW of PV solar generation and a 117-MW AC coupled centralized BESS. In addition, the Project would also include up to three options for one 230- kV gen-tie line alignment, access roads, and collector line routes, collectively referred to as “Linear Facility Routes,” that are located on approximately 110 acres of land administered by the United States Department of Interior, BLM.

The solar site would primarily consist of PV panels, a single-axis tracker system, inverters, converters, transformers, electrical collection and communication lines, a 12-kV distribution line for backup power, an on-site electrical substation, a BESS, security fence, an operations and maintenance (O&M) facility including a stand along storage building, up to three onsite groundwater wells, meteorological station and albedometer weather station, a microwave/communication tower, and a supervisory control and data acquisition (SCADA) system that are located on private lands.

As previously stated, the Project would include up to three 230 kV gen-tie line alignment options, access roads, and collector line routes, collectively referred to as “Linear Facility Routes.” The Linear Facility Routes are located on federal public lands administered by BLM and designed to support the proposed Project, which is located on adjacent private lands. Each of the three 200-foot wide Linear Facility Routes has been included to provide flexibility as it relates to potential California Independent System Operator interconnection options and County Fire Department emergency access requirements. Refer to Figure 2 for locations of the three Linear Facility Routes. Linear Facility Route #1 is approximately 1.6 miles long and located along the northwest corner of the Project site, Linear Facility Route #2 is approximately 1.6 miles long and located toward the northwest corner of the Project site (south of Linear Facility Route #1), and Linear Facility Route #3 is approximately 1.4 miles long and located along the east side of the Project site.

Table 1, provides a summary of the Project components that could be located within the proposed Linear Facility Routes. The Project would interconnect via line tap on the existing Desert Harvest transmission line ultimately connecting to the larger GRID at the Southern California Edison (SCE) Red Bluff Substation on lands administered by the BLM.

Table 1. Project Components to be Located Within Linear Facility Routes					
Linear Facility Routes	230 kV Gen-Tie Line	Access Road	Above Ground Electrical Lines, Spur Roads, and Temporary Pulling and Tensioning Stations	Underground Collector Lines	12-kV Distribution Line
Linear Facility Route #1	●	✓	●	●	●
Linear Facility Route #2	●	✓	●	●	●
Linear Facility Route #3		●		✓	
Note: ✓ = facilities that will be located in Linear Facility Route ● = Facilities that may be located in Linear Facility Route					

The Applicant is pursuing a Conditional Use Permit (CUP), Public Use Permit (PUP), and a Development Agreement (DA) from Riverside County for the private lands associated with the Project and a Right-of-Way (ROW) grant from the BLM for the BLM administered lands associated with the Project. As such, Riverside County will serve as the CEQA lead agency and the BLM as the NEPA lead agency.

Construction of the Project is anticipated to occur in two phases. The first phase would consist of construction of the gen-tie line, telecommunication line, 12-kV distribution line, and access roads associated with the Linear Feature Routes located on lands administered by the BLM. Additionally, the construction of fences, gates, and the onsite substation located on the private lands would also be part of the Project's first phase of construction. The second phase would consist of installation and operation of the approximately 117-MW solar array, the up to 117-MW BESS, and ancillary facilities. Construction is anticipated to commence in the third quarter of 2024 and the Commercial Operation Date (COD) is anticipated to occur in December of 2025. The operational life of the Project is anticipated to be 39 years with potential for an extension to 40 years or greater

4.1. Project Location and Access

The proposed Project site is located in Riverside County, California, approximately five miles north of Desert Center, approximately 40 miles west of the City of Blythe, and three and a half miles north of Interstate 10. The east side of the Project site is adjacent to California State Route 177/Rice Road. Primary Project access would be constructed from Kaiser Road to the site. The access road within

the Linear Facility Routes (Linear Facility Routes #1, #2, and/or #3) would be up to a 24-foot-wide compacted soil road with 5-foot shoulders on either side. The access roads within the Linear Facility Routes (Linear Facility Routes #1 or #2) containing the distribution line is proposed to be up to a 16-foot-wide compacted soil road. The driveways will provide independent points of ingress/egress to the Sapphire Solar Project as required by Riverside County Fire Department.

While the Linear Facility Routes are within the land use jurisdiction of the BLM Palm Springs South Coast Field Office, the solar site is located within the land use jurisdiction of Riverside County. The entirety of the 110-acre area associated with the three Linear Facility Routes on BLM administered lands is located within a Development Focus Area (DFA) for solar, wind, and geothermal Projects as designated by the Desert Renewable Energy Conservation Plan (DRECP). The DRECP Final Environmental Impact Statement (EIS) was approved by a Record of Decision (ROD) signed on September 14, 2016.

5. GEOLOGIC AND SUBSURFACE CONDITIONS

Regional, site geology, and groundwater condition findings at the Project are provided in the following sections.

5.1. Regional Geologic Setting

The Project area is situated within the Chuckwalla Valley section of the Colorado Desert physiographic province. The Chuckwalla Valley covers approximately 940 square miles and is surrounded by mountains and highlands.

The seismicity of the area is controlled by several prominent, predominantly east-to-west-trending faults and less prominent, connecting northeast-trending faults. Northwest-trending faults include the Elsinore, San Jacinto, and San Andreas fault zones. Further discussion of faulting relative to the site is provided in the Faulting and Seismicity section of this report and a map depicting faults in the site vicinity is presented on Figure 2.

5.2. Site Geology

Based on the review of published geologic maps and understanding of the Project area, surficial soils at the Project site and along the Linear Facility Routes consist of fill, agricultural topsoil, and alluvium (Figure 3). A brief description of these units is presented below.

5.2.1. Fill

Fill soils are anticipated to underlie portions of the site area due to previous land use, roadway construction, and burial of utility lines. Fill soils are generally anticipated to be composed of clay, silt, sand, and gravel. Documents pertaining to the placement of fill at the Project site were not available for review.

5.2.2. Agricultural Topsoil

Agricultural topsoil is anticipated to mantle most of the site and is anticipated to be on the order of 1 to 3 feet in thickness. These soils are anticipated to generally consist of silty and clayey sand.

5.2.3. Alluvium

Quaternary-aged alluvium underlies the fill and agricultural topsoil at the site. Based on experience in the Project area, these soils are anticipated to consist of silt, sand, and gravel.

5.3. Groundwater

Sources provided by the California Water Data Library Resources (DWR) and the California State Water Resources Control Board (SWRCB) were reviewed for information pertaining to groundwater in the vicinity of the Project. According to the SWRCB Water Quality Control Plan, the Project is located within the Riverside Valley Groundwater Basin.

Information was researched on the SWRCB GeoTracker (GeoTracker, 2022) website for groundwater monitoring well data in the vicinity of the Project site and the California Department of Water Resources Water Data Library Website (CDWR, 2022). The background review indicates that groundwater depths in the area may range from approximately 69 to 400 feet below the ground surface. Fluctuations of groundwater may occur due to variations in ground surface topography, subsurface stratification, rainfall, irrigation practices, groundwater pumping, and other factors.

6. GEOLOGIC HAZARDS

In general, potential geologic hazards at the site include faulting and seismicity as they relate to seismic design of structures. These considerations and other geologic hazards such as liquefaction, landsliding, slope failure, and tsunamis, are discussed in the following sections.

6.1. Faulting and Seismicity

As shown on Figure 2, there are several active faults in the region. Therefore, like most of southern California, the Project area is considered to be seismically active. The San Andreas Fault Zone is the nearest seismically active surface feature mapped in the vicinity of the Project. The San Andreas Fault Zone is approximately 34 miles west of the site. It is noted that the Blue Cut Fault is located approximately 11 miles north of the site and the Salton Creek Fault is located approximately 19 miles south of the site. The Blue Cut Fault and Salton Creek Fault are considered potentially active by the State of California.

6.2. Ground Rupture

Ground surface rupture due to active faulting is not considered likely in the Project area due to the absence of known active faults underlying the site. While active faults are not present at the site, lurching or cracking of the ground surface as a result of nearby seismic events is possible.

6.3. Ground Motion

The 2019 CBC specifies that the Risk-Targeted, Maximum Considered Earthquake (MCE_R) ground motion response accelerations be used to evaluate seismic loads for design of buildings and other structures. The MCE_R ground motion response accelerations are based on the spectral response accelerations for 5 percent damping in the direction of maximum horizontal response and incorporate a target risk for structural collapse equivalent to 1 percent in 50 years with deterministic limits for near-source effects. The horizontal peak ground acceleration that corresponds to the MCE_R for the Project area was calculated as 0.667g (0.2 second period) using the 2019 Structural Engineers Association of California (SEAOC)/Office of Statewide Health Planning and Development (OSHPD) seismic design tool (web-based). Spectral response acceleration parameters, consistent with the 2019 CBC, are also provided in Section 9.2 for the evaluation of seismic loads on buildings and other structures.

The 2019 CBC specifies that the potential for liquefaction and soil strength loss be evaluated, where applicable, for the mapped maximum considered earthquake geometric mean (MCE_G) peak ground acceleration (PGA_M) with adjustment for site class effects in accordance with the ASCE 7-16 Standard. The MCE_G PGA is based on the geometric mean PGA with a 2 percent probability of exceedance in 50 years. The PGA_M was calculated as 0.29g using the 2019 SEAOC/OSHPD seismic design tool (web-based).

The Project has a moderate potential for strong ground motions due to earthquakes on nearby active faults. Structural elements for the Project can be designed to resist or accommodate anticipated ground motions and to conform to seismic design standards. Specifically, seismic analysis and Project design performed in accordance with the requirements of Chapter 16 of the 2022 California Building Code and

the American Society of Civil Engineers (ASCE) 7-10 Standard can be expected to mitigate risks due to ground shaking.

6.4. Liquefaction and Seismically Induced Settlement

Liquefaction of cohesionless soils can be caused by strong vibratory motion due to earthquakes. Research and historical data indicate that loose granular soils and non-plastic silts that are saturated by a relatively shallow groundwater table are susceptible to liquefaction. Based on the absence of a shallow groundwater table, liquefaction is not anticipated to be a design consideration. However, it is the responsibility of the geotechnical engineer of record to verify the potential for liquefaction and dynamic settlement and to provide appropriate design recommendations.

6.5. Landsliding and Slope Failure

Landslides are not mapped at the Project. Based on this information, landslides are not a design consideration. Based on the background review, the Project is located in a relatively flat-lying region and slope failure is not a design consideration.

6.6. Tsunamis and Seiches

Tsunamis are long wavelength seismic sea waves (long compared to the ocean depth) generated by sudden movements of the ocean bottom during submarine earthquakes, landslides, or volcanic activity. Based on the inland location and elevation of the Project, the potential for a tsunami to impact the site is not a design consideration.

Seiches are oscillations of enclosed or partially enclosed bodies of water often generated by seismic activity. Based on the elevation of the site and the absence of nearby bodies of water, the potential for seiches to impact the site is considered low and is not a required design consideration.

6.7. Regional Land Subsidence

Land subsidence is characterized as a shrinking of the ground surface relative to surrounding areas and can generally occur where deep alluvial deposits are present in valley areas. Subsidence in alluvial valley areas is typically associated with groundwater withdrawal or other fluid withdrawal from the subsurface such as oil and/or natural gas. Extraction of these geologic fluids can cause subsidence, which can result in the development of surface ground cracks and fissures, particularly near valley margins. Cracks and earth fissures can cause damage to improvements including roads, transmission lines, foundations, structures, and pipelines. Based on review of background material,

an area of subsidence associated with groundwater pumping is located approximately 40 miles west of the Project site near Indio (USGS, 2022). However, subsidence has not been reported in the Chuckwalla Valley near the Project site; it is therefore not a required design consideration.

6.8. Flood Hazards

Based on review of Federal Emergency Management Agency (FEMA) Flood Hazard Maps for the area (2008), the Project site is located within an area mapped as Zone D, considered to be an area with possible, but undetermined flood hazard. Based on review of the flood maps and the elevation of the site, the potential for significant flooding to impact the Project is not a Project constraint.

6.9. Expansive Soils

Expansive soils generally result from specific clay minerals that have the capacity to shrink or swell in response to changes in moisture content. Shrinking or swelling of foundation soils can lead to damage to slabs, foundations, and other engineered structures, including tilting and cracking. Clayey fill and agricultural soils may be expansive. In general, the soils and earth materials at the Project may be expected to have a moderate to high potential for expansion.

As previously indicated, the Project soils and earth materials may be expected to have a moderate to high potential for expansion. If expansive soils exist on site, the following recommendations may be implemented during construction: the soils may be removed from sensitive areas and placed in deeper fill areas; the soils may be excavated and removed from the site; or the expansive soils may be treated (i.e., lime treatment) to mitigate their potential for expansion. The extent of expansive soils and recommended mitigation measures may be evaluated by subsurface exploration and laboratory testing.

6.10. Collapsible Soils

Hydro-consolidation, or soil collapse, can occur in recently deposited soils that were deposited in an arid or semi-arid environment. Soils that are subject to collapse can include fills, wind-blown sands and silts, and alluvial fan and mudflow sediments that are deposited during flash floods. These soils generally contain pores/voids and may be supported by clay or silt, or they are weakly cemented. When inundated with water, the water removes or dissolves the cementing material, and relatively quick and noticeable settlement may occur. Soils subject to hydro-consolidation, or soil collapse may be present at the site.

Relatively quick settlements associated with hydro-consolidation can result in damage to foundations and slabs. Recommendations to mitigate these soils can include removal of these soils and

replacement with compacted fill, presaturation of these soils during earthwork construction, and extending structure foundations- to soils at depth that are not susceptible to collapse. The presence/extent of soils prone to hydro-consolidation can be evaluated by subsurface exploration and laboratory testing.

6.11. Corrosive Soils

Caltrans corrosion (2021) criteria define as soils with more than 500 parts per million (ppm) chlorides, less than 1,500 ohm-centimeters electrical resistivity, more than 0.15 percent sulfates, or a pH less than 5.5. Based on the previous agricultural use of the site, the site soils are anticipated to be corrosive.

If corrosive soils exist on the site, a corrosion engineer may be required to assist in the design of improvements in contact with the soil. The extent of corrosive soils and recommended mitigation measures may be further evaluated by subsurface exploration and laboratory testing.

6.12. Soils

Although no soil type information is available on the interactive map using the Web Soil Survey website (USDA, 2022), based on the previous agricultural site use and the surrounding paved and unpaved roadways, preexisting native soils are anticipated to have been removed and/or disturbed on the Project site. Soil type is not anticipated to be a design consideration or project constraint.

7. CONCLUSIONS

Based on the review of the referenced background data, the geologic and geotechnical considerations at the Project site include the following:

- Surface and near-surface soils at the Project are mapped as Quaternary-age alluvial deposits. Fill materials associated with the construction of the existing roadways and utilities and agricultural topsoil associated with the site's previous use as farmland are also anticipated to be present at the Project site. Geotechnical constraints related to soils at the Project are:
 - *Soft Ground* – Areas with soft ground or loose soils can be found in areas underlain by existing fill and agricultural topsoil.
 - *Expansive Soils* – The Project soils are expected to have a moderate to high potential for expansion.
 - *Collapsible Soils* – Hydro-consolidation, or soil collapse, typically occurs in recently deposited soils that were deposited in an arid or semi-arid environment. Soils that are subject to collapse can include fills, wind-blown sands and silts, and alluvial fan and mudflow sediments that are deposited during flash floods. These soils generally contain pores/voids and may be supported by clay or silt, or they are weakly cemented. When inundated with

water, the water removes or dissolves the cementing material, and relatively quick and noticeable settlement may occur.

- *Fill Soils* – Man-made fill soils placed without engineering supervision may be loosely or inadequately compacted, may contain oversized materials unsuitable for reuse in engineered fills, and may contain unsuitable organic or expansive materials and debris that may preclude their use in engineered fills.
- Shallow groundwater is not anticipated at the site.
- The active San Andreas Fault Zone is approximately 34 miles west of the site, and the active Blue Cut Faults and the Salton Creek Fault are located approximately 11 miles north and 19 miles south of the site, respectively. Geotechnical constraints related to faulting and seismic events at the Project are:
 - *Ground Shaking* – The Project has potential for strong ground motions due to earthquakes on nearby active faults.
 - *Liquefaction* – Alluvial deposits may be subject to seismic settlement and/or liquefaction during a nearby seismic event.
- The potential for landsliding in the Project area is considered low.
- Significant flooding or dam inundation are not considered design constraints.
- Regional land subsidence is not documented within the Project site. However, an area of subsidence associated with groundwater withdrawal is located approximately 40 miles west of the Project site.
- Based on previous uses of the Project site, soils at the Project site may be expansive and corrosive.
- The conditions described above would increase the cost and duration of grading and construction of the Project but would not preclude development of the Project.

8. PRELIMINARY RECOMMENDATIONS

Based on the geologic and geotechnical considerations at the Project site and Linear Facility Routes presented in the previous section, the general preliminary recommendations are presented below. These preliminary recommendations assume that further geotechnical evaluation, including subsurface evaluation and laboratory testing, will be conducted prior to finalization of Project plans and that specific recommendations will be provided at that time, as is standard practice.

- *Soft Ground* – Soils in areas with soft ground or loose soils in the area of the proposed Project may be subject to settlement. Recommendations to mitigate this condition can typically include removal and/or replacement of soils as engineered compacted fill. The extent of soft soils and recommended removals may be evaluated by subsurface exploration and laboratory testing.

- **Expansive Soils** – Expansive soils may lead to damage to foundations and engineered structures. If expansive soils exist on site, the following recommendations may be implemented during construction: the soils may be removed from sensitive areas and placed in deeper fill areas; the soils may be excavated and removed from the site; or the expansive soils may be treated (i.e., lime treatment) to mitigate their potential for expansion. The extent of expansive soils and recommended mitigation measures may be evaluated by subsurface exploration and laboratory testing.
- **Collapsible Soils** – Relatively quick settlements associated with hydro-consolidation can result in damage to foundations and slabs. Recommendations to mitigate these soils can include removal of these soils and replacement with compacted fill, presaturation of these soils during earthwork construction, and extending structure foundations- to soils at depth that are not susceptible to collapse. The presence/extent of soils prone to hydro-consolidation can be evaluated by subsurface exploration and laboratory testing.
- **Ground Shaking** – Proposed structures should be designed appropriately to mitigate strong ground shaking in the event of an earthquake on a nearby fault.
- **Liquefaction** – The site is not anticipated to be susceptible to liquefaction and dynamic settlement based on the anticipated depths to groundwater across the site. However, prior to development, a geotechnical evaluation involving subsurface exploration and laboratory testing should be performed to specifically evaluate the potential for liquefaction on the Project site. If such an evaluation finds that a potential for liquefaction exists, the following recommendations may be implemented during construction: removal and replacement of soils susceptible to seismic settlement and/or liquefaction; densification of these soils; or utilization of special foundations to mitigate liquefaction and seismic settlement.
- **Shallow groundwater** – Although shallow groundwater is not anticipated at the site, shoring and dewatering may be required if construction is proposed in areas of shallow groundwater.
- **Landsliding** – Landslides have not been mapped on the site or reported in the available literature.
- **Corrosive Soils** – If corrosive soils exist on the site, a corrosion engineer may be required to assist in the design of improvements in contact with the soil. The extent of corrosive soils and recommended mitigation measures may be further evaluated by subsurface exploration and laboratory testing.

9. IMPACT ANALYSIS

Based upon the results of the geologic reconnaissance, findings, conclusions, and recommendations regarding potential geological impacts to the Project are summarized in the following sections.

9.1. Significance Thresholds

In evaluating the significance of potential environmental concerns in a particular study area, the criteria to consider, as they relate to geologic and soil conditions, are presented in the CEQA Guidelines. In accordance with the scope of work, the findings of this study were

evaluated with respect to Questions A through E of Section 7 “Geology and Soils” with in Appendix G of the CEQA Guidelines (2021).

9.2. Project Impacts and Significance

Based on the above criteria and the results of the evaluation, the potential impact by geologic and soil conditions at the Project have been identified, and are discussed below.

A. Would the Project directly or indirectly cause 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 known fault?

The potential for ground surface rupture due to active faulting is considered low in the Project area due to the absence of known active faults underlying the site (less than significant impact). However, lurching or cracking of the ground surface as a result of nearby seismic events is possible. This impact is likely to be less than significant with mitigation incorporated.

ii. Strong seismic ground shaking?

The Project has a moderate potential for strong ground motions due to earthquakes on nearby active faults. Structural elements for the Project can be designed to resist or accommodate anticipated ground motions and to conform to seismic design standards. Specifically, seismic analysis and Project design performed in accordance with the requirements of Chapter 16 of the 2022 California Building Code and the American Society of Civil Engineers (ASCE) 7-10 Standard can be expected to mitigate risks due to ground shaking. We are not aware of any reason such engineering design methods cannot be implemented for the Project. This impact is likely to be less than significant with mitigation incorporated.

iii. Seismic related ground failure, including liquefaction?

Based on the lack of a shallow ground water table, liquefaction is not anticipated to be a design consideration and should be evaluated further. However, prior to development, a geotechnical evaluation involving subsurface exploration and laboratory testing that conforms to the requirements of Chapter 19 of the 2016 California Building Code should be performed to specifically evaluate the potential for liquefaction on the Project site. Common and appropriate methods for evaluating and mitigating liquefaction potential and other seismic-related ground failures are provided in California Geological Survey

Special Publication 117A. In following recommendations of the design-level geotechnical evaluation, Project risks with respect to liquefaction and other seismic-related ground failure can thus be mitigated. If liquefaction potential is present at the Project site, therefore this impact is likely to be less than significant with mitigation incorporated. Mitigation of the potential impacts of seismic related ground failure can be achieved through Project design that incorporates recommendations from a site-specific geotechnical evaluation.

iv. Landslides?

Geologic mapping does not indicate the presence of mapped landslides on the Project site, which is generally flat. Therefore, the potential for existing landslides is likely to be low (less than significant impact).

B. Would the Project result in substantial soil erosion or the loss of topsoil?

If the site is developed in accordance with current building codes and industry standards, the potential for substantial soil erosion is considered to be low (less than significant impact). The potential for substantial additional loss of topsoil due to the proposed development is considered low due to the previous agricultural uses of the site, which is expected to have physically removed and/or disturbed the previously existing topsoil.

C. Would the Project be located on 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 landslide, lateral spreading, subsidence, liquefaction or collapse?

The alluvial deposits underlying the site may be subject to seismic settlement or liquefaction during a nearby seismic event. If liquefaction hazards are identified as part of a site-specific geotechnical evaluation, proposed structures may be designed to accommodate vertical movement associated with liquefaction. Risks associated with subsidence can be addressed by appropriate engineering design for the Project based on the design-level geotechnical evaluation. Placement of structures away from existing fissures, planned road maintenance, and settlement due to large-scale subsidence should be considered during the design of the Project. The site is not considered prone to landsliding or slope instability issues. Based on these items, this impact is likely to be less than significant with mitigation incorporated.

D. Would the Project be located on expansive soil, as defined in Table 18-1-B of the Uniform Building Code (1994), creating substantial direct or indirect risks to life or property?

The soils on the Project site are expected to have a moderate to high potential for expansion.

However, this impact is likely to be less than significant with mitigation incorporated. Mitigation of the potential impacts of expansive soil can be achieved through Project design that incorporates recommendations from a site-specific geotechnical evaluation. Specifically, the risk associated with expansive soils can be addressed during design of the Project, in accordance with the requirements of Chapter 18 of the 2016 California Building Code; mitigation techniques include over excavation and replacement with non-expansive soil, moisture control, soil mixing, lime treatment and/or development of specific structural design for expansive soil condition. In following recommendations of the design-level geotechnical evaluation, Project risks with respect to expansive soils can be adequately mitigated.

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?

The soils on the Project site are expected to be able to support adequately designed septic tanks or alternative waste water disposal systems. This impact is likely to be less than significant.

10. RIVERSIDE COUNTY ENVIRONMENTAL ASSESSMENT CHECKLIST

Based on the guidelines by Riverside County, this evaluation shall address geologic hazards including, but not necessarily limited to, slope stability, rock fall hazards, landslide hazards, surface fault rupture, fissures, liquefaction potential, collapsible and/or expansive soils, hydroconsolidation, subsidence, wind and water erosion, debris flows, seiche, and groundshaking potential. These hazards as they relate to the project are discussed below.

- slope stability – slope stability is not a concern due to the relatively flat topography of the site and the absence of mapped landslides at the site, however, excavations may be subject to caving due to loose, unconsolidated sands;
- rock fall hazards - the potential for rock fall hazards at the Project site are considered low due to the relatively flat topography of the site;
- landslide hazards - the potential for landsliding at the project site is considered low due to the relatively flat topography of the site and the absence of mapped landslides at the site;
- surface fault rupture - ground surface rupture due to active faulting is not considered likely in the project area due to the absence of known active faults underlying the site;
- fissures – fissures are not considered likely in the project area due to the absence of known active faults or documented land subsidence underlying the site;
- liquefaction potential - the site is not anticipated to be susceptible to liquefaction based on the absence of shallow groundwater;

- collapsible and/or expansive soils - soils subject to soil collapse may be present at the site, the project soils are expected to have a moderate to high potential for expansion;
- hydroconsolidation - soils subject to hydro-consolidation may be present at the site;
- subsidence - regional land subsidence is not documented within the project site;
- wind and water erosion - the potential for wind and water erosion at the project site are considered moderate;
- debris flows - the potential for a debris flow at the project site is considered low;
- seiche - inundation by seiche and significant flooding of the site are not considered to be significant hazards to the Project site;
- groundshaking potential - the Project has a moderate potential for strong ground motions due to earthquakes on nearby active faults.

11. LIMITATIONS

The field evaluation and geotechnical analyses presented in this report have been conducted in accordance with current engineering practice and the standard of care exercised by reputable geotechnical consultants performing similar tasks in this area. No warranty, implied or expressed, is made regarding the conclusions, recommendations, and professional opinions expressed in this report. Variations may exist and conditions not observed or described in this report may be encountered. Preliminary conclusions and recommendations are based on an analysis of the observed conditions and the referenced background information.

The purpose of this study was to evaluate geologic and geotechnical conditions within the Project site including the Linear Facility Routes and to provide a preliminary geotechnical evaluation report to assist in the preparation of environmental impact documents for the Project. A comprehensive geotechnical evaluation, including subsurface exploration and laboratory testing, should be performed prior to design and construction of structural improvements.

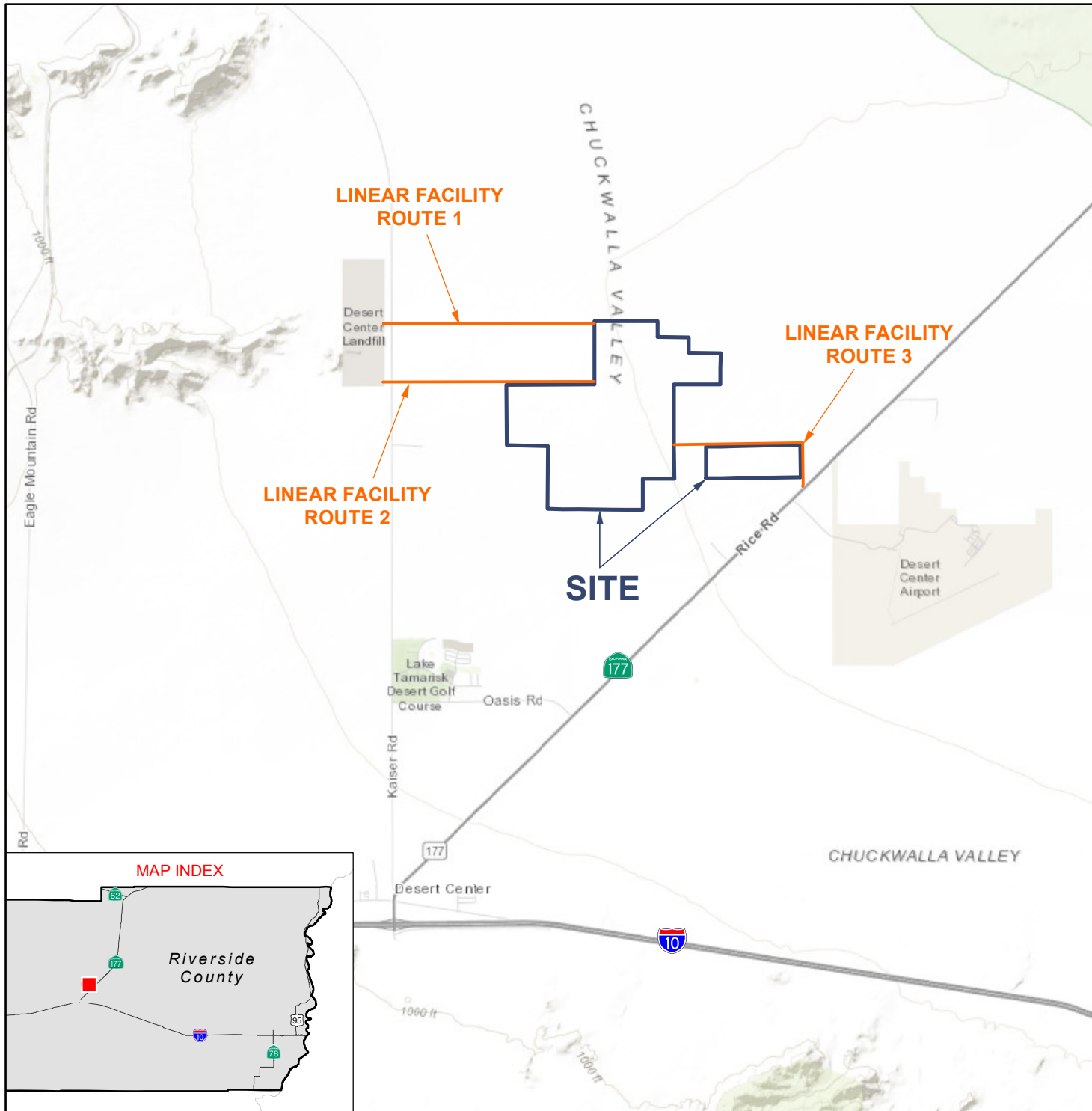
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FIGURES

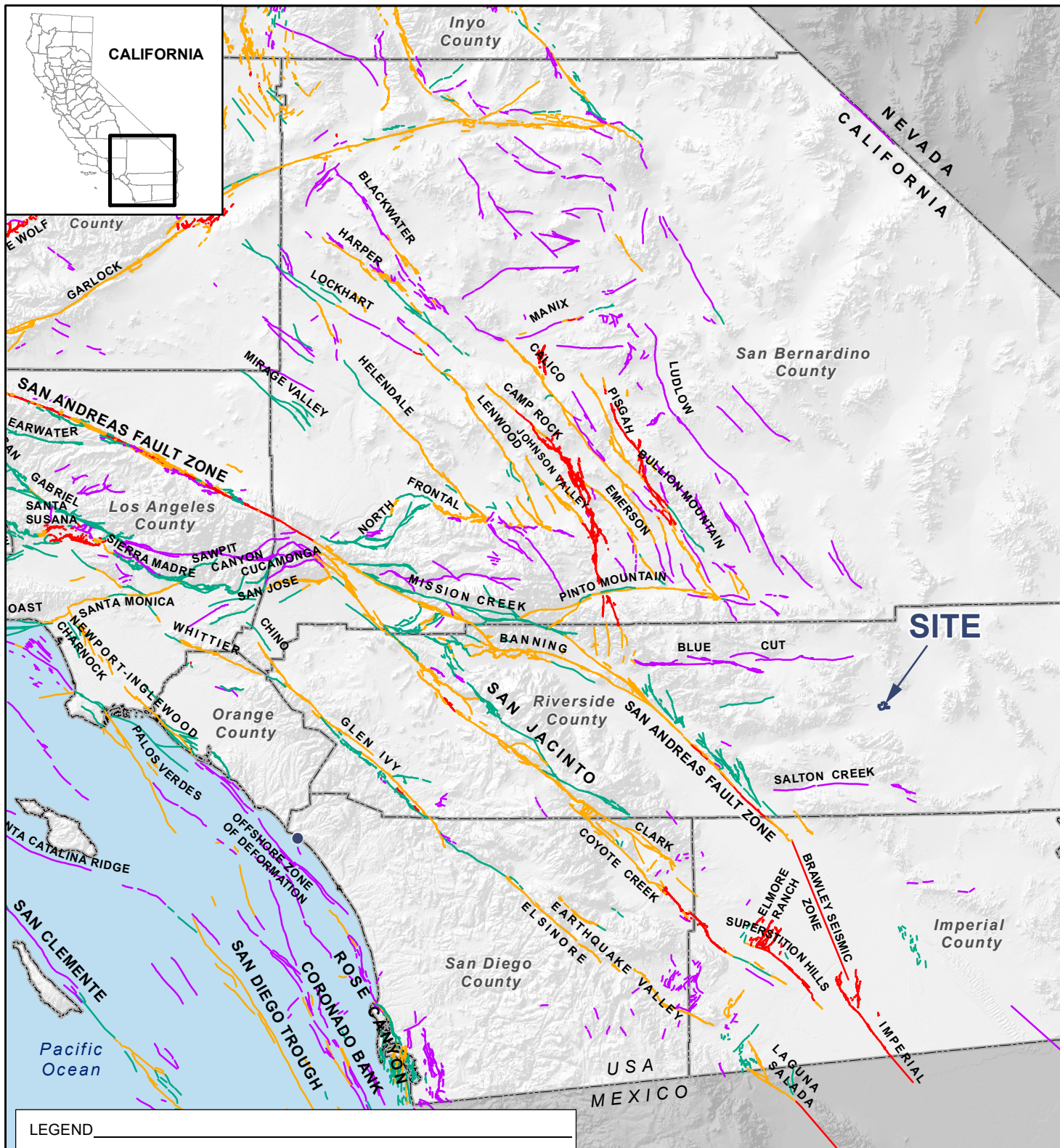


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NOTE: DIRECTIONS, DIMENSIONS AND LOCATIONS ARE APPROXIMATE. | SOURCE: ESRI WORLD TOPO, 2023



FIGURE 1



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SOURCE: U.S. GEOLOGICAL SURVEY AND CALIFORNIA GEOLOGICAL SURVEY, 2006, QUATERNARY FAULT AND FOLD DATABASE FOR THE UNITED STATES.

LEGEND

CALIFORNIA FAULT ACTIVITY

HISTORICALLY ACTIVE

HOLOCENE ACTIVE

LATE QUATERNARY (POTENTIALLY ACTIVE)

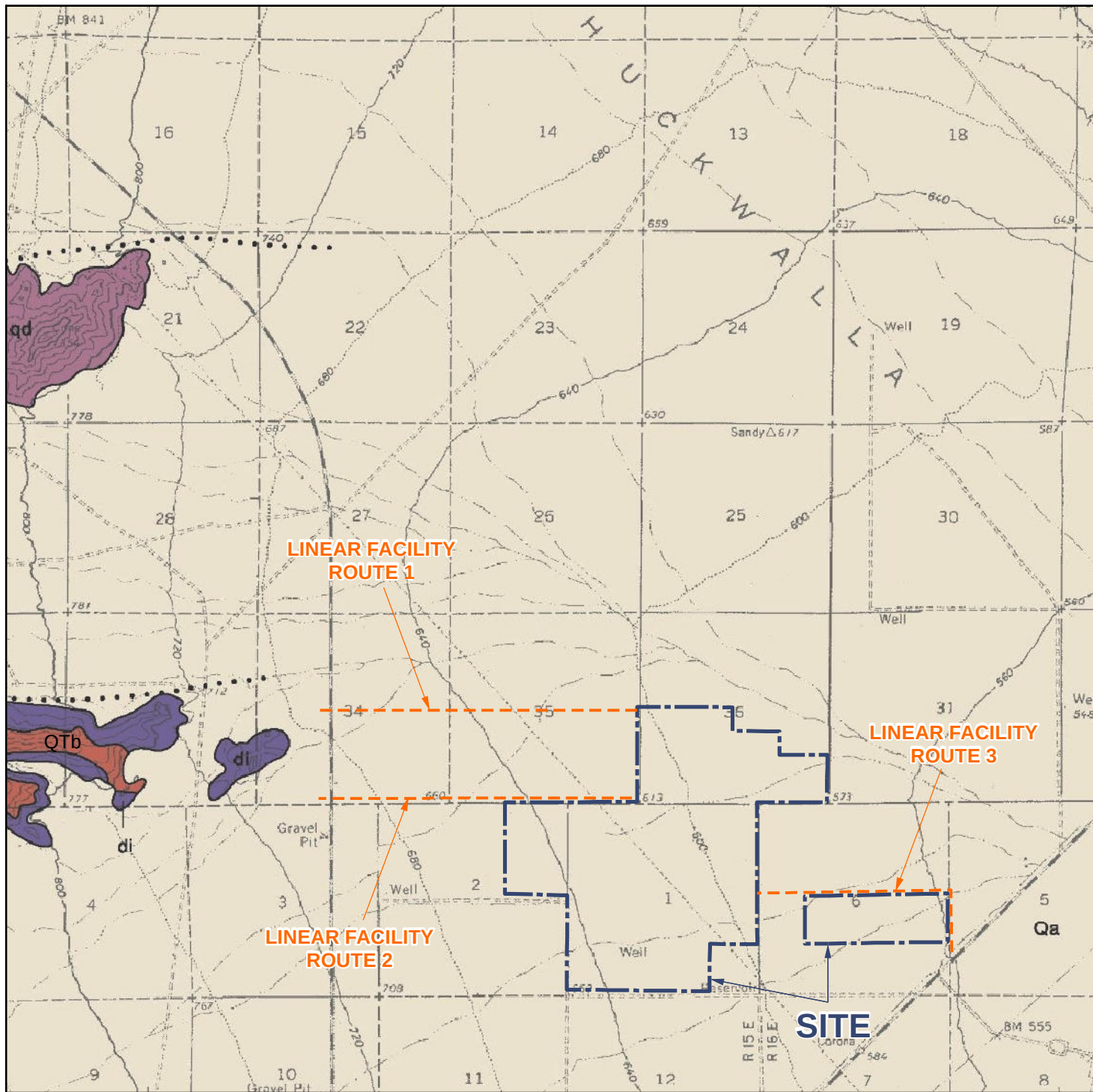
QUATERNARY (POTENTIALLY ACTIVE)

STATE/COUNTY BOUNDARY

NOTE: DIRECTIONS, DIMENSIONS AND LOCATIONS ARE APPROXIMATE.



FIGURE 2



LEGEND

Qa	SURFICIAL SEDIMENTS
QTb/Tb	INTRUSIVE VOLCANIC ROCKS
qd di	GRANITIC ROCKS

NOTE: DIRECTIONS, DIMENSIONS AND LOCATIONS ARE APPROXIMATE. | SOURCE: DIBBLEE, T.W., AND MINCH, J.A., 2008, GEOLOGIC MAP OF THE COXCOMB MOUNTAINS 15 MINUTE QUADRANGLE, RIVERSIDE COUNTY, CALIFORNIA

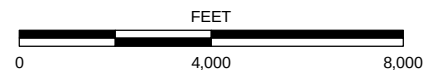
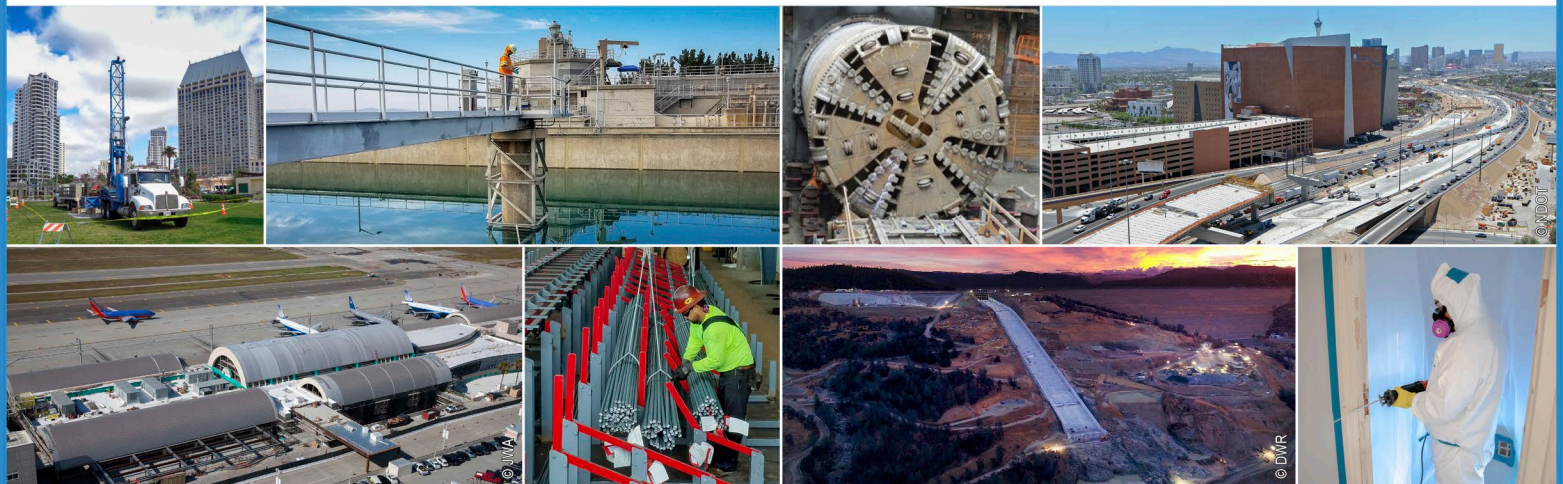


FIGURE 3

GEOLOGY

SAPPHIRE SOLAR PROJECT
RIVERSIDE COUNTY, CALIFORNIA

109514001 | 3/23



5710 Ruffin Road | San Diego, California 92123 | p. 858.576.1000

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