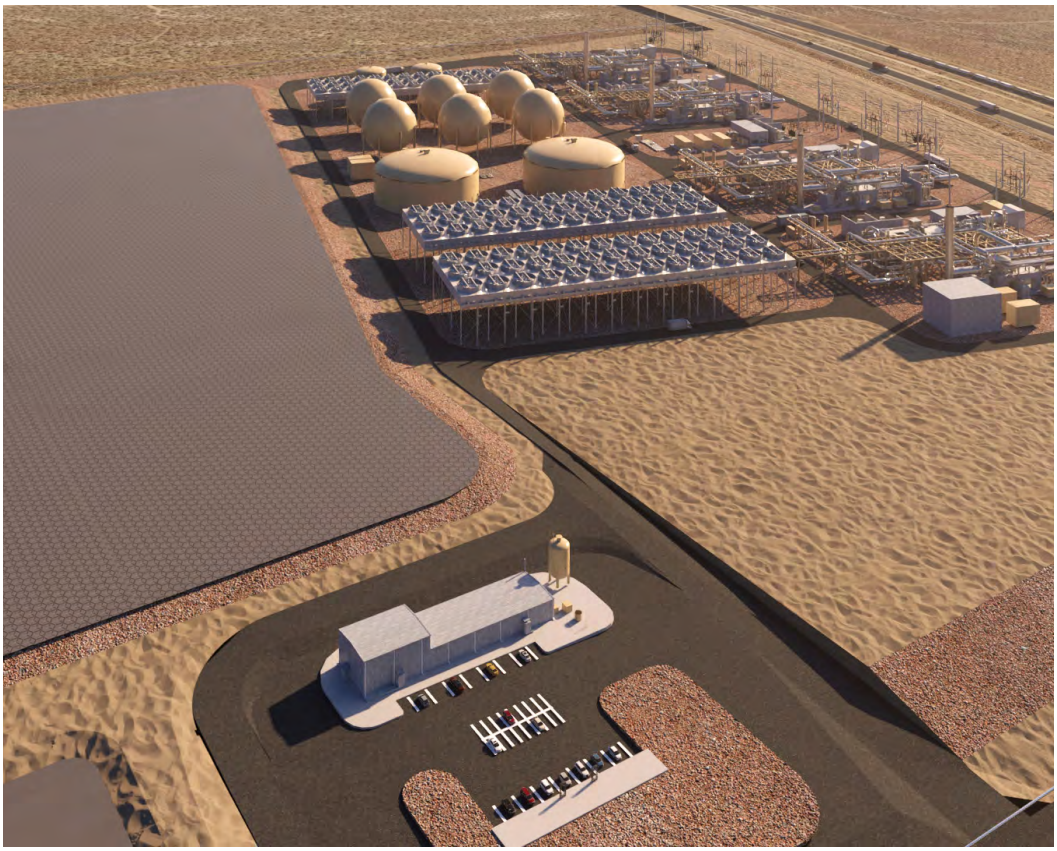
DOCKETED	
Docket Number:	21-AFC-02
Project Title:	Willow Rock Energy Storage Center
TN #:	254806
Document Title:	Willow Rock Energy Storage Center SAFC - Volume 1, Part A
Description:	N/A
Filer:	Amanda Cooey
Organization:	Ellison Schneider Harris & Donlan LLP
Submitter Role:	Applicant Representative
Submission Date:	3/1/2024 4:57:55 PM
Docketed Date:	3/1/2024



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Volume 1

Supplemental Application for Certification

Willow Rock Energy Storage Center

Submitted to:

California Energy Commission

Submitted by:

GEM A-CAES LLC

March 2024

Volume I

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Acronyms

°F	degrees Fahrenheit
°F	degrees Fahrenheit
A-1	Limited Agriculture (zoning designation)
AAG	Archaeological Advisory Group
AB-52	Assembly Bill 52
A-CAES	advanced compressed air energy storage
ACS	American Community Survey
AD	anno Domini
ADNU	area deliverability network upgrade
AERMOD	American Meteorological Society/Environmental Protection Agency Regulatory Model
AF	acre-feet
AFC	Application for Certification
AFL-CIO	American Federation of Labor and Congress of Industrial Organizations
ALUCP	Airport Land Use Compatibility Plan
AMSL	above mean sea level
APCD	Air Pollution Control District
APE	Area of Potential Effect
APN	Assessor's Parcel Number
Applicant	GEM A-CAES LLC; also GEM
ASPA	Aboveground Petroleum Storage Act
ASTM	American Society for Testing and Materials
AVEK	Antelope Valley East Kern Water Agency
AVEP	Antelope Valley Energy Project
AVH	Antelope Valley Hospital
BACT	Best Available Control Technology
BC	before Christ
BEA	U.S. Bureau of Economic Analysis
BESA	Built Environment Survey Area
bgs	below ground surface
BHP	brake horsepower

bkW	break kilowatt
BLM	Bureau of Land Management
BMP	best management practice
BP	before present
BPIP-PRIME	Building Profile Input Program-Plume Rise Model Enhancements
CAA	Clean Air Act
CAAQS	California Ambient Air Quality Standards
CAES	compressed air energy storage
CAISO	California Independent System Operator
CAL FIRE	California Department of Forestry and Fire Protection
Cal/OSHA	California Division of Occupational Safety and Health
CAL200	Larson Davis Model CAL200 Sound Level Calibrator
CalARP	California Accidental Release Program
CalEPA	California Environmental Protection Agency
Caltrans	California Department of Transportation
CARB	California Air Resources Board
CAS	Chemical Abstract Service
CBC	California Building Code
CCED	California Conservation Easement Database
CCR	California Code of Regulations
CDCA	California Desert Conservation Area
CDFW	California Department of Fish and Wildlife
CDMV	California Department of Motor Vehicles
CDOC	California Department of Conservation
CDOF	California Department of Finances
CDP	Census Designated Place
CEC	California Energy Commission
CEDD	California Employment Development Department
CEQ	Council on Environmental Quality
CEQA	California Environmental Quality Act
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CERS	California Environmental Reporting System
CESA	California Endangered Species Act

CFR	Code of Federal Regulations
CGS	California Geological Survey
CHP	California Highway Patrol
CHRIS	California Historical Resources Information System
CHSC	California Health & Safety Code
CIWMA	California Integrated Waste Management Act
cm	centimeters
CML	continuous monitoring location
CNPS	California Native Plant Society
CO	carbon monoxide
CO_2	carbon dioxide
Committee	California Energy Commission Siting Committee for Willow Rock
County	Kern County
CPAD	California Protected Area Database
CPM	compliance project manager
CPUC	California Public Utilities Commission
CRF	Cultural Resource Facility at California State University, Bakersfield
CRHR	California Register of Historic Resources
CRS	cultural resources specialist
CUP	Conditional Use Permit
CUPA	Certified Unified Program Agency
CVC	California Vehicle Code
CWA	Clean Water Act
CWPP	Community Wildfire Protection Plan
dB	decibels
dBA	A-weighted decibels
dBL	linear decibels
DC	direct current
DCH	Designated Critical Habitat
DCS	distributed control systems
DESCP	drainage, erosion, and sediment control plan
DMCA	Desert and Mountain Conservation Authority
DOE	U.S. Department of Energy

DPM	diesel particulate matter
DPR	Department of Parks and Recreation
DSOD	California Department of Water Resources, Division of Safety of Dams
DTSC	Department of Toxic Substances Control
DWR	Department of Water Resources
EAFB	Edwards Air Force Base
EAP	Emergency Action Plan
EHS	Extremely Hazardous Substance
EIA	economic impact analysis
EJ	environmental justice
EKAPCD	Eastern Kern Air Pollution Control District
EMF	electromagnetic field(s)
EO	Executive Order
EPA	U.S. Environmental Protection Agency
ESA	Environmental Site Assessment
FAA	Federal Aviation Administration
Far Western	Far Western Anthropological Research Group, Inc.
FHSZ	Fire Hazard Severity Zone
FHSZ	Fire Hazard Severity Zone
FM	fuel model
FMMP	Farmland Mapping and Monitoring Program
Fox Field	General William J. Fox Airfield
FP	Fully Protected
FVGB	Fremont Valley Groundwater Basin
FY	fiscal year
g	acceleration due to gravity
g/bhp-hr	grams per break horsepower-hour
GEM	GEM A-CAES LLC; also the Applicant
gen-tie	generation tie
GEP	Good Engineering Practice
GHG	greenhouse gas
GO-95	General Order 95
gpm	gallons per minute

HAP	hazardous air pollutant
HARP2	Hotspots Analysis and Reporting Program
HCP	Habitat Conservation Plan
HDPE	high density polyethylene
HMBP	Hazardous Materials Business Plan
HMRT	hazardous materials response team
HP	high pressure
HRA	Health Risk Assessment
HSR	High-Speed Rail
HUD	Department of Housing and Urban Development
HVAC	heating, ventilation, and air conditioning
Hz	hertz
IEEE	Institute for Electrical and Electronics Engineers
in/sec	inches per second
IP	intermediate pressure
IR	Interconnection Request
ISO	International Standard Organization
kA	kiloampere
KCFD	Kern County Fire Department
KCFD	Kern County Fire Department
KCPHSD	Kern County Public Health Services Department
KCSO	Kern County Sheriff's Office
Kern COG	Kern Council of Governments
km	kilometer
KOP	key observation point
kV	kilovolts
kW	kilowatt
LADWP	Los Angeles Department of Water and Power
Ldn	day-night average sound level
LEPC	Local Emergency Planning Committee
Leq	equivalent sound pressure level
Leqdn	average sound
LFN	low-frequency noise

Lmax	maximum sound pressure level
Lmin	minimum sound pressure level
Ln	sound pressure levels that were exceeded n percent of the time during a given sampling period
LORS	laws, ordinances, regulations, and standards
LOS	Level of Service
LP	low pressure
LWRP	Lancaster Water Reclamation Plant
MBTA	Migratory Bird Treaty Act
MCV	Manual of California Vegetation
MEIR	maximum exposed individual resident
MEIS	maximum exposed individual sensitive
MEIW	maximum exposed individual worker
ML	monitoring location
MLD	Most Likely Descendant
MNSSR	Major New Stationary Source Review
mph	miles per hour
MRCA	Mountains Recreation and Conservation and Authority
MVA	megavolt amperes
MW	megawatts
MWh	megawatt hours
N/A	not applicable
N_2O	nitrous oxide
NAAQS	National Ambient Air Quality Standards
NAD83	North American Datum of 1983
NAHC	Native American Heritage Commission
NASCAR	National Association for Stock Car Auto Racing, LLC
NED	National Elevation Dataset
NERC	North American Electric Reliability Corporation
NERC	North American Electric Reliability Corporation
NESHAP	National Emission Standards for Hazardous Air Pollutants
NFP	National Fire Plan
NFPA	National Fire Protection Association
NHD	National Hydrography Dataset

NHMLAC	Natural History Museum of Los Angeles County
NHPA	National Historic Preservation Act
NIEHS	National Institute of Environmental Health Sciences
NMFS	National Marine Fisheries Service
NO_2	nitrogen dioxide
NO+	nitrogen oxide
NPDES	National Pollutant Discharge Elimination System
NRCS	Natural Resources Conservation Service
NRHP	National Register of Historic Places
NSA	noise sensitive area
NSPS	New Source Performance Standards
NSR	New Source Review
NSSR	New Stationary Source Review
NWI	National Wetland Inventory
OEHHA	Office of Environmental Health Hazard Assessment
OHP	Office of Historic Preservation
OHWM	ordinary high-water mark
ONAC	Office of Noise Abatement and Control
OPR	Office of Planning and Research
OSHA	Occupational Safety and Health Administration
PAST	Pacific Archaeological Sciences Team
PCE	Passenger car equivalents
PCS	process control system
PFYC	Potential Fossil Yield Classification
PLC	programmable logic controller
PM	particulate matter
PM10	particulate matter less than 10 microns
PM2.5	particulate matter less than 2.5 microns
PMI	point of maximum impact
POC	people of color
PPE	personal protective equipment
ppm	parts per million
PRC	California Public Resources Code

PRC	Public Resources Code
PRMMP	Paleontological Resources Monitoring and Mitigation Plan
Project	Willow Rock Energy Storage Center
PRPA	Paleontological Resources Preservation Act
PRS	Paleontological Resource Specialist
PSD	prevention of significant deterioration
PSI	pounds per square inch
PSPS	public safety power shutoff
PSPS	public safety power shutoff
PTE	potential to emit
PWRP	Palmdale Water Reclamation Plant
RAM	Reliability, Availability, and Maintainability
RCDS	Rosamond Community Services District
RCRA	Resource Conservation and Recovery Act
RCSD	Rosamond Community Sanitation District
REL	Reference Exposure Level
RIMS II	Regional Input-Output Modeling System
RMP	risk management plan
ROW	right-of-way
RQ	reportable quantity
RTE	round trip efficiency
RTP	Regional Transportation Plan
RV	recreational vehicle
RWQCB	Regional Water Quality Control Board
S&HC	Streets and Highway Code
S&T	shell and tube
SARA	Superfund Amendments and Reauthorization Act
SB	Senate Bill
SCD	short-circuit duty
SCE	Southern California Edison
SCS	Sustainable Communities Strategy
SEMS	Standardized Emergency Management System
SF6	sulfur hexafluoride

SIL	significant impact level
SLAMS	State and Local Monitoring Stations
SO2	sulfur dioxide
SPCC	Spill Prevention Control and Countermeasure
SPL	sound pressure level
SQG	small quantity generator
SR	State Route
SRA	State Responsibility Area
SSC	Species of Special Concern
SSJVIC	Southern San Joaquin Valley Information Center
SVP	Society for Vertebrate Paleontology
SWP	State Water Project
SWPPP	stormwater pollution prevention plan
SWRCB	State Water Resources Control Board
TBACT	Best Available Control Technology for Toxics
TDS	total dissolved solids
TMDL	Total Maximum Daily Load
TPD	Transmission Plan Deliverability
TPQ	threshold planning quantities
tpy	tons per year
TWA	time-weighted average
U.S. DOT	U.S. Department of Transportation
U.S. EPA	U.S. Environmental Protection Agency
U.S.C.	United States Code
UCMP	University of California Museum of Paleontology
UIC	Underground Injection Control
UPS	uninterruptible power supply
USC	United States Code
USDI	U.S. Department of the Interior
USDOT	U.S. Department of Transportation
USDW	underground source of drinking water
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service

USGS	U.S. Geological Survey
UTM	Universal Transverse Mercator
V	volts
VAC	volts alternating current
VAR	volt ampere reactive
VDC	volts direct current
VFD	variable frequency drive
VFHCP Program	Kern County Valley Floor Habitat Conservation Plan
VMT	Vehicle Miles Traveled
VOC	volatile organic compound(s)
VRI	Visual Resources Inventory
Willow Rock	Willow Rock Energy Storage Center; also WRESC
WMP	West Mojave Plan
WOTUS	Waters of the United States
WRESC	Willow Rock Energy Storage Center; also Willow Rock
WRF	water reclamation facilities
WSP	WSP Environment and Infrastructure Inc.
WWTP	Wastewater Treatment Plant

1.0 INTRODUCTION

On December 1, 2021, GEM A-CAES LLC (GEM, or the Applicant) filed this Application for Certification (AFC) with the California Energy Commission (CEC) seeking to construct and operate the Gem Energy Storage Center (21-AFC-02). On August 5, 2022, the Applicant changed the name of the project to the Willow Rock Energy Storage Center (Willow Rock, or WRESC). On June 21, 2023, the Applicant's *Status Report No. 10* stated that efforts to optimize the proposed WRESC were ongoing, including consideration of alternative surface facility configurations, cavern engineering options given the site geotechnical results, and alternate sites that may better support the cavern design. Alternative sites included adjacent and offsite properties in the area with potentially more favorable geologic conditions.

On July 12, 2023, CEC staff filed a motion requesting that the CEC Siting Committee for Willow Rock (Committee) grant an order suspending the AFC proceeding for Willow Rock and requested that the Applicant be directed to submit a supplemental AFC that contains all necessary information for the updated project.

On August 9, 2023, the Committee issued an order indicating that the Applicant may file a single supplemental AFC that updates the project description and all required elements of the application reflecting all project modifications to satisfy the information requirements for an application, as detailed in Appendix B to Article 6 of Title 20 in the California Code of Regulations.

This document is the Supplemental AFC filed in response to the direction set forth in the Committee's August 9, 2023, order (CEC Transaction Numbers (TN#) 251599, 251592).

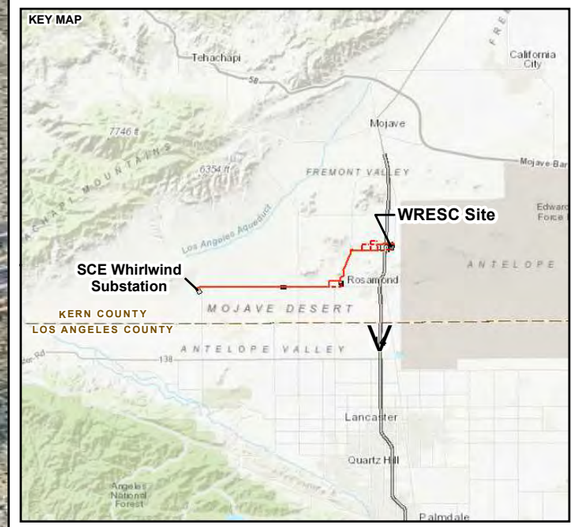
As described further in this Supplemental AFC, the WRESC will be a nominal 520-megawatt (MW) gross (500 MW net) and 4,160 megawatt-hour (MWh) gross (4,000 MWh net) facility using Hydrostor, Inc.'s (Hydrostor's) proprietary, advanced compressed air energy storage (A-CAES) technology. Energy stored at the WRESC will be delivered to Southern California Edison's (SCE's) Whirlwind Substation located southwest of the WRESC at the intersection of 170th Street W and Rosamond Boulevard, via a new approximately 19-mile 230-kilovolt (kV) generation-tie (gen-tie) line. The WRESC will be capable of operating on a 24-hour basis, 365 days a year with an approximately 50-year lifespan.

WRESC will deploy proprietary A-CAES technology consisting of all-electric air compressors and associated power turbine trains, an underground compressed air storage cavern, and miscellaneous aboveground support facilities. Willow Rock will provide unique operation and reliability characteristics that neither conventional nor renewable power plant technologies or batteries can provide on their own. The main elements of Willow Rock, including an optional architectural berm, are further summarized in Section 1.3, below. A detailed project description is included in Chapter 2 of this Supplemental AFC.

Figure 1-1 shows the existing conditions of the WRESC site, and **Figure 1-2** and **Figure 1-3** provide architectural renderings of the same area after construction of Willow Rock with and without the architectural berm on the west and north sides of the WRESC site.

KEY MAP

KEY MAP



REFERENCE(S)

1. PROJECT AREA AERIAL IMAGE - GOOGLE EARTH PRO, 2024
2. COORDINATE SYSTEM: NAD 1983 STATEPLANE CALIFORNIA V FIPS 0405 FEET
3. MAP SERVICE LAYER CREDITS: SOURCES: ESRI, HERE, GARMIN, INTERMAP, INCREMENT P CORP., GEBCO, USGS, FAO, NPS, NRCAN, GEOBASE, IGN, KADASTER NL, ORDNANCE SURVEY, ESRI JAPAN, METI, ESRI CHINA (HONG KONG), (C) OPENSTREETMAP CONTRIBUTORS, AND THE GIS USER COMMUNITY

CLIENT

GEM A-CAES LLC

PROJECT

WILLOW ROCK ENERGY STORAGE CENTER
SUPPLEMENTAL AFC

TITLE

EXISTING SITE CONDITIONS

CONSULTANT

wsp

YYYY-MM-DD	2024-02-15
DESIGNED	MK
PREPARED	MK
REVIEWED	SCH
APPROVED	VG/LL

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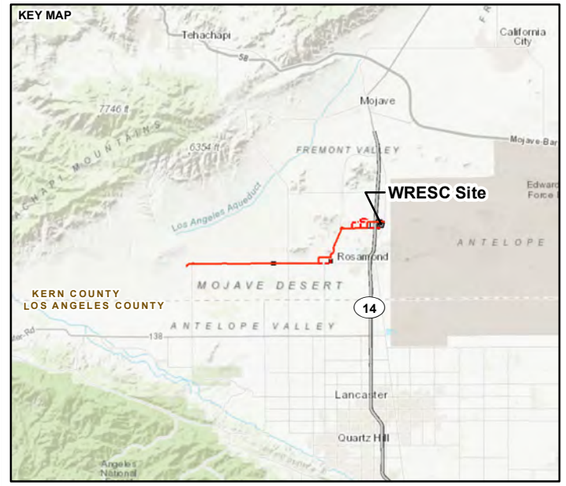

REFERENCE(S)

1. WRESC SITE RENDERING - KIEWIT 2024
2. COORDINATE SYSTEM: NAD 1983 STATEPLANE CALIFORNIA V FIPS 0405 FEET
2. MAP SERVICE LAYER CREDITS: SOURCES: ESRI, HERE, GARMIN, INTERMAP, INCREMENT P CORP., GEBCO, USGS, FAO, NPS, NRCAN, GEOBASE, IGN, KADASTER NL, ORDNANCE SURVEY, ESRI JAPAN, METI, ESRI CHINA (HONG KONG), (C) OPENSTREETMAP CONTRIBUTORS, AND THE GIS USER COMMUNITY

CLIENT
GEM A-CAES LLC

PROJECT
WILLOW ROCK ENERGY STORAGE CENTER
SUPPLEMENTAL AFC

TITLE
RENDERING OF WILLOW ROCK STORAGE CENTER WITH ARCHITECTUAL BERM

CONSULTANT

wsp

YYYY-MM-DD	2024-02-21
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PREPARED	MK
REVIEWED	SCH
APPROVED	VG/LL

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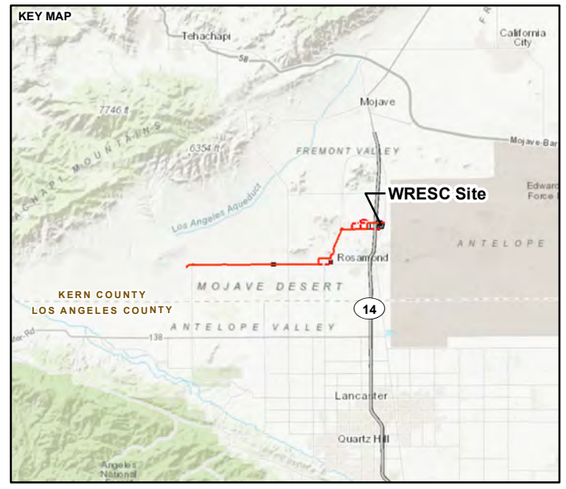

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2. MAP SERVICE LAYER CREDITS: SOURCES: ESRI, HERE, GARMIN, INTERMAP, INCREMENT P CORP., GEBCO, USGS, FAO, NPS, NRCAN, GEOBASE, IGN, KADASTER NL, ORDNANCE SURVEY, ESRI JAPAN, METI, ESRI CHINA (HONG KONG), (C) OPENSTREETMAP CONTRIBUTORS, AND THE GIS USER COMMUNITY

CLIENT
GEM A-CAES LLC

PROJECT
WILLOW ROCK ENERGY STORAGE CENTER
SUPPLEMENTAL AFC

TITLE
RENDERING OF WILLOW ROCK STORAGE CENTER WITHOUT ARCHITECTUAL BERM

CONSULTANT

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PREPARED	MK
REVIEWED	SCH
APPROVED	VG/LL

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1.1 Project Objectives

The Willow Rock basic project objectives are the following:

1. Provide 500 MW of quick-starting, flexible, controllable generation with the ability to ramp up and down through a wide range of electrical output to facilitate the integration of renewable energy into the electrical grid in satisfaction of California's Renewable Portfolio Standard and climate objectives, by displacing older and less efficient generation.
2. Interconnect the project to the CAISO-controlled SCE Whirlwind Substation, a major substation in or near the Tehachapi Renewable Wind Resource Area, to facilitate the integration of onshore and offshore renewable energy development.
3. Implement a proven sustainable energy storage technology that provides improved technological diversity, non-combustible energy storage, minimal residual hazardous waste at asset retirement, a long-term commercial lifespan of 30 years or greater, and non-degrading energy storage.
4. Use A-CAES technology to provide dispatchable long-duration storage and energy delivery for a minimum of 8 hours; fossil fuel and greenhouse gas emissions-free operation; flexible capacity with minimal response time; provide long-duration storage to avoid curtailment through energy storage and to facilitate the further integration of renewable resources; peaking energy for local contingencies; voltage support and primary frequency response, including synchronous power output to support grid resiliency without the need for fossil fuel; superior transient response attributes, including synchronous power output; and superior round-trip thermodynamic efficiency.
5. Locate the facility on a site with adequate geologic characteristics for the underground facilities for compressed air storage, including suitable overburden characteristics (limited thickness, constructable soil type); deep subsurface geological formation (2,000 to 2,500 feet below ground surface) of sufficient quality and definition at the required depth for construction of the excavated storage cavern; ultra-low hydraulic conductivity and permeability in deep subsurface geological formation to retain water and air under pressure within the excavated storage cavern; and competent geological structural integrity to sustain an excavated storage cavern at depth intact indefinitely, allowing for repeated compressed air injection and discharge cycles over the life of the project without eroding or collapsing.
6. Site the project on land with acceptable constructability and with adequate access and size for construction of aboveground facilities—at least approximately 80 acres.
7. Site the project near adequate water supply for construction.
8. Locate the project on a site that is available to provide adequate site control, through long-term lease or purchase.
9. Minimize additional supporting infrastructure needs and reduce potential environmental impacts by locating the facility near existing and planned infrastructure, including access to an existing substation with available transmission capacity.
10. Create jobs in Kern County and the state of California through both construction and operation of the facility.
11. Be a good corporate citizen and respected member of the community through the lifecycle of the project.

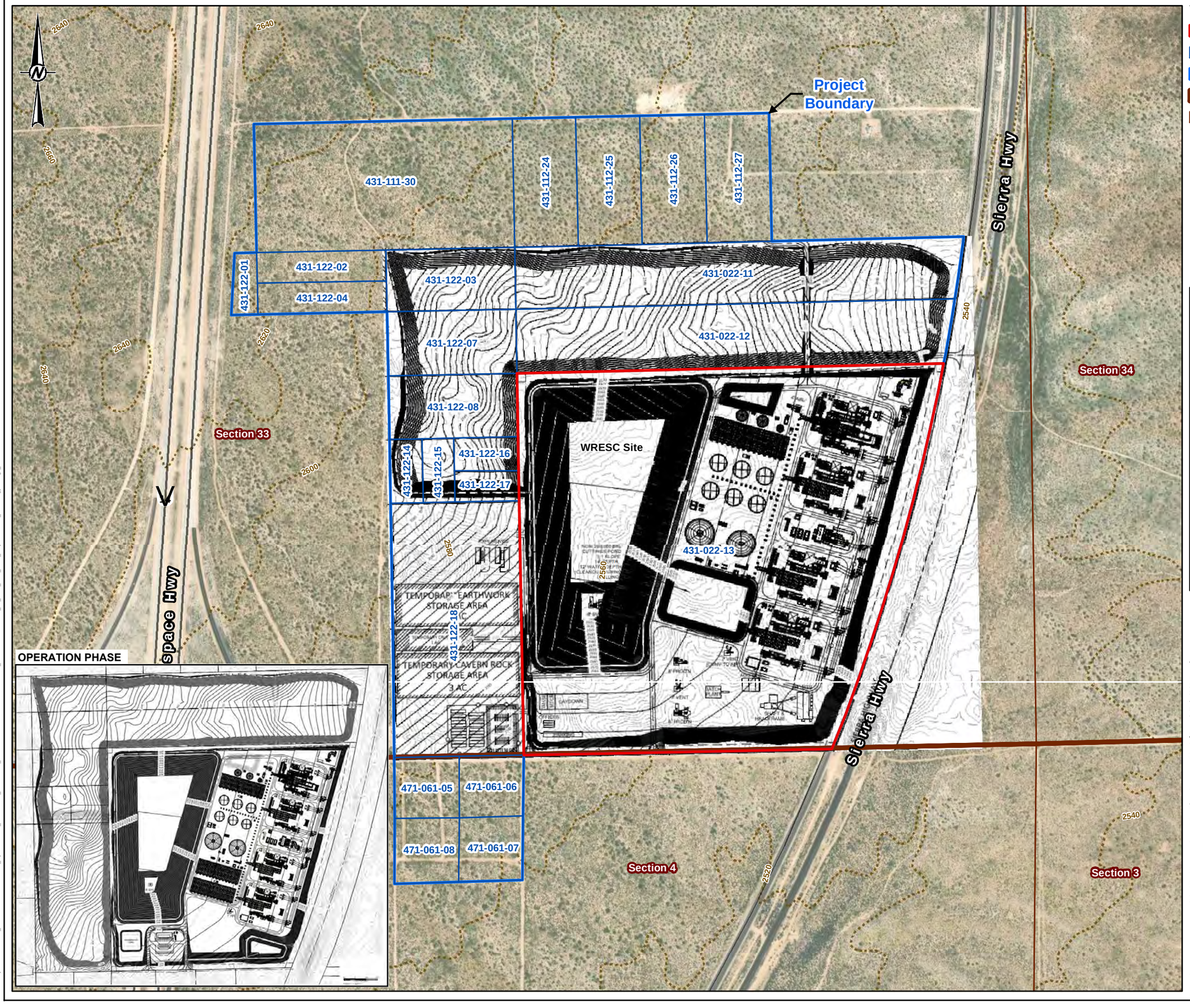
1.2 Project Location

Willow Rock will be located in unincorporated Kern County (County), approximately 4 miles north of Rosamond, California (**Figure 1-4** and **Figure 1-5**). The WRESC site is within the southeast quarter of Section 33 of Township 10 North, Range 12 West.

The WRESC site is located on the western portion of an approximately 112-acre parcel with Assessor's Parcel Number (APN) 431-022-13 that is bisected by Sierra Highway and the Union Pacific Railway. The eastern portion of APN 431-022-13 is not included in the project boundary. The WRESC site is bounded on the north and west by undeveloped property, on the east by Sierra Highway, and on the south by Dawn Road approximately 1,800 feet east of the State Route 14 corridor. Additional parcels adjacent to the WRESC site within the project boundary may be used for temporary parking, construction laydown, or construction of an architectural berm.

The WRESC site is currently proposed on undeveloped land in an area zoned Limited Agriculture (A-1) District. The area surrounding the project boundary is largely undeveloped with very sparse residential development; the nearest residence is approximately 0.8 miles northwest of the northwest corner of the WRESC site. The parcels within the project boundary including the WRESC site are not under a Williamson Act Contract.

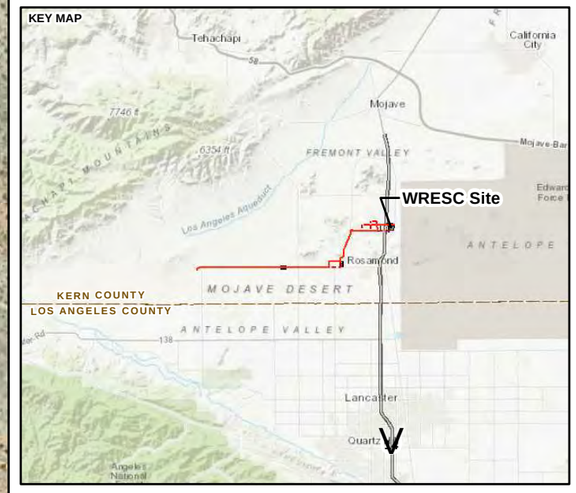
Appendix 1A contains a copy of the Assessor's Parcel Map for the parcels within the project boundary. A list and map of the owners of properties within 1,000 feet of the project boundary and 500 feet of the proposed gen-tie line is provided in Appendix 1B. **Figure 1-6** shows the project boundary and gen-tie line.



LEGEND

- WRESC Site
- Other Project Parcel
- Project Boundary
- PLSS Township and Range
- PLSS Section

KEY MAP



0 500 1,000

1 " = 500 feet FEET

REFERENCE(S)

1. WRESC SITE PLAN - KIEWIT 2024
2. PLSS - CALIFORNIA STATE GEOPORTAL PLSS DB, 2023
3. PARCEL BOUNDARIES - KERN COUNTY, 2023
4. COORDINATE SYSTEM: NAD 1983 STATEPLANE CALIFORNIA V FIPS 0405 FEET
5. MAP SERVICE LAYER CREDITS: SOURCES: ESRI, HERE, GARMIN, INTERMAP, INCREMENT P CORP., GEBCO, USGS, FAO, NPS, NRCAN, GEOBASE, IGN, KADASTER NL, ORDNANCE SURVEY, ESRI JAPAN, METI, ESRI CHINA (HONG KONG), (C) OPENSTREETMAP CONTRIBUTORS, AND THE GIS USER COMMUNITY SOURCE: ESRI, MAXAR, EARTHSTAR GEOGRAPHICS, AND THE GIS USER COMMUNITY

CLIENT

GEM A-CAES LLC

PROJECT

WILLOW ROCK ENERGY STORAGE CENTER
SUPPLEMENTAL AFC

TITLE

PROJECT LOCATION MAP OF WILLOW ROCK ENERGY STORAGE CENTER WITH ARCHITECTUAL BERM (CONSTRUCTION PHASE)

CONSULTANT

wsp

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REVIEWED	SCH
APPROVED	VG/LL

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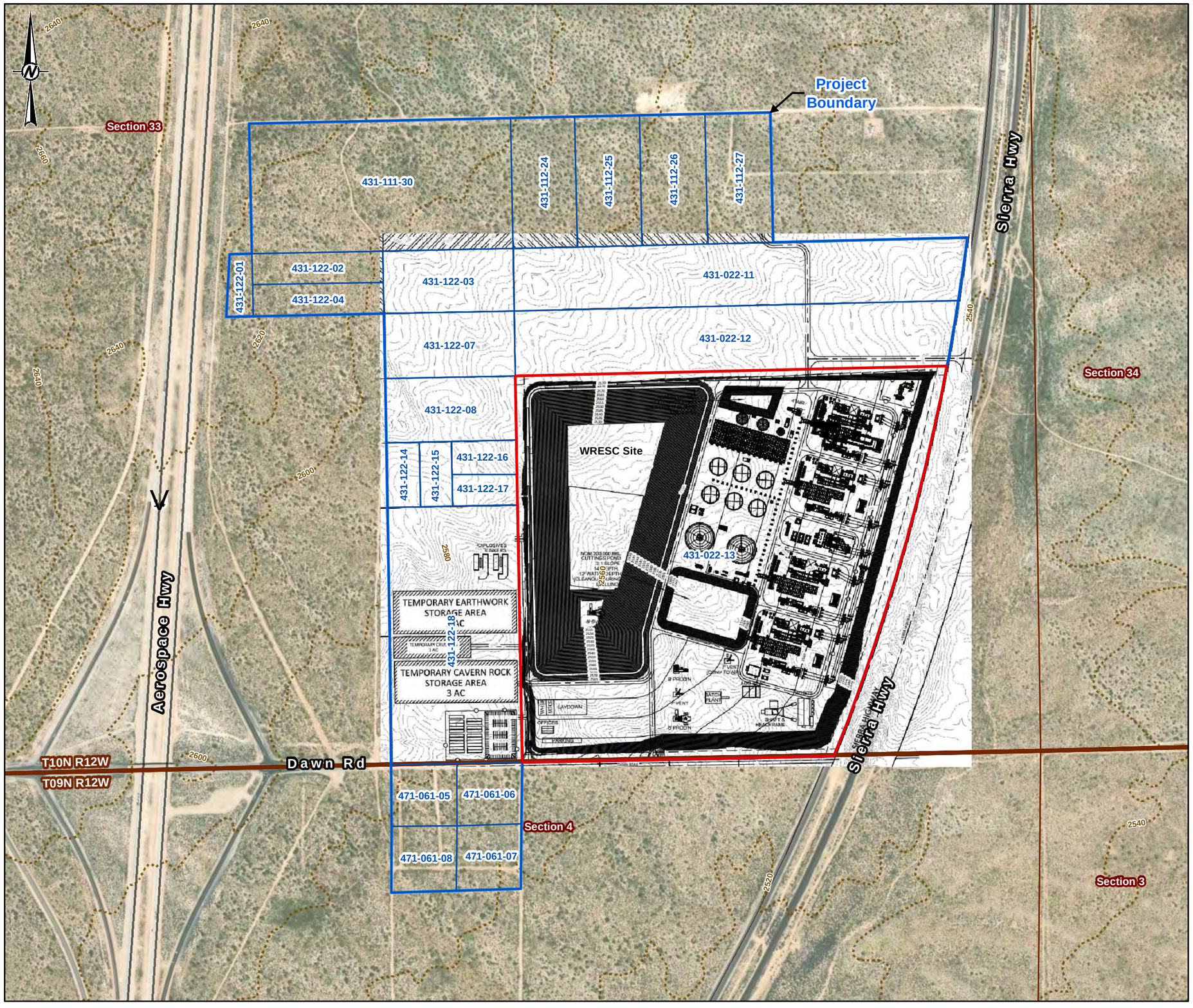
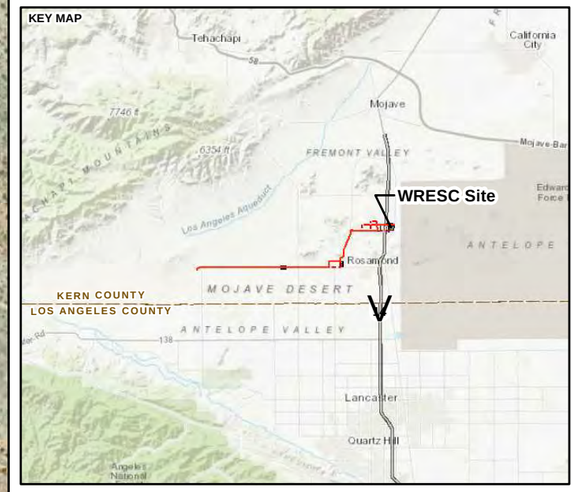


LEGEND

- WRESC Site
- Other Project Parcel
- Project Boundary
- PLSS Township and Range
- PLSS Section

KEY MAP



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1 " = 500 feet FEET

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2. PLSS - CALIFORNIA STATE GEOPORTAL PLSS DB, 2023
3. PARCEL BOUNDARIES - KERN COUNTY, 2023
4. COORDINATE SYSTEM: NAD 1983 STATEPLANE CALIFORNIA V FIPS 0405 FEET
5. MAP SERVICE LAYER CREDITS: SOURCES: ESRI, HERE, GARMIN, INTERMAP, INCREMENT P CORP., GEBCO, USGS, FAO, NPS, NRCAN, GEOBASE, IGN, KADASTER NL, ORDNANCE SURVEY, ESRI JAPAN, METI, ESRI CHINA (HONG KONG), (C) OPENSTREETMAP CONTRIBUTORS, AND THE GIS USER COMMUNITY SOURCE: ESRI, MAXAR, EARTHSTAR GEOGRAPHICS, AND THE GIS USER COMMUNITY

CLIENT

GEM A-CAES LLC

PROJECT

WILLOW ROCK ENERGY STORAGE CENTER SUPPLEMENTAL AFC

TITLE

PROJECT LOCATION MAP OF WILLOW ROCK ENERGY STORAGE CENTER WITHOUT ARCHITECTUAL BERM (CONSTRUCTION PHASE)

CONSULTANT

wsp

YYYY-MM-DD	2024-02-22
DESIGNED	MK
PREPARED	MK
REVIEWED	SCH
APPROVED	VG/LL

PROJECT NO.	CONTROL	REV.	FIGURE
31406639.003	01	0	1-5

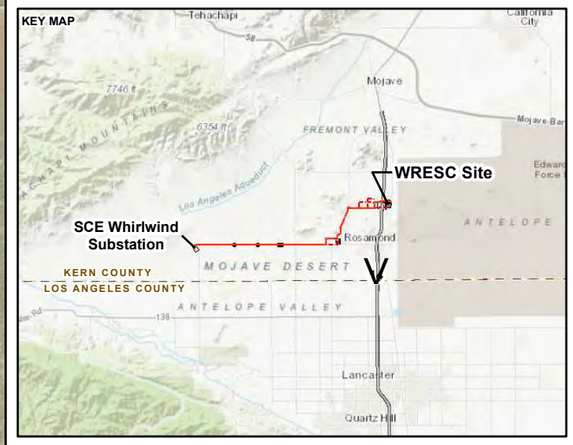
LEGEND

Proposed Transmission Line

- Preferred Route, Aboveground
- Preferred Route, Underground
- Route Options 1-6, Aboveground
- Route Options 1-6, Underground

Project Components

- WRESC Site
- Other Project Parcel
- Project Boundary
- SCE Whirlwind Substation



0 8,000 16,000

1 " = 8,000 feet FEET

REFERENCE(S)

1. TRANSMISSION LINES - GEM A-CAES LLC
2. PARCEL BOUNDARIES - KERN COUNTY GIS DEPT.
3. COORDINATE SYSTEM: NAD 1983 STATEPLANE CALIFORNIA V FIPS 0405 FEET
4. MAP SERVICE LAYER CREDITS: SOURCES: ESRI, HERE, GARMIN, INTERMAP, INCREMENT P CORP., GEBCO, USGS, FAO, NPS, NRCAN, GEOBASE, IGN, KADASTER NL, ORDNANCE SURVEY, ESRI JAPAN, METI, ESRI CHINA (HONG KONG), (C) OPENSTREETMAP CONTRIBUTORS, AND THE GIS USER COMMUNITY SOURCE: ESRI, MAXAR, EARTHSTAR GEOGRAPHICS, AND THE GIS USER COMMUNITY

CLIENT
GEM A-CAES LLC

PROJECT
WILLOW ROCK ENERGY STORAGE CENTER
SUPPLEMENTAL AFC

TITLE
PROJECT SITE AND FACILITIES MAP

CONSULTANT
wsp

YYYY-MM-DD	2024-02-20
DESIGNED	MK
PREPARED	MK
REVIEWED	SCH
APPROVED	VG/LL

PROJECT NO.	CONTROL	REV.	FIGURE
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1.3 Project Elements

WRESC includes the following key features:

- A-CAES Energy Storage Process, Cooling Systems and Electric Transmission
  - All-electric-motor-driven air compressors configured in four trains, totaling nominally 500 MW net
  - Air-powered turbine generators with air discharge stacks
  - Heat extraction and recovery main process heat exchangers
  - Thermal storage system using water
  - Electric, air-cooled heat exchangers
  - Hydrostatically compensating surface reservoir with liner and interlocking shape floating cover
  - Evaporation pond for process water
  - Aboveground piping pipe racks and filter houses
  - Underground compressed air storage cavern
  - Interconnecting shafts for movement of compressed air and water to and from the cavern
  - Optional permanent aboveground architectural berm for onsite re-use of excavated cavern rock[1]
  - Approximately 19-mile long 230 kV single-circuit, double-conductor bundle generation-tie (gen-tie) line interconnecting to the SCE Whirlwind Substation with a preferred gen-tie route and alternate route options
  - Approximately 125 transmission poles
- Operation and Maintenance Facilities, Ancillary Support Systems and Other Features
  - Site stormwater drainage system and stormwater percolation/evaporation pond
  - Water supply from adjacent existing Antelope Valley East Kern Water Agency's supply pipeline
  - Fire detection and fire monitoring system
  - Firewater tank and fire suppression system
  - Diesel-fired emergency fire pump
  - Diesel-fired emergency backup power supply engines to maintain critical loads in the event of a loss of power
  - Combined Office, Control Room, and Maintenance Building
  - Employee and visitor parking area with electric vehicle charging ports and landscaping
  - Primary and secondary entrances with security access gates and site perimeter fencing
  - Permanent plant access roads within the WRESC
  - Extension/upgrades to Dawn Road between the State Route (SR) 14 interchange and Sierra Highway
  - Unpaved access road for portions of the gen-tie line corridor that do not have established access
- Temporary Construction Facilities
  - Temporary laydown and parking areas including cavern construction laydown area, construction phase earthwork areas, cavern rock temporary re-use areas, cavern rock temporary backup re-use areas, and parking areas located on adjacent and nearby parcels
  - Temporary rock crushing facility and portable concrete batch plant to support cavern construction and excavated rock management
  - Temporary entrances for construction
  - Temporary conductor pull and tensioning sites
  - Temporary disturbance for each transmission pole placement

Chapter 2, Project Description, of this Supplemental AFC provides details regarding project elements.

[1] Approximately 1.3 million cubic yards of crushed rock (accounting for swell and void space) would be extracted during construction of the cavern. The WRESC will include options for managing the extracted rock that may be implemented alone or in any combination, including (a) permanent onsite storage in the form of an architectural berm around portions of the WRESC; (b) off-taker transport for commercial use; and (c) off-taker transport for permanent offsite storage. The size of the potential architectural berm will depend on the quantity of rock. The height is expected to not exceed approximately 10 feet. If all the rock were re-used onsite, the total facility size would increase by up to an additional approximately 74.6 acres for a total of approximately 163.2 acres.

1.4 Project Benefits

The WRESC will provide the following key environmental and economic benefits:

- **Strategic location:** The WRESC is located strategically to facilitate the further integration of variable renewable resources located in the Tehachapi Renewable Resource Area, which will help avoid curtailment of variable renewable energy resources through energy storage and to meet California and regional electric grid reliability needs.
- Hydrostor A-CAES technology that provides:
  - Fossil fuel emissions-free spinning reserve.
  - Flexible capacity with minimal start time.
  - Peaking energy for local contingencies.
  - Voltage support and primary frequency response without burning fossil fuel.
  - Superior transient response attributes.
  - Superior round-trip thermodynamic efficiency.
- **Minimized land use impacts:** Willow Rock is sited on compatibly zoned parcels in a sparsely populated area. There are no schools, parks, recreational areas, or other sensitive land uses immediately adjacent to the WRESC Site. The project is consistent with the applicable local land uses and land use plans.
- **Key project for integrating renewables:** Willow Rock will provide rapid-response delivery of energy and synchronous condenser voltage support services that are essential to providing reliability support and stability to the grid and integrating intermittent renewable energy sources into the electrical grid.
- **Substantial construction jobs:** Willow Rock will provide approximately 275 to 750 construction jobs (average to peak) with an expected construction payroll of approximately $400–450 million over the 60-month construction and commissioning period.
- **Permanent local jobs:** Willow Rock will provide approximately 40 full time jobs for operation of the facility.
- **Substantial property tax revenue to Kern County and local schools:** With its sizeable capital cost (estimated at approximately $1.5 billion), Willow Rock will generate significant income in the form of annual property tax payments, and therefore will provide a robust boost to Kern County's economy and local schools.
- **Local economic benefits:** In addition to the direct employment benefit, Willow Rock will require and use the services of local or regional firms for major maintenance and overhauls, plant supplies, and other support services throughout the life of the Willow Rock facility. The project will not significantly impact local housing, educational, or emergency response resources.
- **Supportive community participant:** The Applicant is committed to working collaboratively with the local community and the County to be a beneficial contributor to community programs and supportive community participant.

1.5 Project Operation

Willow Rock will be designed to operate 24 hours per day, 7 days per week and be available to operate at full load at least 95 percent of the time. The facility will typically cycle between Charging Mode (compression/energy storage) lasting approximately 14 hours and Discharging Mode (decompression/power production) lasting 8 hours at nameplate capacity.

During Charging Mode, electric power will be drawn from the grid (typically off-peak) to run the all-electric air compressors. Compressed air will be injected into a water-filled subterranean cavern displacing the cavern water upward into the hydrostatically compensating reservoir. Heat generated during the compression process will be recovered to heat water in a closed loop thermal storage system, with hot water stored in aboveground spherical tanks (spheres). Upon completion of the charging cycle, the system will be available to generate electricity.

During the Discharge Mode, water from the hydrostatically compensating reservoir will be allowed to flow down into the subterranean cavern, displacing the stored compressed air which will be expanded in power turbines to generate electricity for up to 8 or more hours. Hot water recovered and stored in the aboveground spheres during the charging cycle will be used to reheat the expanding air at intermediate turbine stages to facilitate higher

efficiency power generation. During the compression process, water vapor entrained in the compressed air will be condensed and recycled. Dry air exiting the power turbines will be discharged to the atmosphere through five stacks, one serving each power generation train. No fossil fuels will be required to operate the Willow Rock facility.

1.6 Project Ownership

Project Applicant, Owner, and Operator:

GEM A-CAES LLC is the Applicant, owner, and operator of the Willow Rock project, including all aboveground and underground power plant facilities, the onsite substation, and the interconnecting gen-tie line. GEM is a wholly owned subsidiary of Hydrostor Inc.

Hydrostor is a private company based in Toronto, Canada, and is the world's leading developer of utility-scale energy storage facilities deploying its proprietary A-CAES product.

Project Site Owner:

Willow Rock will be located on an approximately 88.6-acre portion of an approximately 112-acre parcel that is currently owned by Zevsar Concepts, LLC, a Nevada limited liability company. GEM has obtained site control of the entire 112-acre parcel by virtue of an optional purchase and sale agreement with the landowner.

Project Construction and Laydown Area Owners:

GEM has entered into, or is in the process of completing, pending purchase and sale agreements with each of the parcel owners that provides the project with full access and site control.

There are no current plans to merge project parcels. Further, merger is not required under the Kern County Code (§ 18.06.030).

A complete listing of properties associated with the project development included in Tables 2-1 and 2-2. Additional information regarding the WRESC and construction laydown area parcels is provided in Appendix 1 D.

1.7 Project Schedule

Construction of Willow Rock is expected to begin no later than March 2025. Pre-operational testing of the power plant is expected to begin during 2029, and full-scale operation is expected to begin by September 2029. Additional details of the major milestones are provided in Table 2-8 in Chapter 2, Project Description.

1.8 Persons Who Prepared the Application for Certification

Appendix 1C contains a listing of the persons involved in preparation of the AFC, including their roles and responsibilities.

2.0 Project Description

The Willow Rock Energy Storage Center (WRESC, or Willow Rock) will be located on approximately 88.6 acres of private land immediately north of Dawn Road and between State Route (SR) 14 and Sierra Highway within unincorporated, southeastern Kern County, California. The WRESC will be a nominal 520-megawatt (MW) gross (500 MW net) and 4,160 megawatt-hour (MWh) gross (4,000 MWh net) facility using Hydrostor, Inc.'s (Hydrostor's) proprietary, advanced compressed air energy storage (A-CAES) technology. Energy stored at the WRESC will be delivered to Southern California Edison's (SCE's) Whirlwind Substation located southwest of the WRESC at the intersection of 170th Street W and Rosamond Boulevard, via a new approximately 19-mile 230-kilovolt (kV) generation-tie (gen-tie) line. The WRESC will be capable of operating on a 24-hour basis, 365 days a year with an approximately 50-year lifespan.

The proposed project includes the following key features:

- A-CAES Energy Storage Process, Cooling Systems and Electric Transmission
  - Eight electric-motor-driven air compressors configured in four trains, totaling nominally 500 MW net
  - Four nominally 130 MW air-powered turbine generators with 100-foot-tall air vent stacks
  - Heat extraction and recovery main process heat exchangers
  - Thermal storage system using water, including up to six, 87.5-foot-diameter by 100-foot-tall (maximum) hot-water spherical storage tanks and two 150-foot-diameter, 60-foot-tall cold-water storage tanks
  - Cooling system: three air-cooled heat exchangers with evaporative mist system using excess internally produced process water
  - One approximately 21.5-acre, 577-acre-foot capacity hydrostatically compensating surface reservoir with liner and interlocking shape floating cover
  - One lined evaporation pond for process water
  - Aboveground piping pipe racks and filter houses
  - Underground compressed air storage cavern (approximately 900,000 cubic yards capacity)
  - Interconnecting conduits for movement of compressed air to and from the cavern
  - Potential permanent aboveground architectural berm for onsite re-use of excavated cavern rock[1]
  - Onsite 230 kV substation with oil-filled transformers with 230/13.8 kV rating
  - One approximately 19-mile-long 230 kV single-circuit double-bundle conductor generation-tie (gen-tie) line interconnecting to the SCE Whirlwind Substation with a preferred gen-tie route and route options
  - Approximately 125 transmission poles (approximately 0.1 acres permanent disturbance)
- Operation and Maintenance Facilities, Ancillary Support Systems, and Other Features
  - Site stormwater drainage system and stormwater percolation/evaporation ponds
  - Water supply connection to an existing Antelope Valley East Kern Water Agency's supply pipeline adjacent to Sierra Highway east of the WRESC Site
  - Fire detection and fire monitoring systems
  - Firewater tank and fire suppression system
  - Acoustic enclosures for Turbomachinery
  - Weather Enclosures for Motor Control Center
  - One diesel-fired 345-kilowatt (kW) (460 horsepower) emergency fire pump
  - Three diesel-fired up to 2.5 MW, 4.16 kV emergency backup power supply engines to maintain critical loads in the event of a loss of power
  - One combined office, control room, and maintenance building
  - Employee and visitor parking area with electric vehicle charging ports and landscaping
  - Primary and secondary entrances with security access gates and site perimeter fencing

[1] Approximately 1.3 million cubic yards of crushed rock (accounting for swell and void space) would be extracted during construction of the cavern. The WRESC will include options for managing the extracted rock that may be implemented alone or in any combination, including (a) permanent on-site storage in the form of an architectural berm around portions of the WRESC; (b) off-taker transport for commercial use; and (c) off-taker transport for permanent off-site storage. The size of the potential architectural berm will depend on the quantity of rock. The height is expected to not exceed approximately 10 feet. If all the rock were re-used onsite, the total facility size would increase by up to an additional approximately 74.6 acres for a total of approximately 163.2 acres.

  - Permanent plant access roads within the WRESC Site
  - Extension/upgrades to Dawn Road between the SR 14 interchange and Sierra Highway
  - An estimated up to 1.75 miles of unpaved service access road along the gen-tie line corridor as needed (approximately 4 acres permanent disturbance)
- Temporary Construction Facilities
  - Up to approximately 136.3-acre total laydown areas including cavern construction laydown area, construction phase earthwork areas, cavern rock temporary re-use areas, cavern rock temporary backup re-use areas, and parking areas located on adjacent and nearby parcels
  - Rock crushing facility and concrete batch plant to support cavern construction and excavated rock management (acreage included in 136.3-acre total temporary disturbance)
  - Two temporary entrances for construction; the Dawn Road construction entrance may be converted to permanent
  - Up to five conductor pull and tensioning sites (3.4 acres total)
  - Approximately 75- by 75-foot temporary disturbance for placement of each transmission pole (16.1 acres total)

Willow Rock will not require the combustion of fossil fuel and will not produce combustion-related air emissions during normal operation.[2]

The WRESC Site is located immediately north of Dawn Road and immediately west of Sierra Highway, Rosamond, California, on the 88.6-acre portion of Assessor's Parcel Number 431-022-13, located west of Sierra Highway. The final site boundary and potential construction laydown areas depend on whether the facility will include onsite re-use of excavated cavern rock in an architectural berm on the west and north sides of the facility. **Figure 2-1** and **Figure 2-2** show the WRESC Site and potential construction laydown areas with and without the architectural berm option, respectively. **Table 2-1** summarizes all parcels that will be associated with immediate site development if excavated cavern rock is hauled offsite. **Table 2-2** summarizes all parcels that will be associated with immediate site development if excavated cavern rock is re-used onsite in an architectural berm.

Table 2-1: Main Facility and Associated Parcels with Excavated Cavern Rock Hauled Offsite (No Architectural Berm)

Assessor's Parcel Number	Owner	Parcel Size (acres)	Use
431-022-13	Zevsar Concepts LLC	88.6	Main facility - permanent
431-122-18	Private Owner	20.3	Temporary construction laydown and parking, if needed
431-022-12	Private Owner	17.2	Temporary construction laydown and parking
431-022-11	Private Owner	17	Temporary construction laydown and parking
431-022-08	GEM A-CAES LLC	79.4	Temporary construction laydown and parking and/or Permanent environmental mitigation site

[2] The project will include three emergency diesel-fired engines to maintain critical loads in the event of a loss of power and one diesel-fired fire pump engine. These engines are expected to operate less than 50 hours per year for reliability testing and maintenance and will not operate concurrently during testing. The diesel-fired engines will operate in an emergency for other critical facility loads when electric power is not available. A separate diesel-engine-driven fire pump will provide water in the event of an emergency. This emergency backup equipment does not need to operate for the WRESC to function during normal operation.

Table 2-2: Main Facility and Associated Parcels with Onsite Cavern Rock Re-use (with Architectural Berm)

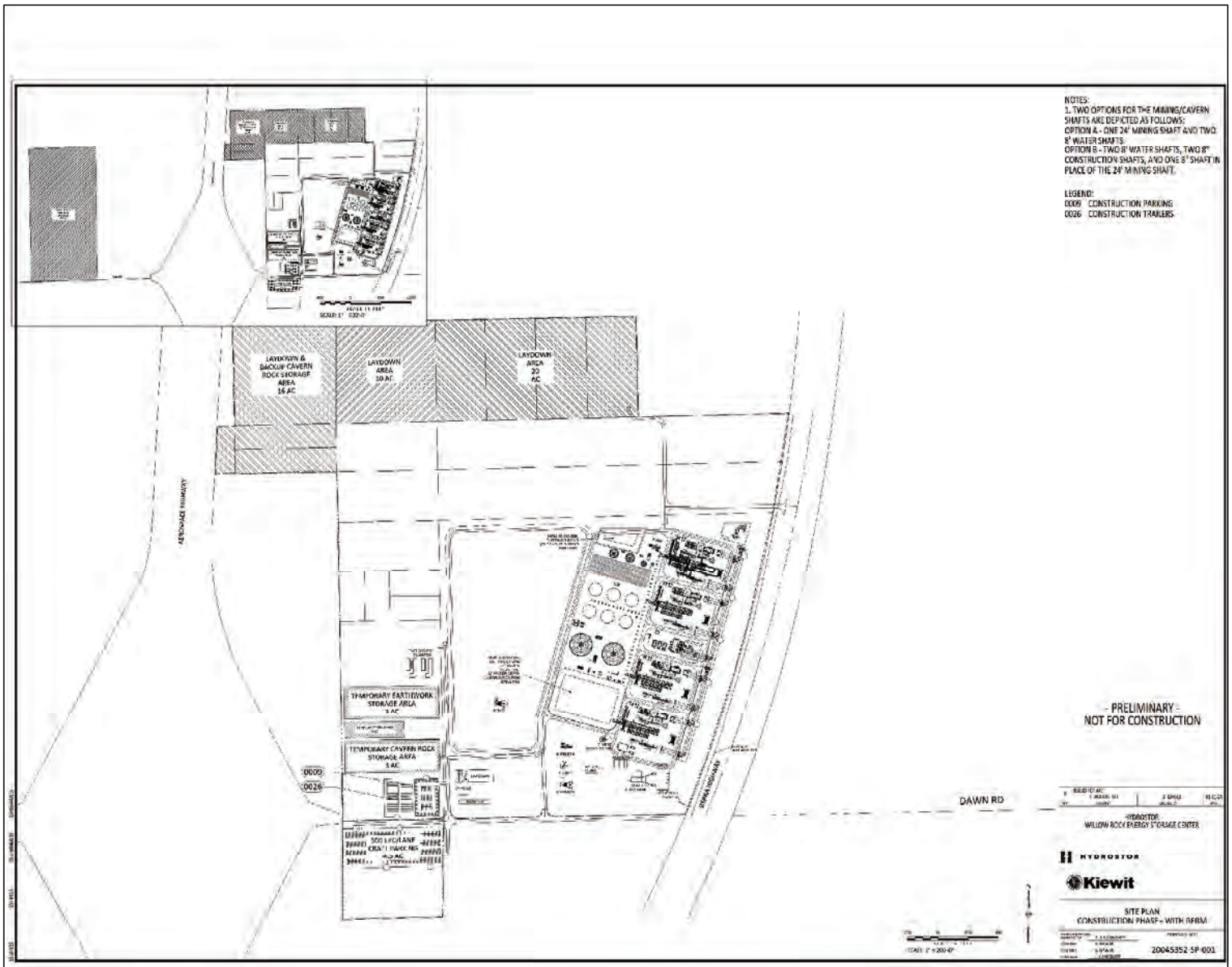
Assessor's Parcel Number	Owner	Parcel Size (acres)	Use
431-022-13	Zevsar Concepts LLC	88.6	Main facility - permanent
431-122-18	Private Owner	20.3	Architectural berm – permanent, if needed
431-022-12	Private Owner	17.2	Architectural berm - permanent
431-022-11	Private Owner	17	Architectural berm - permanent
431-122-01	Private Owner	0.9	Temporary construction and gen-tie line corridor
431-122-02	Private Owner	2.4	Temporary construction and gen-tie line corridor
431-122-03	Private Owner	4.9	Architectural berm - permanent
431-122-04	Private Owner	2.5	Temporary construction and gen-tie line corridor
431-122-07	Private Owner	5.1	Architectural berm - permanent
431-122-08	Private Owner	5.1	Architectural berm - permanent
431-122-14	Private Owner	1.3	Architectural berm – permanent, if needed
431-122-15	Private Owner	1.3	Architectural berm - permanent
431-122-16	Private Owner	1.3	Architectural berm - permanent
431-122-17	Private Owner	1.2	Architectural berm - permanent
431-111-30	Private Owner	20.6	Temporary construction laydown
431-112-24	GEM A-CAES LLC	5.1	Temporary construction laydown
431-112-25	GEM A-CAES LLC	5.1	Temporary construction laydown
431-112-26	GEM A-CAES LLC	5.1	Temporary construction laydown
431-112-27	GEM A-CAES LLC	5.1	Temporary construction laydown
471-061-05	Private Owner	2.5	Temporary construction laydown and parking
471-061-06	Private Owner	2.4	Temporary construction laydown and parking
471-061-07	Private Owner	2.5	Temporary construction laydown and parking
471-061-08	Private Owner	2.6	Temporary construction laydown and parking
431-022-08	GEM A-CAES LLC	79.4	Temporary construction laydown and parking and/or Permanent environmental mitigation site, if needed

A summary of total permanent and temporary disturbances with and without the architectural berm is provided in **Table 2-3.**

Table 2-3: Summary of Estimated Permanent and Temporary Disturbance With and Without Onsite Rock Re-use

Project Element	Disturbed Acreage Without Berm (Rock Hauled Offsite)	Disturbed Acreage With Berm (Onsite Rock Re-use)	Permanent or Temporary?
Main Facility	88.6	88.6	Permanent
Architectural Berm	0	74.6	Permanent
Site Construction Laydown and Parking	133.9	136.3	Temporary
Transmission Poles	0.1	0.1	Permanent
Transmission Pole Construction Sites	16.1	16.1	Temporary
Pull and Tensioning Sites	3.4	3.4	Temporary
New Access Roads	4	4	Permanent
Total Permanent	92.6	167.3	Permanent
Total Temporary	153.5	155.9	Temporary

Project elements are described in the following subsections. The project location, ownership, and benefits are described in detail in Chapter 1, Introduction.



KEY MAP

REFERENCE(S)

1. WRESC SITE RENDERING - KIEWIT 2024
2. COORDINATE SYSTEM: NAD 1983 STATEPLANE CALIFORNIA V FIPS 0405 FEET
3. MAP SERVICE LAYER CREDITS: SOURCES: ESRI, HERE, GARMIN, INTERMAP, INCREMENT P CORP., GEBCO, USGS, FAO, NPS, NRCAN, GEOBASE, IGN, KADASTER NL, ORDNANCE SURVEY, ESRI JAPAN, METI, ESRI CHINA (HONG KONG), (C) OPENSTREETMAP CONTRIBUTORS, AND THE GIS USER COMMUNITY

CLIENT
GEM A-CAES LLC

PROJECT
WILLOW ROCK ENERGY STORAGE CENTER
SUPPLEMENTAL AFC

TITLE
WRESC SITE AND CONSTRUCTION LAYDOWN/PARKING – WITH ARCHITECTURAL BERM OPTION

CONSULTANT

YYYY-MM-DD	2024-02-22
DESIGNED	MK
PREPARED	MK
REVIEWED	SCH
APPROVED	VG/LL

PROJECT NO.	CONTROL	REV.	FIGURE
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REFERENCE(S)

1. WRESC SITE RENDERING - KIEWIT 2024
2. COORDINATE SYSTEM: NAD 1983 STATEPLANE CALIFORNIA V FIPS 0405 FEET
3. MAP SERVICE LAYER CREDITS: SOURCES: ESRI, HERE, GARMIN, INTERMAP, INCREMENT P CORP., GEBCO, USGS, FAO, NPS, NRCAN, GEOBASE, IGN, KADASTER NL, ORDNANCE SURVEY, ESRI JAPAN, METI, ESRI CHINA (HONG KONG), (C) OPENSTREETMAP CONTRIBUTORS, AND THE GIS USER COMMUNITY

CLIENT
GEM A-CAES LLC

PROJECT
WILLOW ROCK ENERGY STORAGE CENTER
SUPPLEMENTAL AFC

TITLE
WRESC SITE AND CONSTRUCTION LAYDOWN/PARKING – NO ARCHITECTURAL BERM OPTION

CONSULTANT

YYYY-MM-DD	2024-02-22
DESIGNED	MK
PREPARED	MK
REVIEWED	SCH
APPROVED	VG/LL

PROJECT NO.	CONTROL	REV.	FIGURE
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2.1 Generating Facility Description, Design, and Operation

The WRESC will be a nominal 4,160 MWh energy storage facility capable of charging and discharging daily. The overall facility will consist of four nominal 130 MW (gross) trains, outputting a total of 500 MW net at the point of interconnection. Each train will contain an electric motor-driven air compressor drivetrain, heat exchangers, an air turbine generator, air exhaust stacks and ancillary equipment. Each train will share a common set of thermal storage tanks (hot and cold water), as well as the air storage cavern.

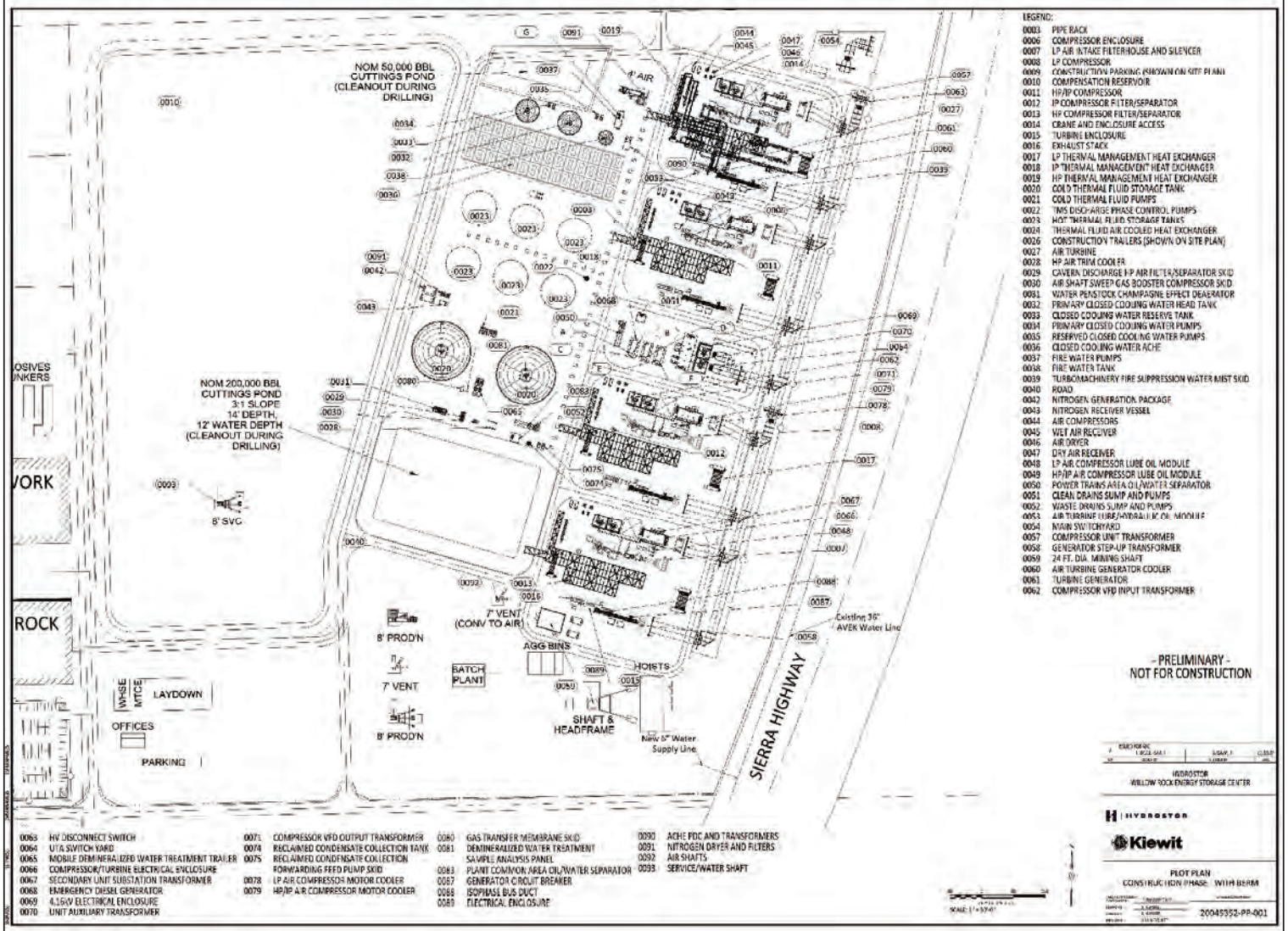
The WRESC will be designed and constructed following the design criteria provided in Appendix 2A, Engineering Design Criteria following applicable laws, ordinances, regulations, and standards (LORS).

2.1.1 General Site Arrangement and Layout

Figure 2-3 and **Figure 2-4** show the plot plan or general arrangement for the WRESC Site during the construction phase and operations phase, respectively. **Figure 2-5** and **Figure 2-6** present elevation drawings showing the project profile with and without the berm option, respectively. The main access to the Willow Rock site will be from Dawn Road. There will be two entry/exit points from Dawn Road for heavy load traffic. Access at the west side will lead to the laydown area, while access at the east side will lead to the east end of the Power Block. Temporary access during construction will be obtained from crushed rock driveways from both Dawn Road and Sierra Highway; the Dawn Road temporary construction access may be converted to permanent. The Sierra Highway access point will enter the WRESC Site at the construction laydown areas to the north. The permanent entrances and main plant roads within WRESC Site will be surfaced to provide internal access to all project facilities and onsite buildings. Personnel parking spaces, electric vehicle charging stations, and parking lot landscaping will be provided and will conform to Kern County requirements. The areas around equipment will have crushed rock surfacing, not paved or concreted. **Table 2-4** summarizes the preliminary square footage for the single onsite building, a combined office, control room, warehouse and maintenance building.

Table 2-4: Approximate Building Square Footage

Building Structure	Area (square feet)
Office and control room	5,000
Warehouse and maintenance area	1,600
Combined building area	6,600



REFERENCE(S)

1. WRESC SITE RENDERING - KIEWIT 2024
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CLIENT
GEM A-CAES LLC

PROJECT
WILLOW ROCK ENERGY STORAGE CENTER
SUPPLEMENTAL AFC

TITLE
WRESC PLOT PLAN – CONSTRUCTION PHASE

CONSULTANT

YYYY-MM-DD	2024-02-22
DESIGNED	MK
PREPARED	MK
REVIEWED	SCH
APPROVED	VG/LL

PROJECT NO.	CONTROL	REV.	FIGURE
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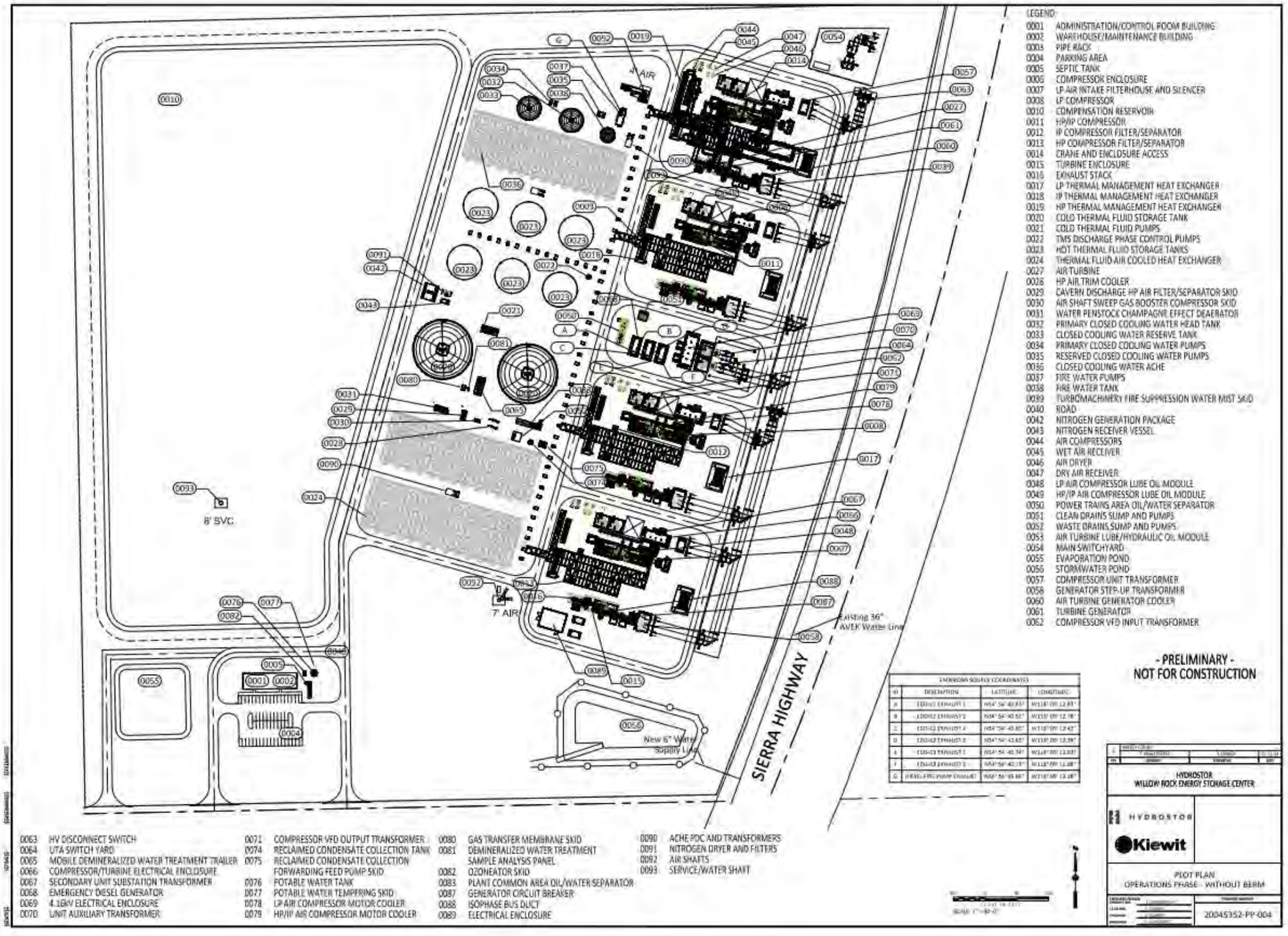

LEGEND

0001	ADMINISTRATION/CONTROL ROOM BUILDING
0002	WAREHOUSE/MAINTENANCE BUILDING
0003	PIPE RACK
0004	PARKING AREA
0005	SEPTIC TANK
0006	COMPRESSOR ENCLOSURE
0007	LP AIR INTAKE FILTERHOUSE AND SILENCER
0008	LP COMPRESSOR
0010	COMPENSATION RESERVOIR
0011	HP/IP COMPRESSOR
0012	IP COMPRESSOR FILTER/SEPARATOR
0013	HP COMPRESSOR FILTER/SEPARATOR
0014	CRANE AND ENCLOSURE ACCESS
0015	TURBINE ENCLOSURE
0016	EXHAUST STACK
0017	LP THERMAL MANAGEMENT HEAT EXCHANGER
0018	IP THERMAL MANAGEMENT HEAT EXCHANGER
0019	HP THERMAL MANAGEMENT HEAT EXCHANGER
0020	COLD THERMAL FLUID STORAGE TANK
0021	COLD THERMAL FLUID PUMPS
0022	TMS DISCHARGE PHASE CONTROL PUMPS
0023	HOT THERMAL FLUID STORAGE TANKS
0024	THERMAL FLUID AIR COOLED HEAT EXCHANGER
0027	AIR TURBINE
0028	HP AIR TRIM COOLER
0029	CAVERN DISCHARGE HP AIR FILTER/SEPARATOR SKID
0030	AIR SHAFT SWEEP GAS BOOSTER COMPRESSOR SKID
0031	WATER PENSTOCK CHAMPAGNE EFFECT DEAERATOR
0032	PRIMARY CLOSED COOLING WATER HEAD TANK
0033	CLOSED COOLING WATER RESERVE TANK
0034	PRIMARY CLOSED COOLING WATER PUMPS
0035	RESERVED CLOSED COOLING WATER PUMPS
0036	CLOSED COOLING WATER ACHE
0037	FIRE WATER PUMPS
0038	FIRE WATER TANK
0039	TURBOMACHINERY FIRE SUPPRESSION WATER MIST SKID
0040	ROAD
0042	NITROGEN GENERATION PACKAGE
0043	NITROGEN RECEIVER VESSEL
0044	AIR COMPRESSORS
0045	WET AIR RECEIVER
0046	AIR DRYER
0047	DRY AIR RECEIVER
0048	LP AIR COMPRESSOR LUBE OIL MODULE
0049	HP/IP AIR COMPRESSOR LUBE OIL MODULE
0050	POWER TRAINS AREA OIL/WATER SEPARATOR
0051	CLEAN DRAINS SUMP AND PUMPS
0052	WASTE DRAINS SUMP AND PUMPS
0053	AIR TURBINE LUBE/HYDRAULIC OIL MODULE
0054	MAIN SWITCHYARD
0055	EVAPORATION POND
0056	STORMWATER POND
0057	COMPRESSOR UNIT TRANSFORMER
0058	GENERATOR STEP-UP TRANSFORMER
0060	AIR TURBINE GENERATOR COOLER
0061	TURBINE GENERATOR
0062	COMPRESSOR VFD INPUT TRANSFORMER
0063	HV DISCONNECT SWITCH
0064	UTA SWITCH YARD
0065	MOBILE DEMINERALIZED WATER TREATMENT TRAILER
0066	COMPRESSOR/TURBINE ELECTRICAL ENCLOSURE
0067	SECONDARY UNIT SUBSTATION TRANSFORMER
0068	EMERGENCY DIESEL GENERATOR
0069	4.16kV ELECTRICAL ENCLOSURE
0070	UNIT AUXILIARY TRANSFORMER
0071	COMPRESSOR VFD OUTPUT TRANSFORMER
0074	RECLAIMED CONDENSATE COLLECTION TANK
0075	RECLAIMED CONDENSATE COLLECTION FORWARDING FEED PUMP SKID
0076	POTABLE WATER TANK
0077	POTABLE WATER TEMPERING SKID
0078	LP AIR COMPRESSOR MOTOR COOLER
0079	HP/IP AIR COMPRESSOR MOTOR COOLER
0080	GAS TRANSFER MEMBRANE SKID
0081	DEMINERALIZED WATER TREATMENT SAMPLE ANALYSIS PANEL
0082	OZONEATOR SKID
0083	PLANT COMMON AREA OIL/WATER SEPARATOR
0087	GENERATOR CIRCUIT BREAKER
0088	ISOPHASE BUS DUCT
0089	ELECTRICAL ENCLOSURE
0090	ACHE POC AND TRANSFORMERS
0091	NITROGEN DRYER AND FILTERS
0092	AIR SHAFTS
0093	SERVICE/WATER SHAFT

3 NARROW SOURCE COORDINATES

ID	DESCRIPTION	LATITUDE	LONGITUDE
A	EDG#1 EXHAUST 1	N34° 56' 40.81"	W118° 09' 12.87"
B	EDG#1 EXHAUST 2	N34° 56' 40.92"	W118° 09' 12.78"
C	EDG#2 EXHAUST 1	N34° 56' 40.80"	W118° 09' 12.42"
D	EDG#2 EXHAUST 2	N34° 56' 43.80"	W118° 09' 12.39"
E	EDG#3 EXHAUST 1	N34° 56' 40.39"	W118° 09' 12.03"
F	EDG#3 EXHAUST 2	N34° 56' 40.15"	W118° 09' 11.88"
G	DIESEL FIRE PUMP EXHAUST	N34° 56' 39.86"	W118° 09' 13.28"

HYDROSTOR
WILLOW ROCK ENERGY STORAGE CENTER

HYDROSTOR
Kiewit

PLOT PLAN
OPERATIONS PHASE - WITHOUT BERM

20345352-PP-004

KEY MAP

REFERENCE(S)

1. WRESC SITE RENDERING - KIEWIT 2024
2. COORDINATE SYSTEM: NAD 1983 STATEPLANE CALIFORNIA V FIPS 0405 FEET
3. MAP SERVICE LAYER CREDITS: SOURCES: ESRI, HERE, GARMIN, INTERMAP, INCREMENT P CORP., GEBCO, USGS, FAO, NPS, NRCAN, GEOBASE, IGN, KADASTER NL, ORDNANCE SURVEY, ESRI JAPAN, METI, ESRI CHINA (HONG KONG), (C) OPENSTREETMAP CONTRIBUTORS, AND THE GIS USER COMMUNITY

CLIENT
GEM A-CAES LLC

PROJECT
WILLOW ROCK ENERGY STORAGE CENTER
SUPPLEMENTAL AFC

TITLE
WRESC PLOT PLAN – OPERATIONS PHASE

CONSULTANT
wsp

YYYY-MM-DD	2024-02-22
DESIGNED	MK
PREPARED	MK
REVIEWED	SCH
APPROVED	VG/LL

PROJECT NO.	CONTROL	REV.	FIGURE
31406639.003	01	0	2-4

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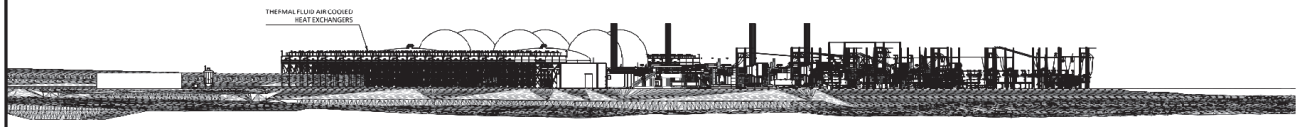

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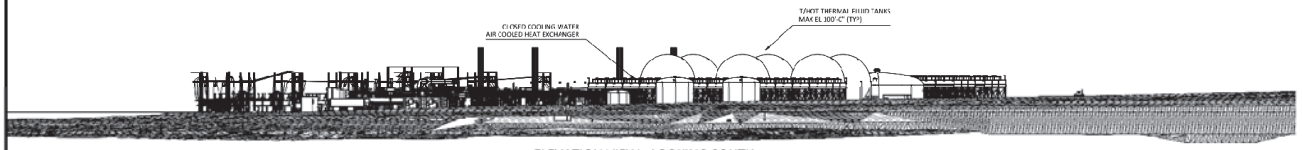

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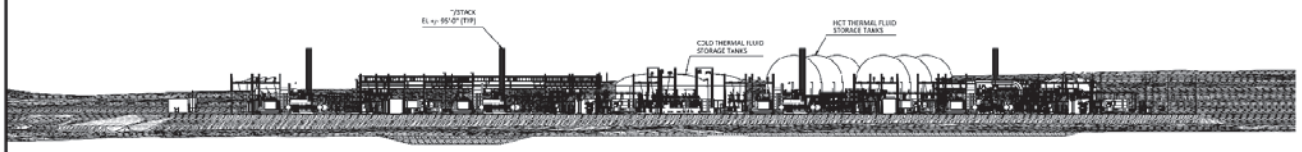
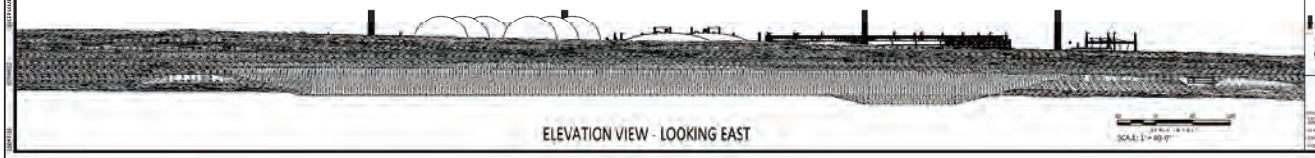


ELEVATION VIEW - LOOKING WEST

- PRELIMINARY -
NOT FOR CONSTRUCTION



ELEVATION VIEW - LOOKING EAST

SCALE: 1" = 60'-0"

0	ISSUED FOR AFC		
REV	DESCRIPTION	CHECKED BY	DATE

HYDROSTOR
WILLOW ROCK ENERGY STORAGE CENTER

HYDROSTOR
Kiewit

ELEVATION VIEWS
OPERATIONS PHASE - WITH BERM

20045352-EL-001

KEY MAP

REFERENCE(S)

1. WRESC SITE RENDERING - KIEWIT 2024
2. COORDINATE SYSTEM: NAD 1983 STATEPLANE CALIFORNIA V FIPS 0405 FEET
3. MAP SERVICE LAYER CREDITS: SOURCES: ESRI, HERE, GARMIN, INTERMAP, INCREMENT P CORP., GEBCO, USGS, FAO, NPS, NRCAN, GEOBASE, IGN, KADASTER NL, ORDNANCE SURVEY, ESRI JAPAN, METI, ESRI CHINA (HONG KONG), (C) OPENSTREETMAP CONTRIBUTORS, AND THE GIS USER COMMUNITY

CLIENT
GEM A-CAES LLC

PROJECT
WILLOW ROCK ENERGY STORAGE CENTER
SUPPLEMENTAL AFC

TITLE
WRESC SITE ELEVATION PROFILE - WITH ARCHITECTURAL BERM OPTION

CONSULTANT

wsp

YYYY-MM-DD	2024-02-22
DESIGNED	MK
PREPARED	MK
REVIEWED	SCH
APPROVED	VG/LL

PROJECT NO.	CONTROL	REV.	FIGURE
31406639.003	01	0	2-5

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM ANSI B

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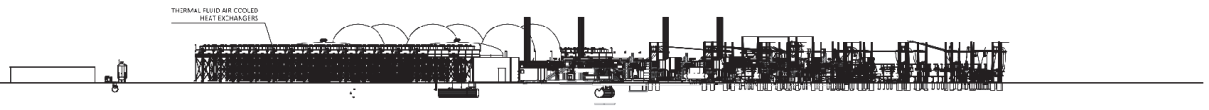
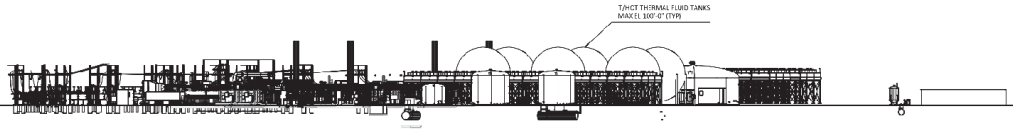


ELEVATION VIEW - LOOKING NORTH



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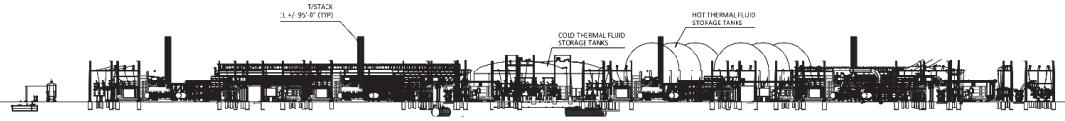


ELEVATION VIEW - LOOKING WEST

- PRELIMINARY -
NOT FOR CONSTRUCTION

ELEVATION VIEW - LOOKING EAST

HYDROSTOR
WILLOW ROCK ENERGY STORAGE CENTER

HYDROSTOR
Kiewit

ELEVATION VIEWS
OPERATIONS PHASE - WITH-OUT BERM

30045352-EL-002

KEY MAP

REFERENCE(S)

1. WRESC SITE RENDERING - KIEWIT 2024
2. COORDINATE SYSTEM: NAD 1983 STATEPLANE CALIFORNIA V FIPS 0405 FEET
3. MAP SERVICE LAYER CREDITS: SOURCES: ESRI, HERE, GARMIN, INTERMAP, INCREMENT P CORP., GEBCO, USGS, FAO, NPS, NRCAN, GEOBASE, IGN, KADASTER NL, ORDNANCE SURVEY, ESRI JAPAN, METI, ESRI CHINA (HONG KONG), (C) OPENSTREETMAP CONTRIBUTORS, AND THE GIS USER COMMUNITY

CLIENT
GEM A-CAES LLC

PROJECT
WILLOW ROCK ENERGY STORAGE CENTER
SUPPLEMENTAL AFC

TITLE
WRESC SITE ELEVATION PROFILE – NO ARCHITECTURAL BERM OPTION

CONSULTANT

wsp

YYYY-MM-DD	2024-02-22
DESIGNED	MK
PREPARED	MK
REVIEWED	SCH
APPROVED	VG/LL

PROJECT NO.	CONTROL	REV.	FIGURE
31406639.003	01	0	2-6

2.1.2 Process Description

Hydrostor's proprietary A-CAES technology is a low-cost, bulk-scale energy storage solution. It provides long-duration, emission-free storage that can be sited where the electricity grid requires long-duration storage, providing multi-hundred MW of generation capacity and a suite of ancillary services with an estimated 30-year service life for major equipment and an estimated 50-year service life for the cavern. This is enabled by combining industry-proven technologies with two key innovations: the use of hydrostatically compensated air storage caverns and a proprietary water-based thermal management system.

The system stores compressed air in a purpose-built underground storage cavern, analogous to those used worldwide for hydrocarbon storage. The storage cavern is filled with water through a hydraulic conduit from a water storage compensation reservoir at the ground surface level. The weight of the water in this compensation reservoir maintains a near-constant air pressure in the cavern throughout both the charging and discharging cycles, supporting efficient operation, and significantly reducing the cavern volume requirements.

The water-based thermal management system captures the heat developed during air compression, stores it, and re-uses it when generating electricity, making the process nearly adiabatic. This increases the system's efficiency and eliminates the need for burning fossil fuels.

When the Hydrostor A-CAES system is charging (known as the "charge cycle"), off-peak energy or surplus electricity (such as excess solar that might otherwise be curtailed when production exceeds demand) from the grid is used to drive air compressors, converting the electrical energy into potential energy in the compressed air and heat energy stored by the thermal energy management system. At multiple points in the compression process, the heat generated during air compression is transferred to boiler-grade water as the only thermal water by a set of heat exchangers and is stored separately for later use during the discharge cycle.

The air stream exits the compression process at the same pressure as that maintained in the air storage cavern which is governed by the vertical distance between the cavern and the connected hydrostatic compensation reservoir located at the surface. As air is charged into the storage cavern, water is displaced up the hydraulic conduit and into the surface reservoir. This maintains near-constant air pressure within the cavern and stores substantial potential energy in the elevated water. Once in the cavern, the air can be stored until electricity is required.

To generate electricity (known as the "discharge cycle"), compressed air is discharged from the cavern, which allows the compensation water to flow back into the cavern. Similar to the charge cycle, the compensation water from the reservoir maintains near-constant air pressure in the cavern during discharging. The cool high-pressure air exiting the cavern is reheated using the heat stored by the thermal management system and the same set of heat exchangers that were initially used to extract it. The reheated compressed air is then used to drive air-expansion turbine generators, which efficiently convert the stored potential energy back into electricity for the grid.

This energy storage system uses non-toxic materials and does not use fossil fuels as part of the energy storage process. The process combines proven, off-the-shelf technologies (air compressors, water-based thermal storage and turbine generators) and the underground storage cavern design, all with a track record of successful performance in other industries/applications.[3] **Table 2-5** summarizes the main process.

[3] A video summarizing Hydrostor's technology can be found at the following link: https://www.youtube.com/watch?v=cN39gCh9PWg.

Table 2-5: Energy Storage Process Steps

STEP 1 Air Compression Using Electricity	STEP 2 Heat Capture in a Thermal Management System	STEP 3 Compressed Air Storage	STEP 4 Compressed Air Conversion to Electricity
Off-peak or surplus electricity from the grid is used to operate air compressors that produce high-pressure heated compressed air.	Heat is extracted from the compressed air and stored in a proprietary thermal management system. This nearly adiabatic process increases overall cycle efficiency and eliminates the subsequent need for burning fossil fuels.	Air is stored in a purpose-built storage cavern, where hydrostatic compensation is used to maintain the system at near-constant air pressure during operation.	Hydrostatic pressure forces air back to the surface, where it is recombined with the stored heat and expanded through turbine generators to generate electricity on demand.

The WRESC heat and mass balance block flow diagrams are shown in Appendix 2C, Heat and Mass Balance Diagrams (confidential). These balances are based on the mean weather conditions at the nearest ASHRAE weather station (Fox Field, Lancaster) using the 95th percentile dry bulb temperature and associated relative humidity for the charging cycle.

The actual net electrical output of the system will vary in response to ambient air temperature conditions, electrical grid operating requirements such as voltage or volt ampere reactive (VAR) support and other operating factors. Operational modes will be driven by good operating practices, market conditions, and grid dispatch requirements.

As a long-duration energy storage asset, the WRESC will be able to provide power during periods of increased need on the grid such as times of high electrical load, periods when intermittent renewable source generation fluctuates, when baseload plants are not operating or are being brought online, or during grid emergency conditions and/or local reliability needs. To maximize efficiency, the facility is expected to charge during times of low demand on the grid such as times of low electrical load and during periods when renewable source generation is higher than the instantaneous system demand, thus affording the ability to store excess renewable generation that might otherwise be lost.

2.1.3 Facility Operational Modes

Hydrostor's facility is an electrical energy storage technology with unique operating characteristics that must be considered across its operating states (charge, discharge, standby).

Based on 95% availability, the facility will be designed to operate:

- Up to 13.5 hours per day and 4960 hours per year in charging mode at a total capacity of 500 MW (plus 213 hours at 75% or less).
- Up to 8 hours per day and 2976 hours per year in discharging mode at a total capacity of 500 MW (plus 128 hours at 75% or less).
- A minimum of 372 hours in standby mode.

2.1.4 Energy Storage Facility Charge Mode Cycle

The facility is designed for 520 MW gross rated capacity on both charge and discharge with an 8-hour discharge duration at full rated capacity. The facility will be designed to achieve an average round trip efficiency of 55 to 60 percent. This means that the facility will return 55 to 60 percent of the electric energy used to complete the storage cycle as useful power output during the discharge cycle and that a complete charge of the cavern will require about 13.5 hours at full rated capacity (8 hours divided by 60 percent RTE).

The frequency of charging the system is dependent on the electrical grid operator's requirement to discharge the system. The system could be charged, or partially charged, daily. It could feasibly remain charged for long durations before discharging, but the hot water stored in the spherical tanks must be maintained by electrical heaters for very long standby periods (exceeding a few days).

When electricity from the electrical grid is available, the system will enter charge mode. While charging, electricity is drawn from the electrical grid to operate multi-stage, electrically driven air compressors. Air at atmospheric pressure and ambient temperature is compressed to cavern storage pressure. The cavern storage pressure is expected to be 870 to 1,100 pounds per square inch gauge (psig) across three sequential pressure sections of compression, low pressure, intermediate pressure, and high pressure (LP, IP, and HP, respectively), to allow storage in an underground hydrostatically compensated rock cavern with a floor depth of approximately 2,000 to 2,500 feet below ground surface (bgs).

As the compressed air enters the storage cavern, the air pressure will overcome the hydrostatic head of the compensation water system, forcing an equivalent volume of water out of the cavern and up the compensation shaft (water conduit), increasing the water level of the surface reservoir.

The hot air exiting each section of compression is cooled using boiler-grade water in the LP, IP, and HP heat exchangers. The water exits each heat exchanger and combines into a common stream. The heated water (water) flows to the hot-water spherical tanks, where it is stored at its vapor pressure to avoid vaporization. This is achieved through a system of self-pressurization whereby water vapor generated inside the tank acts as the head gas to maintain positive pressure.

2.1.5 Energy Storage Facility Generation/Discharge Mode

When the plant is sufficiently charged and is called to operate as a power generation facility, a discharge cycle will commence. A grid signal will initiate the operation of the appropriate electrical breakers and transformers, heat exchangers, and balance-of-plant equipment and begin operation of the turbine generators. With the air flowing from the storage cavern, the turbine generators will start receiving reheated high-pressure air, which will allow the turbine generators to ramp up to "sync-idle" speed, whereupon they can be electrically synchronized to the grid. Thereafter the turbine generators will begin loading (increasing electrical output) until they reach the required plant electrical output.

While discharging, the high-pressure air from the cavern will pass through three turbine sections (HP, IP, and LP) to expand the gas from cavern pressure down to atmospheric pressure. The power produced by the turbine will drive a synchronous electrical generator. The turbine stages are pressure-grouped into the same number of pressure sections as the compressors, and, just as in the case with the compressor, air will flow though the turbine sections sequentially. As the air exits the cavern, the surface water reservoir level will decrease and the compensation water level will increase in the cavern, maintaining a near-constant cavern pressure throughout discharge.

For the discharge cycle, the same heat exchangers (LP, IP, and HP) that were used to remove heat-of-compression for storage will be used, but in reverse, using the stored hot water to increase the temperature of the air before each expansion through each turbine section. This is necessary to avoid low temperatures and liquid condensation from the air as it is expanded and naturally cooled through the turbine's blade path. As the water passes through the heat exchangers, it will be cooled by the air, but will not reach a low enough temperature for the next charge cycle. Accordingly, a secondary cooling system is used to reduce the water temperature as required.

2.1.6 Energy Storage Facility Standby/Idle Mode

When the plant is not actively charging or discharging, it will be maintained in standby/idle mode. Standby/idle mode may occur either at the end of a charge cycle (e.g., the plant is ready and waiting to be called to operate as a power generator) or can occur at the end of a discharge cycle (e.g., the need for power generation has ceased and there is no immediate need to (re)charge the facility with potential energy (high-pressure air and hot water). The electrical power draw of the facility during standby/idle primarily consists of relatively small pumps, heaters, and coolers in various sections of the plant.

If the standby/idle mode follows a complete charge cycle, the stored air contained in the cavern will be at the maximum level and maintained at a high pressure by the hydrostatic compensation system, and the stored thermal energy (heat) will be maintained in the insulated hot-water spherical tanks, which are full. Both the motor-driven air compressors and the air-expansion turbine generators will be idle, with the lubricating oil systems heated and lubricating oil circulating through them to keep them warm and ready to start, slow-speed turning gears operating if required, and with the generators or motors internally heated to keep them at an optimum temperature.

If the standby/idle mode follows a full discharge cycle the stored air contained in the cavern will be at the minimum level and the cavern will be mostly filled with compensation water, leaving the water level in the surface-level compensation reservoir at its minimum level, while the remaining air in the cavern stays at constant hydrostatic pressure. Very little water will remain in the hot-water spherical tanks, and the cooled water will be held in the cold thermal storage tank. Both the motor-driven air compression equipment and the air-expansion turbine generators will be idle, with heated lubricating oil circulating, and motor and generator heaters maintaining them at optimum temperatures, all to keep them ready to start. With the hot-water storage tanks are holding a low level of liquid, the temperature will reduce quickly due to the small amount of water in the tank.

Therefore, supplementary heating via tank immersion heaters will be initiated to counteract any temperature and pressure drops.

In very exceptional circumstances (e.g., a complete plant shutdown for major maintenance), the complete plant could be in a wholly de-pressurized, and potentially a wholly cooled state, with potentially all piping and tanks in a de-watered state (except for the cavern and the compensation reservoir), and all turbomachines allowed to cool as major work is conducted.

2.1.7 Energy Storage Air Compression Equipment Drivetrain

There WRESC will include four air compression drivetrains in the system, one LP compressor, and one IP/HP compressor for each nominal 130 MW gross train, totaling a nominal 520 MW gross load during charge mode.

The compression/charge portion of the basic facility design will consist of a two-part compression drivetrain, each part using a dedicated electrical motor. The basic framework for the charge/compression equipment consists of:

- **LP compressor:** A dedicated LP compressor drawing filtered ambient air, driven by a synchronous electrical motor, with capacity flow and surge control managed by inlet flow mechanisms combined with discharge piping blow-off valves. Filtration and moisture knockout provisions are fitted as required. A non-return valve will be fitted in the LP compressor discharge to prevent air backflow.

The “low-pressure” air discharge from the LP compressor, after being cooled by the downstream heat exchanger, will then be piped to the inlet of the IP/HP compressor, as described below.

- **IP/HP compressor:** A separate compressor with a combined IP compressor and HP compressor, all driven by a single, separate, synchronous electrical motor. Cooled and filtered inlet air for both pressure groups in this combined compressor will be delivered from the upstream air-to-water heat exchanger.

The high-pressure discharge from the HP compressor section will be directed to a final air-to-water heat exchanger and the resulting cooled air will thereafter be directed to the air storage cavern at near-constant pressure. All compressors will utilize heavy process-industry quality synchronous motors with brushless excitation. Each compressor will be fitted with a dedicated lubricating/control oil system, dedicated synchronous motor controllers, and protective relaying. The compressor surge controller will be integrated to monitor and manage the compressors.

2.1.8 Energy Storage Air-Expansion Turbine Generators

The WRESC system will include four air-expansion turbine generators. There will be one turbine and one generator for each 130 MW (gross) train for a plant-wide total of 520 MW (gross).

All turbine generators will be single-casing axial-bladed machines with multiple air inlets and outlets, driving a synchronous generator, and will be complete with power-generation-industry-quality speed/load controls,

generator-protective relaying, voltage regulators, and synchronizing equipment. Each unit will have a dedicated lubricating/control oil system, a dedicated turbine and generator control, and protection systems.

Each air-expansion turbine will consist of three sections or pressure groups. The high-pressure air (produced from the charge cycle) that has been stored in the underground cavern will be utilized to power the turbine. The discharge air will first be piped to the first HP set of heat exchangers where it will be heated, using the hot water from the hot-water (spherical) tanks. The heated air will be used to power the HP heated turbine sections.

After the HP turbine section, the exiting air will have cooled due to the expansion process and will be routed to the IP heat exchangers, where it will be reheated using the hot water. After the IP turbine section, the cooled air will be routed to the LP heat exchangers. This reheated air will be admitted to the low-pressure expansion section of the turbine machine, after which it will exit to the atmosphere via an exhaust stack.

2.1.9 Thermal Management System

The thermal management system will consist of water, main process heat exchangers, fin fan coolers, and both hot and cold thermal storage tanks. During charging, the system will use water to extract heat from the air in the compression process. This heated water will be stored separately in a dense and insulated environment. During discharging, the heat from the heated water will be re-injected back into the air during the expansion process on discharge. The thermal management system is key to an adiabatic and fuel/emission-free process.

The water management system is a closed system whereby the water will be passed between the hot- and cold-water storage tanks during the charge and discharge cycles (as described above). The stored volume within each of the tanks will fluctuate as part of normal operations. Make-up water for the thermal management system will be taken from the reservoir or the Antelope Valley East Kern (AVEK) water supply line and treated before it is sent to the cold-water tank.

Cold water will be stored outdoors in two cylindrical tanks (approximately 150 feet in diameter by 60 feet high). The cold-water tanks will be fitted with a nitrogen blanketing system, operated at low pressure, to prevent air ingress and oxygenation of the treated water.

Hot water will be stored outdoors in up to six spherical storage tanks, each with a diameter of approximately 87.5 feet and a maximum estimated height of up to 100 feet, including appurtenances. The head gas in the hot-water tanks is steam in liquid-vapor equilibrium with the stored water.

The hot-water tanks will be outfitted with immersion fluid electrical heaters that will counteract any thermal losses. Each tank will be insulated for heat conservation.

The LP, IP, and HP heat exchangers will be designed to both heat the air on discharge and cool the air on charge. They are standard industrial shell and tube heat exchangers and will be insulated to retain heat on standby periods. **Table 2-6** summarizes the number of shells of the heat exchangers per 130 MW gross train.

Table 2-6: Heat Exchangers [a]

Stage	Low Pressure	Intermediate Pressure	High Pressure
Type	Shell and Tube	Shell and Tube	Shell and Tube
Number of Shells	3 per train (12 total)	2 per train (8 total)	2 per train (8 total)

[a] Refer to Appendix 2B, Construction Schedule for the heat balances

2.1.10 Hydrostatically Compensating Surface Reservoir

An approximately 575-acre-foot surface reservoir will be excavated and constructed predominantly in cut (below finished grade) using earthen berms approximately 6 feet high. The reservoir will cover a surface area of approximately 21.5 acres and have an average depth of approximately 45 feet. The berms will be constructed from a combination of excavated soil and excavated rock from underground storage cavern construction. Each berm will have an approximate height of up to 6 feet from the exterior toe to the berm's top. The water level in the

reservoir will fluctuate as to maintain constant underground air storage pressure and be designed to operate with a minimum freeboard of approximately 4 feet at full state of charge. The surface reservoir will be equipped with an engineered liner on the bottom (to prevent percolation and possible comingling with groundwater) and a floating cover consisting of interlocking shapes to minimize evaporative water loss.

Because of the height of the berms and the quantity of water stored between the maximum water elevation and the outside toe of the berm, the reservoir is not expected to be subject to California Division of Safety of Dams jurisdiction.

2.1.11 Underground Storage Infrastructure (Cavern and Shafts)

The A-CAES facility will utilize underground storage infrastructure consisting of one underground manmade cavern for the storage of compressed air and compressed air as well as manmade shafts for conveyance of air and water between the cavern and topside facility.

The storage cavern will be constructed in the bedrock below the WRESC Site targeting a depth of approximately 2,000 to 2,500 feet bgs. Initial access to the cavern depth ("cavern access") for mobilization of the construction equipment and crews will be accomplished by one of two methods:

1. Construction of a large-diameter conventionally sunk shaft, or
2. Construction of several rotary drilled (blind bore) shafts.

The preferred cavern access approach is still being finalized, so both options have been shown on the plot plan to date. Regardless of the cavern access technique employed, cavern excavation will be accomplished using the same mining approach and techniques. The cavern construction requirements associated with each of these approaches are described below.

Cavern Access

To access the cavern during construction, a combination of conventionally sunk shafts and/or rotary drilled shafts will be constructed on a 24-hour-per-day, 7-day-per-week basis.

Conventionally Sunk Shaft

If a conventionally sunk shaft is used for cavern construction access, a concrete-lined shaft with 24 feet inside diameter will be constructed and equipped with a double-drum hoist, service hoist, dual ventilation ducts, and utilities to support cavern construction. For construction of this shaft, controlled detonations will occur from the top of bedrock surface (approximately 50 to 100 feet bgs) until the cavern construction horizon (2,000 to 2,500 feet bgs) is reached. The controlled detonation associated with shaft construction will increase in depth and decrease in frequency as the shaft is advanced from the surface down to the cavern construction depth. The amount and frequency of controlled detonations will depend on rock properties, but an average of one or two controlled detonations per day are anticipated. Each detonation would last less than a few seconds.

It is expected that the rate of conventional shaft sinking will be around of 5 to 8 feet/day, with an overall shaft construction duration of about 12 to 14 months, including pre-grouting of the overburden. Deeper grouting of the broken bedrock zones will be performed from within the shaft as a step in the sinking cycle if and when necessary.

Once completed, this 24-foot shaft will be sufficient for supporting the hauling, ventilation, and equipment/ personnel all in one shaft.

Rotary Drilled Shafts

If rotary drilled shafts are used for construction access, it is expected that 5- by 8-foot-diameter shafts will be constructed to support the proposed operations. No controlled detonation will be done at the surface or during the drilling phase of the cavern construction if this approach is utilized. Of the five shafts that are constructed, one will be used for equipment and personnel access, two will be used for material movement (rock hauling), and two will be used for ventilation. To construct these shafts, a lined drill cuttings pond will be required that will hold up to approximately three times the shaft volume in water to support the boring operations. Once complete, the pond will be emptied and backfilled. The drilling water will be used for reservoir fill or disposed offsite by a licensed

hauler.Liner material from the drill pond will be removed or perforated, and surplus muck will be spread on top of the settled drill cuttings to completely backfill the pond excavation.

A-CAES Process Shafts

Two types of flow conduits connected to the cavern will be necessary to operate the A-CAES facility: one for the conveyance of air and another for water. It is expected that up to two shafts will be constructed for water conduits, and up to four shafts will be constructed as air conduits. It is possible that fewer shafts will be constructed, but a conservative case is being assumed for this AFC.

If rotary drilled shafts are used for cavern access, two of the cavern access shafts are expected to be repurposed for use as the water shafts for A-CAES operation upon completion of construction. In this case, only the four air wells would need to be constructed. If a conventionally sunk shaft is utilized for cavern construction access, then all six shafts will need to be drilled.

Similar to the rotary drilled cavern access shafts, a drill cuttings pond will be required for the delivery of the A-CAES process shafts. This pond will be sized so that it holds up to approximately three times the shaft volume in water to support the boring operations. Once complete, surplus water will be pumped into the water reservoir, liner material from the drill pond will be removed or perforated, and surplus rock will be spread on top of the settled drill cuttings to completely backfill the pond excavation.

Water Shaft

One large-diameter blind bore or conventionally sunk shaft, approximately 8 feet (blind bore) to 24 feet (conventional) in diameter, will be constructed for use as water conduit during A-CAES operations. Depending on the cavern access used, the shaft either will be a converted construction shaft (for blind bore access) or will be purposely constructed (for conventionally sunk access). The water shaft will be used to convey compensation water between the cavern and topside compensation reservoir during A-CAES operations. The water shaft will be lined and cemented in place to provide formation isolation. The lower end of the water shaft will extend into a sump below the cavern floor to ensure that a water seal will be maintained at all times during operation.

Air Shaft

Up to two blind-bored air shafts, approximately 4 feet in diameter, will be constructed during the cavern construction for use as air shafts during A-CAES operations. The air shaft will be lined and cemented in place for formation isolation. These air shafts will be used to convey compressed air between the cavern and topside process trains during A-CAES operations. The lower end of the air shaft will be located at a high point in the roof of the cavern, such that it is never submerged during operation.

Cavern Excavation

The cavern will be constructed by conventional mining methods including drilling and controlled detonation. The cavern layout will be designed to have a room and pillar or parallel gallery layout. The size and shape of excavated openings will depend on the strength of the host rock and will be finalized during detailed engineering. The size and shape selection of the excavated openings does not materially influence the overall volume of the cavern or rock excavated.

After completion of the cavern access shaft(s), cavern excavation will begin using a combination of conventional controlled detonation methods and physical/mechanical excavation. Cavern excavation will continue on a 24-hour-per-day, 7-day-per-week basis until excavation is complete. The following are the typical steps included in the normal full-scale mining cycle:

1. A jumbo face-drill drills holes into the working face on a predetermined pattern and to a predetermined depth.
2. The drilled holes are loaded with explosives and the charges are set off to break the rock into muck (broken rock).
3. Load-haul-dump vehicles load the muck and haul it from the working face to the production shaft, where it is dumped into the loading pocket and hoisted to the surface.

4. The roof and sidewalls are scaled to remove any loose hanging rock.
5. Rock bolting machines install appropriate ground support (typically rock bolts and wire mesh) for the newly exposed roof and sidewalls.
6. The centerline and drill pattern are marked on the new working face by surveyors and the cycle is repeated.

During underground construction, twice-daily controlled detonation episodes of a few seconds duration each will occur at the beginning of each shift. Controlled detonation is NOT continuous throughout the day and will occur on a regular scheduled approximately 10- to 12-hour intervals. During full-scale cavern excavation, explosives will be placed in closely spaced locations and detonated remotely. Early in the cavern excavation process, personnel will clear the underground area and remain aboveground during the detonation sequence. Once the cavern is large enough, personnel will remain underground during the detonation sequence.

For gallery construction, a top heading will be initially driven, and roof support will be installed as the excavation advances. One or more successive benches will then be excavated to develop the cavern opening to full height. Waste muck will be crushed underground and brought to the surface via a shaft skip. The cavern floors will be graded to drain toward water sump and shaft. Where geology and ground conditions permit, roofs will be sloped up to naturally vent into the air shaft and avoid the possibility of trapped air pockets. Most caverns are completed with unlined, bare rock surfaces, though some are lined with a thin layer of shotcrete for worker safety and geotechnical integrity. Grouting may also be used, if required, to seal large fractures that could permit water inflow. Upon completion of cavern excavation, the cavern will be commissioned into operations which will require the filling and sealing of the construction shafts that are not converted for use in A-CAES operations.

During operations, the cavern will be filled with water through a hydraulic conduit from the surface reservoir. The weight of the water in this surface reservoir will maintain a near-constant air pressure in the cavern throughout both the charging and discharging cycles. This approach supports efficient operations and significantly reduces the cavern volume requirements. The dimensions and design of the cavern are presented in **Table 2-7**.

Table 2-7: Cavern Design

Design Element	Value
Depth	Approximately 2,000 to 2,500 feet bgs
Pressure	870 to 1,100 psig
Volume	Approximately 900,000 cubic yards

bgs = below ground surface; psig = pounds per square inch gauge

2.1.12 Black Start Capability

The facility will not be designed to be black start capable (i.e. capable of starting up without an external utility power feed).

2.1.13 Major Electrical Equipment and Systems

The net electric power generated at the WRESC will be transmitted to the electrical grid at the point of interconnection. Transmission and auxiliary uses are discussed in the following subsections. The electric power required for charging the system will be drawn from the electrical grid with additional power for the auxiliaries. Refer to the preliminary single-line diagram provided in Chapter 3.0, Electric Transmission (Figure 3-3) depicting the onsite Willow Rock main substation, including applicable ratings of key equipment.

For metering of the import and export of power, a power quality meter suitable for revenue metering of MWh and megavolt ampere reactive-hours will be located at the SCE Whirlwind Substation. The power revenue metering will be constructed according to SCE standards.

A power management system will interface with SCE to coordinate power export/import quality and voltage regulation.

2.1.13.1 Generators and Motors

Turbine Generators

Generators will generate at medium voltage (13.8 kV). This power will be transformed via unit transformers to 230 kV for the electrical grid connection.

Generators are preliminarily rated 150 megavolt amperes (MVA) at 0.9 to 0.95 power factor to supply 130 MW gross and 125 MW net to the electrical grid at the point of interconnection. This allows maximum turndown (reduction in total overall output) of plant, whereby a single generator can operate while other generators are offline for maintenance.

Synchronous Motors for Compression Train

Full charging capacity requires eight synchronous motors running to supply the four air compressor trains. The power to the synchronous motors will be supplied via unit transformers.

The synchronous motors will normally run at unity or a slightly leading power factor in order to mitigate the VAR import requirements of induction motors within the auxiliary power system.

The synchronous motors will be started using a variable frequency drive (VFD) soft start system. One soft start unit will be utilized for each of the four sets of motors (one two-motor set per compressor power train) if required.

2.1.13.2 Alternating Current Power—Transmission

Power will be generated by the four generators at 13.8 kV and transformed to 230 kV for the grid interconnection. 230/13.8 kV main transformers in each train support connection to the local 230 kV network at the SCE Whirlwind Substation. For motor operation, four additional 230/13.8 kV unit transformers provide back-feed power to the compressor motors. Surge arrestors at the point of interconnection would protect the system from disturbances in the 230 kV system caused by lightning strikes or other system disruptions.

The transformers will be set on concrete foundations, and the design will include a secondary oil containment reservoir to contain the transformer oil in the event of a leak or spill. There will be differential protection on transformers rated 5 MVA and greater. The 230/13.8 kV transformer will be connected to a single-circuit three-phase 230 kV line, which will be connected to the Whirlwind Substation via an approximately 19-mile predominantly overhead gen-tie line. A detailed discussion of the electric transmission system is provided in Chapter 3, Electric Transmission.

2.1.13.3 Alternating Current Power—Distribution to Auxiliaries

The distribution voltages for plant auxiliary systems and lighting will include: 4.16 kV, 480 V, and 208/120 V.

Auxiliary power supplies for instruments will be 24 volts direct current (VDC); however, in the even that increased power consumption is required, 120 volts alternating current (VAC) will be used.

2.1.13.4 Direct Current Power Supply System

Turbine/generator and compressor/motor auxiliaries will be supplied by 125 VDC.

Process control systems (PCS) will be supplied from 24 VDC power supply modules within system cabinets. Control power for the switchgear will be 12 VDC supplied from a dedicated direct current (DC) battery system.

The 125 VDC battery system will be independent of the 120 VAC uninterruptible power supply (UPS) battery system. All DC systems will have 8-hour battery duration.

The system will be designed to provide continuous rated power in the event of main power failure. The DC systems will be located on the emergency generator bus. The DC systems' health will be monitored by the distributed control systems (DCS).

2.1.13.5 Uninterruptible Power Supply System

An independent UPS system will be dedicated to supply power to the following loads:

- Critical instruments, emergency lighting, and valves
- Control panel fans and other ancillaries
- DCS control racks, including programmable logic controllers (PLCs), flow computers, vibration monitoring system, etc.
- Telecommunications system
- Building cameras and security access system
- Smoke and building heat detector UPS systems include:
  - 20 kVA or less:
    - Input voltage: 208 volts (V)
    - Output voltage: 208 V
  - Greater than 30 kVA:
    - Input voltage: 480 V
    - Output voltage: 480 V

The system will be designed to provide continuous rated power in the event of main power failure. The UPS will be located on the emergency generator bus. The UPS and emergency generators health will be monitored by the DCS.

2.1.13.6 Emergency Power

Three diesel-fired self-contained 4.16 kV generators, up to approximately 2.5 MW each, will supply emergency power for all critical loads via double sided 5 kV emergency switchgear. These units will meet U.S. Environmental Protection Agency (USEPA) Tier 4 emissions standards and will normally operate only to facilitate maintenance and reliability testing for up to 50 hours per year. Only one unit will operate at a time to perform maintenance and reliability testing.

When needed for emergency power due to a loss of utility interconnection, the generators would activate and operate during the emergency period.

2.1.14 Water Supply and Use

The AVEK water agency currently owns and operates a 36-inch-diameter water supply line that is located adjacent to the WRESC Site approximately 300 feet east of the WRESC Site's boundary. AVEK will supply Willow Rock with the required water rates and quantities from a new dedicated tap into its water supply line at a location adjacent to the WRESC Site. A permanent 6-inch-diameter buried water pipeline will be installed onsite to deliver water from the AVEK main supply pipeline to the surface reservoir.

These sources will also provide water for filling the storage tank used for fire protection and service water. Appendix 2D, Water Balance Diagrams and Construction Water Use, provides water balance diagrams showing annual average and high temperature ambient operating conditions.

During plant operation, the expected water consumption from AVEK will be less than 2,000 gallons per day, as shown in the water balance. As the cooling and thermal storage systems operate in a closed loop, losses are minimal, and make-up water demand will be small. The reservoir volume is balanced by controlling evaporation with the floating cover, the inflow of annual precipitation, and condensed water from compressed air.

When the plant is operating in charging mode and the compressors are filling the cavern with compressed air, water is produced at the exit of each compression stage. This is caused by compressed air becoming saturated during compression and moisture in the air condensing in each post-cooling stage. The condensate must be removed from the system to avoid damage to the compressors and sent to the water reservoir and evaporative cooling system.

The water provided by AVEK during operations will mostly be used as a tap water source for offices, maintenance facilities, service water, fire system re-filling, and make-up water for cooling and thermal system water.

During construction and during the initial filling of the surface reservoir the WRESC will require approximately 1,400 acre-feet of water. Construction water requirements are discussed further in Section 5.15, Water Resources. Once the facility commences operation, it is expected to have an annualized surplus of approximately 3.6 acre-feet per year (on average) of non-potable recharge quality water to provide surface reservoir water make-up. Evaporative loss will be reduced by the use of a cover on the reservoir. Since there will be a seasonal variation associated with the production of water as well as evaporation losses, the reservoir will be designed with adequate freeboard to allow for seasonal fluctuations in water inventory.

2.1.14.1 Construction Water

An estimated 1,400 acre-feet of water (incorporating approximate 20 percent contingency) will be needed throughout the construction and startup period. Most of the water will be used for filling the hydrostatically compensating reservoir. Other uses include supporting construction of the cavern works (shaft drilling and cavern excavation), surface works (hydrotesting and general purpose washdown), and fire system testing. These are discussed briefly below. Refer to Appendix 2D, Water Balance Diagrams and Construction Water Use for the estimated water consumption required during construction by month.

Cavern Works

Construction of the cavern is estimated to require an estimated 252 acre-feet of water over the construction period. Uses include site preparation, air and shaft drilling, and excavation of the cavern. Refer to Appendix 2D, Water Balance Diagrams and Construction Water Use for the estimated water consumption required during construction by month. Water remaining in the drilling pond(s) after shaft sinking will be filtered, water quality tested and then either sent to the reservoir, or, if necessary based on test results, hauled offsite by an approved waste hauler.

Surface Works

The surface construction is expected to require approximately 47 acre-feet of water for several purposes over the 24-month period, including the following:

- General purpose (de-dusting roads, daily washdown, etc.)
- Tank and sphere hydrotest
- Piping and vessel hydrotest
- Fire system testing

Water used for hydrotesting will be reused for hydrotesting other systems, including the spheres, pipe circuits, and initial fill. A temporary pumping sub-system with screening and filtering capabilities will be utilized to re-use this water. After all testing, the volume of hydrotest water (losses at flange breaks, nozzle spray tests, etc.) will be screened and filtered to a suitable cleanliness level to supplement the initial fill volume of the cold thermal storage tanks and/or reservoir.

Surface workers are assumed to use 20 gallons of potable water per person per day during all stages of construction, including drinking and wash water.

Refer to Appendix 2D, Water Balance Diagrams and Construction Water Use for the estimated water consumption required for surface construction, by month.

Hydrostatically Compensating Surface Reservoir Fill

The roughly 600-acre-foot surface reservoir will require approximately 868 acre-feet of water for initial fill (accounting for evaporation losses during the filling period). The reservoir fill will require approximately 14 months, with monthly fill requirements as shown in Appendix 2D, Water Balance Diagrams and Construction Water Use. The required fill amount accounts for both precipitation and evaporation. After initial filling, the surface reservoir will be equipped with an interlocking shape floating cover estimated to be 90 percent effective in reducing evaporation. The estimated fill amount conservatively assumes no benefit from the cover.

2.1.14.2 Water and Wastewater Requirements

Demineralized water will be produced onsite and used as make-up water for the water-based thermal storage and closed-cooling medium loops. Appendix 2D includes water balance diagrams for annual average and high temperature conditions, respectively, as well as an estimated month-by-month water balance. Water requirements are further discussed in Section 5.15, Water Resources, subsection 5.15.1.5.

The evaporative cooling water is used intermittently during hot temperatures when the closed-cooling loops cannot meet the cooling objectives of the turbomachinery. The water for the evaporative cooling is expected to be sourced from the produced water at the air compressors such that the evaporative cooling does not require sourcing of additional water.

2.1.14.3 Water Quality

Section 5.15, Water Resources, includes a projection of the water quality based on available testing data.

2.1.14.4 Water Treatment

The AVEK supply water will be used for make-up to the plant water system, fire protection, and general needs such as equipment and surface washdown.

The thermal energy storage system and cooling system will be filled with demineralized water during commissioning. A temporary, portable demineralization system will be used to generate water for the first filling and commissioning. Make-up demineralized water will be produced during operations to cover minor losses in the system. The expected quality of demineralized water used for the first filling will have the following characteristics:

- Appearance: clear and colorless
- Odor: odorless
- Total dissolved solids maximum: < 1 part per million (ppm)
- Hardness: < 0.01 Deutsche Harte
- Oil and grease: none
- Conductivity at 25 degrees Celsius: < 0.5 micro Siemens per centimeter
- Chlorides: <0.5 ppm
- Iron: <0.005 ppm
- Copper: <0.01 ppm

2.1.14.5 Water Availability

AVEK will provide the required quantity and quality of water required by the project. GEM A-CAES LLC (GEM, the Applicant) has filed an application for water service with AVEK and is in the process of securing a water service agreement.

2.1.15 Waste Management

Waste management is the process whereby all wastes produced at Willow Rock will be properly collected, treated if necessary, and disposed of. Wastes include process wastewater, as well as nonhazardous waste (primarily excavated waste rock) and hazardous waste, both liquid and solid. Waste management is discussed below and in more detail in Section 5.14, Waste Management.

2.1.15.1 Wastewater and Stormwater Collection, Treatment, and Disposal

Wastewater and Septic Waste

Project wastewater will be diverted to the zero-discharge evaporation pond. The oil-free evaporation pond will be maintained, and the remaining "sludge" will be hauled offsite by an approved waste disposal company to an approved disposal facility. The water balance diagrams in Appendix 2D show the expected wastewater stream and flow rate under operating conditions.

The septic waste from the administration/control building will be handled by one of the two methods described below:

- Sanitary waste from the administration/control building will be directed to a nearby underground septic storage tank, pumped out periodically by truck, and trucked offsite to an approved disposal facility.
- Alternatively, the sanitary sewer system will consist of a lateral septic system containing a lateral line from the structure to a septic tank. From there, the waste will flow to the lateral system of pipes that allows the waste from the septic system to discharge via perforations in the lateral pipes.

Willow Rock will not have a practice of washing down any equipment with oily residues. Equipment that has oily residues will be cleaned with rags and sorbents, and appropriate cleaning solutions will be applied to the rags and sorbents.

After cleaning, the oily rags and sorbents will be properly stored, manifested, and disposed of by licensed disposal companies in the regulatory-required time frames.

Stormwater

Onsite stormwater flows generated within the WRESC Site boundary will be routed to an unlined stormwater pond and will not be discharged outside the WRESC Site. Plant area drains will be directed to oil-water separators. There will be at least one oil-water separator for the common plant areas, and one oil-water separator for each power block. Water from the oil-water separator sumps will be discharged to the waste drains sump and then to the lined evaporation pond. The separated oil will be periodically pumped out of the oil-water separators by truck and disposed of offsite by a licensed hauler.

A summary of the approach for offsite perimeter stormwater drainage is described below for the "without berm" and "with berm" options.

Option 1 – Without Berm

Offsite flows will be diverted via proposed ditches along the north and west side of the WRESC Site to route them to where they are currently flowing. The flows conveyed by the west ditch will discharge stormwater south and then to the ditch along Dawn Road. The flows conveyed by the north ditch will discharge stormwater to the east to the ditch along the Sierra Highway. These ditches will be sized to carry, at a minimum, the 100-year discharge calculated using TR55 SCS Unit Hydrograph methodology.

Onsite flows generated by the WRESC Site will not be discharged outside the WRESC Site Boundary. All the WRESC Site stormwater will be conveyed via sheet flow and system flow (catch basins, swales, and stormwater conveyance piping) to a proposed, unlined stormwater pond on the southeast corner of the WRESC Site.

Option 2 - With Berm

Offsite flows will be diverted via proposed ditches along the north and west side of the architectural berm and route them to where they are currently flowing. The flows conveyed by the west ditch will discharge stormwater south and then to the ditch along Dawn Road. The flows conveyed by the north ditch will discharge stormwater to the east to the ditch along the Sierra Highway. These ditches will be sized to carry at a minimum the 100-year discharge calculated using TR55 SCS Unit Hydrograph methodology.

Rainwater that falls on the north and west sides of the architectural berm will flow to the proposed ditches along the north and west side of the architectural berm described above. Rainwater that falls on the south and east side

of the architectural berm will be directed south and east via ditches on the north and west boundaries of the WRESC Site and flow towards the Dawn Road and Sierra Highway ditches, respectively.

Onsite flows generated by the WRESC Site will not be discharged outside the WRESC Site. All the WRESC Site stormwater will be conveyed via sheet flow and system flow (catch basins, swales, and stormwater conveyance piping) to a proposed, unlined stormwater pond on the southeast corner of the site.

Excavation Waste

The WRESC will produce excavated material associated with typical mining techniques to create the underground compressed air storage cavern. Excavation waste generally includes soil and rock. The cavern has an equivalent volume of excavated material of approximately 1.3 million cubic yards based on an expected swell by a factor of 1.4. The swell factor accommodates the volumetric expansion from solid rock at depth to crushed rock at the surface. Waste management is discussed further in Section 5.14, Waste Management.

Based on preliminary engineering and environmental planning, the Applicant is considering options for adaptive re-use of the cavern rock onsite within the project boundaries or hauled offsite to up to four independent third parties. To plan conservatively, the project analyses assume that cavern rock will be fully reused in four options: up to 100 percent reused onsite as an architectural berm, up to 100 percent hauled offsite to the Robertson's Ready Mix in Los Angeles County, up to 100 percent hauled offsite to the Holliday Rock facility in Kern County, , and/or up to 100 percent hauled offsite to the Vulcan Materials Inc. processing facility in Los Angeles County. At the time of filing, commercial agreements are underway with the private off-takers, and design of an onsite architectural rock berm is being advanced through engineering.

All of the offsite third-party off-takers have expressed interest in potentially reusing the rock material for commercial purposes. Each potential off-taker has the appropriate permits in place to import material from third parties.

In lieu of hauling the excavated rock offsite, another option is to re-use the material within the project boundaries as an architectural berm. The specific design of the feature is to be determined through final engineering.

2.1.15.2 Solid Nonhazardous Waste

The WRESC will produce nonhazardous waste related to construction, operation, and maintenance that is typical of power generation and energy storage operations. Surface construction wastes will generally include soil, scrap wood, excess concrete, empty containers, scrap metal, insulation, and sanitary waste. Cavern construction wastes will include some of the same materials, as well as explosives packaging.

Facility waste during operation will includes oily rags, scrap metal and plastic, insulation material, defective or broken electrical materials, empty containers, and other solid wastes, including the typical refuse generated by workers. Solid waste will be trucked offsite for recycling or disposal. Waste management is discussed further in Section 5.14, Waste Management.

2.1.15.3 Hazardous Wastes

Several methods will be used to properly manage and dispose of hazardous wastes generated by the project. Waste lubricating oil will be recovered and recycled by a waste oil recycling contractor. Spent lubrication oil filters will either be recycled or disposed of in a Class I landfill. Workers will be trained to handle hazardous wastes generated at the WRESC Site. Chemical cleaning wastes will be temporarily stored onsite in portable tanks or sumps and disposed of offsite by an appropriate contractor in accordance with applicable regulatory requirements.

Hazardous materials management is further discussed in Section 5.5, Hazardous Materials Handling.

2.1.16 Management of Hazardous Materials

A variety of chemicals will be stored, handled, and used during the construction and operation of Willow Rock, following applicable LORS. Chemicals will be stored in appropriate chemical storage facilities. Bulk chemicals will be stored in storage tanks, and most other chemicals will be stored in returnable delivery containers. Chemical

storage and chemical feed areas will be designed to contain leaks and spills. Containment pits and drain piping design will allow a full-tank capacity spill without overflowing the containment area. For multiple tanks located within the same containment area, the capacity of the largest single tank will determine the volume of the containment area and drain piping with an allowance for rainwater. Drain piping for reactive chemicals will be trapped and isolated from other drains to eliminate noxious or toxic vapors.

Safety showers and eyewashes will be provided adjacent to, or in the vicinity of, chemical use and storage areas. Plant personnel will use approved personal protective equipment during chemical spill containment and cleanup activities. Personnel will be properly trained in the handling of these chemicals and will be instructed in the procedures to follow in the event of a chemical spill or accidental release. Adequate supplies of emergency response equipment, including absorbent material, will be stored onsite for spill cleanup.

A list of the chemicals anticipated to be used at Willow Rock, and their storage locations, is provided in Section 5.5, Hazardous Materials Handling.

2.1.17 Fire Protection

The fire protection system will be designed to protect personnel and limit property loss and facility downtime in the event of a fire. The system will include an electric fire pump, a small jockey pump to keep the system under pressure, and a fire protection water network system consisting of hydrants or standpipes and portable fire extinguishers. Where required, automatic or fire sprinkler systems will be provided. A diesel-fired approximately 345 kW (460 horsepower) fire pump will be provided for emergency backup. The fire protection and piping network system will be designed to protect the facility, which will be designed under the following regulations:

- Federal, state, and local fire codes, and occupational health and safety regulations, in concert with the Authority Having Jurisdiction
- California Building Code, where applicable
- Applicable, mandatory National Fire Protection Association standards

The diesel-fired pump engine will meet USEPA Tier 3 emission standards and normally only operate for maintenance and reliability testing for up to 50 hours per year.

Firefighting water will be stored in the service/fire water storage tank. The tank will have an internal service water pump suction standpipe so that the required water volume for a fire event is always available to the fire water pumps. The system can supply maximum water demand for any fire suppression requirements, as well as water for fire hydrants. The total capacity of the tank is estimated at 350,000 gallons, with 300,000 gallons reserved for fire water.

Separation criteria will be evaluated in a fire protection study during further engineering.

Portable and wheeled fire extinguishers will be provided at strategic locations around the facility. Their locations will be determined based on the guidelines of National Fire Protection Association 10 or relevant local requirements.

The following types of portable fire extinguishers can be used as appropriate for the type of risk:

- For areas where there are ordinary combustibles such as wood, cloth, paper, plastic, etc., extinguishers will be suitable for Class A fires. These can be in the form of water, foam, or dry powder.
- For areas where there are flammable liquids, oils, grease, paint etc., extinguishers will be suitable for Class B fires. These can be carbon dioxide (CO_2) dry powder, or foam or any other suitable film forming foams.
- For areas where there is energized electrical equipment, extinguishers will be suitable for Class C fires. These will be CO_2 or other suitable dry chemicals.

Portable fire extinguishers, where applicable, will be installed at a suitable distance above the floor for ease of deployment and to minimize the potential for corrosion. Fire extinguishers will be fixed to walls, columns, or structural supports as appropriate. Weatherproof storage cabinets will be provided for extinguishers located in open areas. Wheeled extinguishers located in external areas will be equipped with a weatherproof cover.

Section 5.5, Hazardous Materials Handling, includes additional information about fire and explosion risk, and Section 5.10, Socioeconomics, provides information about local fire protection capability.

2.1.18 Plant Auxiliaries

The following systems will support, protect, and control the Willow Rock facility.

2.1.18.1 Process Systems

A 5 kV substation will be required in the process area to supply power to the area loads. The 230/5 kV transformers will be distributed at the WRESC Site. Large motors in the process area (above 300 horsepower) will be fed from the 5 kV system with many of the motors on emergency power for operation during a power outage.

Smaller motors will be fed from the 480 V system, and some will be on emergency backup power.

2.1.18.2 Heating, Ventilation, and Air Conditioning Systems

All buildings will be equipped with suitable heating, ventilation, and air conditioning systems and critical systems will operate on emergency power as required.

2.1.18.3 Lighting

Indoor building lighting will be designed consistent with building code requirements to provide adequate indoor illumination with consideration for human factors. Exterior lighting will be hooded and downward facing to provide adequate space lighting while minimizing offsite glare.

The emergency lighting will be sufficient to illuminate the exit path from process areas and inside the buildings and will be supplied from a 120 V UPS located indoors. Exit signs will be self-illuminating. In outdoor areas, emergency light fixtures will be equipped with rechargeable battery packs with minimum 1-hour battery backup. These emergency lighting fixtures will not normally be switched on and will be identical to the fixtures used throughout the facility.

Process plant lighting and convenience outlets will be supplied from a 208 V/120 V, three-phase, four-wire, 60 hertz system.

Section 5.13, Visual Resources provides additional information regarding the potential for offsite lighting impacts. A detailed lighting plan is included in Appendix 5.13B.

2.1.18.4 Grounding

All systems will be grounded and bonded as per the National Electric Code and local municipal codes and standards.

All equipment containing flammable liquids or gases and liable to static discharge ignition will be grounded by having one or more anchor bolts connected to the reinforcing bar of the equipment foundation.

The grounding system design will be as per Institute for Electrical and Electronics Engineers (IEEE)-80 and IEEE-142 guidelines. A detailed step/touch potential, including ground potential rise calculation, will be performed. The substation grounding systems will be designed to limit the overall resistance to earth to safe step and touch voltage conditions.

Prior to detailed design execution, sufficient site soil data will be obtained for performing grounding studies and calculations

All equipment will be connected to the ground through a minimum of two paths, except for small equipment that can be safely connected to a single source.

A dedicated, clean, instrument-grounding system will be provided to connect all PCSs, in addition to a standard equipment grounding system.

The instrumentation grounding system will be bonded to the electrical system ground below grade.

2.1.18.5 Control System

Process Control System

The PCS will provide all monitoring and control of the facility. The PCS configuration will be justified with the plant engineering contractor based on the facility complexity.

The facility will function automatically with minimum operator intervention. Emphasis will be given to automating routine actions so that the operator will have more time to analyze and identify short- and medium-term plant performance, efficiency, and imminent failures.

Adequate instrumentation will be installed to enable operations personnel to monitor facility performance from the central control room with minimum field intervention. Field operators will only assist in visual surveillance and will intervene only when critical equipment and systems warrant immediate attention. All field functions will require a permissive signal from the control system.

For standalone control packages within the facility where operator action will be entirely local, a package common alarm will be connected to the PCS to direct an operator to examine local indicators or panels to determine equipment status.

Operator Interface System

Under normal conditions, the facility will be operated from the central control room with operator displays with mouse and operator keyboards, radio, and telephone panels, monitors for internet protocol camera access.

The PCS operator workstations will provide the following functions at minimum:

- Presentation of process information to the operator
- Facilities to enable the operator to adjust and control the process
- Monitoring and control of packaged equipment
- Monitoring and control of utility systems
- Short-term logging of process conditions and operator actions
- Diagnostic of the PCS and its component parts
- Site security

Monitoring and Controls

The PCS will use solid-state equipment and a PLC or DCS to increase reliability and flexibility.

Electromechanical control relays will not be used, except when required for safety interlocks. The plant DCS will meet cyber-security standards as required by the California Independent System Operator.

If the control system involves electromechanical timing sequences or interlocks, auxiliary dry contacts will be provided for indication of steps or conditions. These contacts will be used to interface with the PCS to monitor the operational status.

All failure and alarm switches will be “fail safe”—i.e., an abnormal condition will cause a loss in output signal. Upon loss of power, control circuits and alarms will go to the “fail safe” condition. Solenoid valves and actuating relays will be normally energized and will de-energize upon protective action or alarm. All alarm contacts shall open to alarm. When contacts are controlled by a pneumatically loaded device, the device will be normally loaded and will vent to create the alarm or shutdown condition.

In general, interlock system circuits will be activated from separate primary instruments. Each interlock signal initiating a shutdown will also activate a separate pre-alarm point to indicate that an abnormal condition exists, and failure to take corrective action will result in a shutdown of the affected equipment. Pre-alarms may be actuated by a “normal” instrumentation system signal.

Communications between the PLC and human-machine interface, and PLC to PCS will be Ethernet transmission control protocol/internet protocol or ProfiNet.

Communications to motor control centers and VFDs will be Ethernet- or fiber-based. Communications to discrete field contacts will be automated with limit switch indications.

Wireless communication devices will be used for communication between control room and operators in the facility.

2.1.18.6 Cathodic Protection

The cathodic protection system will be designed to control corrosion of metallic piping when buried in the soil. Depending on the corrosion potential, type of soils on the WRESC Site, ease of isolation of buried pipe from the aboveground facilities, and proximity to ground grid and foundations, either a passive or impressed current cathodic protection will be provided where required.

2.1.18.7 Freeze Protection System

Freeze protection for above- and below-grade piping and instrumentation lines will be evaluated and installed as necessary, based on the expected minimum ambient temperature at the facility. Given that the record minimum temperature near Willow Rock is 24 degrees Fahrenheit, freeze protection is not expected to be required for large piping but may be required for small piping and air tubing. Below-grade piping will be installed below freezing depth according to site's climate and soil data. Where necessary, the above-grade piping will be protected with an electrical heat tracing system and/or continuous circulation in rare instances of freezing temperatures. The foundation of aboveground pipe support will be rooted below the freezing depth.

2.1.18.8 Service Air

The service air system will supply compressed air to hose connections for general use at the WRESC. Service air headers will be routed to hose connections located at various points throughout the facility.

2.1.18.9 Instrument Air

The instrument air system will provide dry, filtered air to pneumatic operators and devices. Air from the service air system will be dried, filtered, and pressure-regulated before delivery to the instrument air piping network. An instrument air header will be routed to locations within the facility equipment areas.

2.1.19 Interconnect to Electrical Grid

The facility will connect to the SCE electrical grid via a 230 kV overhead (predominantly) single-circuit gen-tie line that will run approximately 19 miles from the SCE Whirlwind Substation to the WRESC Site (see Chapter 3, Electric Transmission). The 230 kV line will terminate at a dead-end tower before the main power transformers, which will step down the voltage to 13.8 V and 5 kV, suitable for distribution within the WRESC. The grid connection will be capable of power import and export, rated to suit all operating scenarios. There are expected to be a small number of short underground gen-tie line segments to allow for crossing of a Los Angeles Department of Water and Power high-voltage transmission corridor and in other locations where the transmission corridor is congested with preexisting facilities (see Figure 1-4 in Chapter 1.0, Introduction). Open trenching or horizontal directional drilling will be used to complete these short underground segments.

A preliminary single-line diagram depicting the onsite Willow Rock main substation, including applicable ratings of key equipment, are included in Chapter 3, Electrical Transmission.

2.1.20 Project Construction

2.1.20.1 Construction Schedule

The construction of the WRESC from site preparation and grading to full-scale operation and construction closure is expected to take roughly 60 months. Major milestones are listed in **Table 2-8**. A more in-depth construction manpower and equipment schedule is provided in in Appendix 2B, Construction Manpower and Equipment

Schedule. The Applicant will assess the prospect of initiating full-scale operations for a portion of the facility's energy capacity in advance of the target date shown below.

Table 2-8: Major Project Milestones

Target Project Milestones	Begin		Complete	
	Month Number	Calendar Date	Month Number	Calendar Date
Mobilization	1	Mar 2025	3	May 2025
Grading	2	Apr 2025	13	Mar 2026
Reservoir Excavation	3	May 2025	13	Mar 2026
Shaft Drilling (Ventilation and Process Connections)	10	Dec 2025	35	Jan 2028
Access Shaft Excavation	11	Jan 2026	23	Jan 2027
Topside Equipment Installation	15	May 2026	45	Nov 2028
Transmission Line Construction	24	Feb 2027	39	May 2028
Cavern Construction (and Cavern Rock Crushing and Hauling)	24	Feb 2027	47	Jan 2029
Topside Equipment Commissioning	40	Jun 2028	52	Jun 2029
Subsurface Commissioning	47	Jan 2029	52	Jun 2029
Full Plant Commissioning	52	Jun 2029	55	Sep 2029
Startup	55	Sep 2029	60	Feb 2030
Construction Demobilization	59	Jan 2030	60	Feb 2030
Commercial Operation	60	Feb 2030	61	Mar 2030

Source: Hydrostor 2024

2.1.20.2 Construction Workforce

During construction, there will be an average and peak workforce of approximately 273 and 749 workers, respectively, including construction craft workers and supervisory, support, and construction management personnel onsite if 100 percent of the waste rock is hauled offsite. The construction average and peak workforce would decrease slightly to 269 and 731, respectively, if all the excavated rock is re-used onsite in the form of an architectural berm (see Section 5.10, Socioeconomics, Table 5.10-8 for a more detailed breakdown of expected labor requirements).

Surface work will normally occur in 8-hour shifts, 5 days a week. Cavern work is planned as follows:

- Mobilization and site preparation (months 1 through 3): 5 days a week, 10-hour shifts
- Grading, excavation, and shaft drilling (months 2 through 26): 12 hours/day, 10 days on, 4 days off
- Cavern construction (months 26 until completion): 24 hours/day, 7 days/week, 12-hour shifts

During cavern construction, trucks will either haul excavated waste rock up to 24 hours per day from the WRESC Site or re-use the material onsite. Excavated rock during construction may be temporarily stored for re-use if necessary. The temporary storage areas will be located as shown in **Figure 2-1** and **Figure 2-2**.

Cavern construction will occur 24 hours per day, 7 days per week. Additional hours may also be necessary for surface construction work to make up schedule deficiencies or to complete critical activities (e.g., pouring concrete at night during hot weather, and working around time-critical shutdowns and constraints).

2.1.20.3 Construction Laydown and Traffic

Construction laydown and parking will be located on property to the west and north of the WRESC Site, as depicted on the WRESC Site plot plans in **Figure 2-1** and **Figure 2-2.** The peak construction site workforce level

is expected to last from month 25 through month 46 of the construction period, with the peak being months 26 and 27.

Table 2-9 provides an estimate of the average and peak construction traffic during the 60-month construction/ commissioning period for Willow Rock based on the worst-case workforce (100 percent excavated rock hauled offsite).

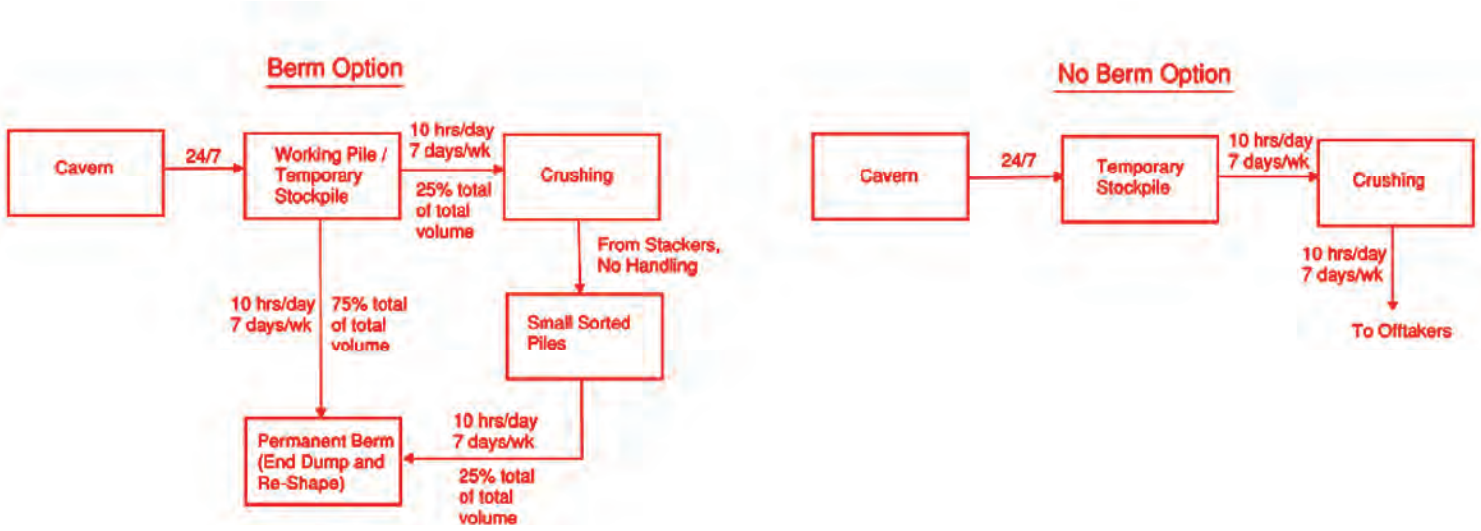
Table 2-9: Estimated Worst-Case Average and Peak Construction Traffic

Vehicle Type	Average Daily Trips	Peak Daily Trips
Construction Workers (one way, no carpooling assumed)	273	749
Deliveries	45	60
Total	318	809

2.1.20.4 Temporary Construction Rock Crushing Facility

A temporary portable rock crushing facility will be located onsite for up to 10 hours per day, 7 days per week for 22 months beginning approximately in month 25. The rock crushing facility will be capable of processing up to 350 tons per hour and is expected to consist of a primary jaw crusher, a secondary cone crusher, screens, three conveyors, and two stackers. The facility will use a combination of water sprays and a baghouse to control fugitive dust and fine particulate matter emissions. The facility will be capable of operating from a locally provided power feed or using two 779-horsepower diesel-fired engine generators meeting USEPA Tier 4 emission standards. The entire facility is expected to be certified under the California Air Resources Board Portable Equipment Registration Program.

The overall quantity of rock to be crushed will depend on whether an architectural berm will be constructed onsite or whether excavated rock will be hauled offsite. If an architectural berm is constructed, only 25 percent of the excavated rock is expected to be crushed to facilitate berm stability. If the excavated rock is hauled offsite, then up to 100 percent of the excavated rock is expected to be crushed to meet off-taker specifications. These options are depicted diagrammatically in **Figure 2-7**.



REFERENCE(S)

1. WRESC SITE RENDERING - KIEWIT 2024

CLIENT
GEM A-CAES LLC

PROJECT
WILLOW ROCK ENERGY STORAGE CENTER
SUPPLEMENTAL AFC

TITLE
ROCK CRUSHING OPERATION PROCESS DIAGRAM WITH AND WITHOUT BERM OPTIONS

CONSULTANT

YYYY-MM-DD	2024-02-22
DESIGNED	MK
PREPARED	MK
REVIEWED	SCH
APPROVED	VG/LL

PROJECT NO.	CONTROL	REV.	FIGURE
31406639.003	01	0	2-7

2.1.20.5 Temporary Concrete Batch Plant

A temporary portable concrete batch plan is also expected to be located onsite to support construction of the shafts and, if necessary, initial cavern construction. The concrete batch plant is expected to operate onsite for approximately 12 to 15 months. Construction is expected to require up to 80 cubic yards per day of finished cement. The facility will be capable of operating from a locally provided power feed or using one 500-horsepower diesel-fired engine generator meeting USEPA Tier 4 emission standards. The entire facility is expected to be certified under the California Air Resources Board Portable Equipment Registration Program.

2.1.21 Willow Rock Facility Operation

The WRESC will be operated and monitored continuously 24 hours per day, 7 days per week by qualified and licensed onsite operations staff and will not be remotely operated (other than potential grid regulation-required operations such as generator transfer trips or special protection schemes).

There will be a total of approximately 40 full-time staff to operate the facility. The operations staff will include control room operators (24 hours per day, 7 days per week) and roving operators in the field conducting general rounds at least twice per 12-hour shift.

Additional field checks will be done as needed for maintenance activity, upsets, or other general operations requirements.

2.2 Engineering

In accordance with California Energy Commission (CEC) regulations, this section together with the engineering appendix (Appendix 2A, Design Criteria) and Chapters 3, Electric Transmission present information concerning the design and engineering of Willow Rock. The LORS applicable to Willow Rock's engineering are provided in Appendix 2A along with a list of agencies that have jurisdiction, the contacts within those agencies, and a list of the permits that will be required.

2.2.1 Facility Design

Summary descriptions of the design criteria for all the major engineering disciplines are included in Appendix 2A, Design Criteria.

Design and engineering information and data for the following systems may be found in the related subsections of this Application for Certification:

- Power Generation: see Section 2.1.8, Energy Storage Air-Expansion Turbine Generators. Also see Appendix 2A and Section 2.1.17 which describe the various plant auxiliaries.
- Power Consumption: see Sections 2.1.7, Energy Storage Air Compression Equipment Drivetrain and 2.1.6, Energy Storage Facility Standby/Idle Mode.
- Water Supply System: see Section 2.1.14, Water Supply and Use. Also see Appendix 2D.
- Waste Disposal System: see Section 2.1.15, Waste Management and Section 5.14, Waste Management.
- Noise Abatement System: see Section 5.7, Noise.
- Switchyards/Transformer Systems: see Section 2.1.13, Major Electrical Equipment and Systems; Section 2.1.18.4, Grounding; Section 2.1.13.2, Alternating Current Power—Transmission; Section 2.1.19, Interconnect to Electrical Grid; and Chapter 3, Electric Transmission. Also see Appendix 2A.

2.2.1.1 Facility Safety Design

Willow Rock will be designed to maximize safe operation. Potential hazards that could affect the facility include earthquake, flood, and fire. Facility operators will be trained in safe operation, maintenance, and emergency response procedures to minimize the risk of personal injury and damage to the facility.

2.2.2 Facility Reliability

This section discusses the expected facility availability, equipment redundancy, fuel availability, water availability, and project quality control (QC) measures.

2.2.2.1 Facility Availability

The WRESC will be designed to be available to operate at its full load at least 95 percent of the time.

Availability is the duration of time that the entire facility will be able to perform its intended task. It is calculated as a ratio expressed in percentage, where the numerator is the number of hours when the system as a whole either (1) is ready to either charge or discharge (during idle/standby periods), or (2) is charging or discharging, all divided by the total number of hours in the period.

Typically, both planned and unplanned outages are subtracted from the availability calculation numerator to calculate actual availability for a period. The availability calculation denominator can be the total amount of time in the day, week, month, or, most commonly, year during which availability is being calculated.

For further clarity, availability is not the same as a typical generating plant's capacity factor, which accounts for annual criteria such as the plant's actual energy MWh output (numerator) versus the plant's nameplate capability to produce MWh over a full year (denominator), and which is usually based on the general assumption that the relevant plant will always operate at baseload.

The WRESC is intended to be operated for approximately 50 years. Reliability and availability projections are based on this operating life. Operation and maintenance procedures will be consistent with industry standard practices to maintain the useful life of plant components.

2.2.3 Redundancy of Critical Components

The following subsections identify equipment redundancy as it applies to project availability. Sparing of equipment must take into consideration the requirement to provide the targeted overall system availability of 95 percent. A Reliability, Availability, and Maintainability (RAM) study will be performed during final engineering design to further refine this preliminary redundancy information.

2.2.3.1 Turbomachinery

As is typical in the industry, there is no redundancy in turbomachinery (spares), given the overall reliability of the component parts and the need to control capital expenditures. Routine minor inspection and maintenance will be performed between charge and discharge cycles during pre-planned outages. Major inspections and overhauls will require shutdowns for removal of the turbomachinery casings, rotors, and other major components.

2.2.3.2 Pumps

All types of pumps are considered susceptible to mechanical breakdown and generally have one installed spare. The decision not to install a spare will depend on the criticality of the service. In general, pumps will be spared in an N +1 arrangement as an early front-end engineering design assumption until either more accurate input is available or the RAM analysis has completed.

2.2.3.3 Heat Exchangers

Shell and tube (S&T) heat exchangers are less susceptible to mechanical breakdown, though appropriate protection will be provided to safeguard equipment against tube failures and cross contamination of fluids. S&T heat exchangers will not be spared; however, the parallel nature of the heat exchanger system will allow the plant to remain available when individual exchanger units are under service. Appropriate filtration will be included to prevent corrosion and increase reliability. Tube inspection and maintenance allowances will be made in the layout design and procurement.

2.2.3.4 Storage Tanks

Multiple spherical tanks are required due to size constraints on the technology at the required operating condition, effectively resulting in sparing. They are not spared beyond the minimum number of spherical tanks required to store the hot water. That is, the WRESC will still be able to operate with a spherical tank rendered unusable, but at a reduced charge/discharge duration.

The low-pressure (atmospheric) tank is not susceptible to mechanical breakdown and, as such, does not require frequent shutdowns for maintenance purposes.

Both types of tanks will be inspected and maintained during pre-planned outages, with major inspections coordinated with major work on the turbomachinery.

Critical sensors and transducers will have triple redundancy.

2.2.4 Fuel Availability

The WRESC will not use fuel for the process. California ultra-low sulfur diesel (15 ppm sulfur by weight) will be used for the emergency backup generators and fire pump and is readily available in the marketplace.

2.2.5 Water Availability

Potable and process water will be provided by interconnection with the AVEK water distribution system. The availability of water to meet the requirements of the facility need is discussed in more detail in Section 5.15, Water Resources.

2.2.6 Project Quality Control

The project will implement a QC program that will ensure the highest level of oversight while meeting the desired project outcomes, as well as the appropriate license and social license for ongoing operations.

2.2.7 Quality Control Records

The following QC records will be maintained for review and reference:

- Project instructions manual
- Design calculations
- Project design manual
- Quality assurance audit reports
- Conformance to construction records drawings
- Procurement specifications (contract issue and change orders)
- Purchase orders and change orders
- Project correspondence
- Any other records as required by LORS

During construction, field QC activities will be performed during the last four stages of the project: receipt inspection, construction/installation, system/component testing, and plant operations. The construction contractor will be contractually responsible for performing the work in accordance with the quality requirements specified by contract.

The subcontractors' quality compliance will be surveyed through inspections, audits, and administration of independent testing contracts.

A plant operation and maintenance program, typical of a project this size, will be implemented at the Willow Rock site to control operation and maintenance quality. A specific program for this project will be defined and implemented prior to initial plant startup.

2.2.8 Facility Closure

Closure of the facility can be temporary or permanent. Temporary closure is defined as a shutdown for a period exceeding the time required for normal maintenance, with an intent to restart in the future. Permanent closure is defined as a cessation in operations with no intent to restart operations. Section 2.3.1 discusses temporary facility closure, and Section 2.3.2 discusses permanent facility closure in relation to the WRESC.

2.2.9 Temporary Closure

For a temporary closure where there is no release of hazardous materials, the Applicant will maintain security of the WRESC facilities and will notify the CEC and other responsible agencies as required by law. If the temporary closure includes damage to the Willow Rock facilities, and if there is a release or threatened release of regulated substances or other hazardous materials into the environment, procedures will be followed as set forth in an Emergency Management Plan in accordance with a Hazardous Materials Plan. Procedures will include methods to control releases, notification of applicable authorities and the public, emergency response, and training for facility personnel in responding to and controlling releases of hazardous materials. Once the immediate problem is solved and the regulated substance/hazardous material release is contained and cleaned up, temporary closure will proceed as described above for a closure where there is no release of hazardous materials.

2.2.10 Permanent Closure

When the facility is permanently closed, the closure procedure will follow a decommissioning plan that will be developed as described below.

The conditions that would affect the decommissioning decision will be presented to the CEC when more information is available and the timing for decommissioning is more imminent.

To ensure that public health and safety and the environment are protected during decommissioning, a decommissioning plan will be submitted to the CEC for approval prior to decommissioning. The plan will discuss the following:

- Proposed decommissioning activities for Willow Rock and all appurtenant facilities constructed as part of Willow Rock
- Conformance of the proposed decommissioning activities to all applicable LORS and local/regional plans
- Associated costs of the proposed decommissioning and the source of funds to pay for the decommissioning

In general, the decommissioning plan for Willow Rock will attempt to maximize the recycling or re-use of all facility components. It is anticipated that the potential cavern rock architectural berm will remain in place to minimize environmental impacts associated with its removal. It will be decommissioned such that no ongoing maintenance is needed for flood control. All nonhazardous wastes will be collected and disposed of in appropriate landfills or waste collection facilities. All hazardous wastes will be disposed of according to all applicable LORS.

3.0 ELECTRIC TRANSMISSION

3.1 Introduction

GEM A-CAES LLC's (GEM, the Applicant) Willow Rock Energy Storage Center (WRESC, or Willow Rock) will be located on approximately 88.6 acres of private land immediately north of Dawn Road and between State Route (SR) 14 and Sierra Highway within unincorporated, southeastern Kern County, California. The WRESC will be a nominal 520-megawatt (MW) gross (500 MW net) and 4,160 megawatt-hour (MWh) gross (4,000 MWh net) facility using Hydrostor, Inc.'s (Hydrostor's) proprietary, advanced compressed air energy storage (A-CAES) technology. Energy stored at the WRESC will be delivered to Southern California Edison's (SCE's) Whirlwind Substation located southwest of the WRESC at the intersection of 170th Street W and Rosamond Boulevard, via a new approximately 19-mile 230-kilovolt (kV) generation-tie (gen-tie) line.

The Project or Project Area encompasses the WRESC Site, the parcels within the Project Boundary, and the right-of-way (ROW) associated with the WRESC's gen-tie line. The Project Boundary encompasses the WRESC Site and the parcels of land (an additional 133 acres of private land surrounding the WRESC) that will be allocated for potential temporary staging and laydown area (referred to herein as the Staging Area) during construction, or the construction of a permanent architectural berm constructed from the material excavated during cavern construction. The Staging Area consists of groups of accessors parcels referred to as P1, P2N, P2S, and VH.

This section discusses the gen-tie interconnection between the Willow Rock Energy Storage Center (Willow Rock, or WRESC) and the existing electrical grid. The following topics are discussed:

- The proposed electrical interconnection between Willow Rock and the electrical grid
- The impacts of the electrical interconnection on the existing transmission grid facilities
- Potential nuisances (electrical effects, aviation safety, and fire hazards)
- Safety of the interconnection
- Description of applicable laws, ordinances, regulations, and standards (LORS)

The WRESC will be located in unincorporated Kern County, California, on an 88.6-acre portion of a 112-acre parcel and will include a new approximately 19-mile long, 230 kilovolt (kV) gen-tie line interconnecting to the SCE Whirlwind Substation.

Sections 3.2 and 3.3 discuss the details regarding the gen-tie alternatives investigated and the results of the gen-tie interconnection studies.

3.2 Gen-tie Lines Description, Design, and Operation

The WRESC will be interconnected with the regional electrical grid by a new, single-circuit, three-phase, 230 kV gen-tie line with the preferred gen-tie route approximately 19 miles in length utilizing a franchise agreement from Kern County. The preferred 230 kV line runs west from the WRESC Site along Dawn Road, south along Mojave-Tropico Road, west along Felsite Road, south on 65th Street West, and west along Rosamond Boulevard before terminating at the SCE Whirlwind Substation. Figure 1-4 in Chapter 1, Introduction presents the preferred gen-tie route between the Willow Rock site and the Whirlwind Substation, along with several route options with approximately the same length that are all considered part of the proposed WRESC gen-tie. Alternatives to the proposed route are discussed in Section 6 Alternatives and shown in Figure 6-2.

3.2.1 Overhead Gen-tie Line Characteristics

The interconnecting 230 kV transmission circuit will consist of a single-circuit three-phase 230 kV line, constructed both overhead and underground (underground locations are as noted in Figure 1-4). The proposed design of the gen-tie line includes installation of 90-foot steel transmission poles. The poles are expected to be spaced approximately 600 to 900 feet from each other. **Figure 3-1a** through **Figure 3-1c** show a transmission pole like the poles to be used as part of the overhead gen-tie interconnection, and **Figure 3-4** shows an example of the underground cable that will be installed for the underground portions of the gen-tie line. The 230 kV gen-tie line

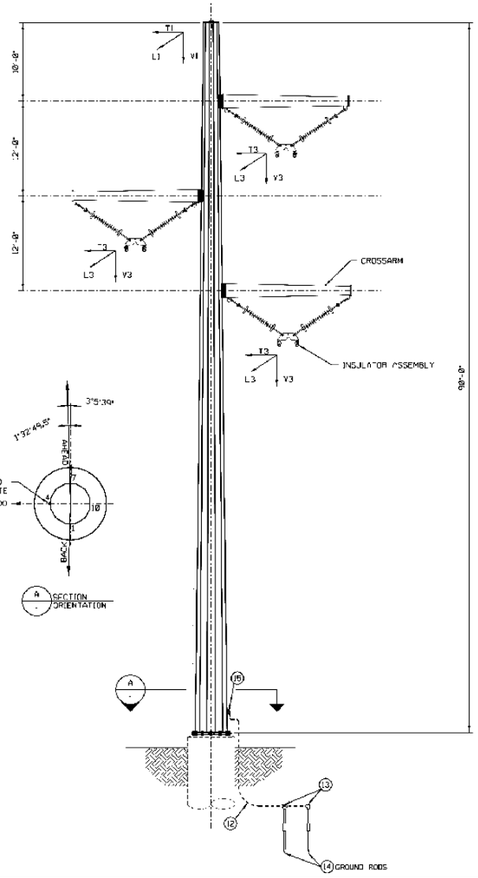
design was selected to match the voltage at the SCE Whirlwind Substation. In addition, the voltage will be able to carry the full capacity of the WRESC, whereas lower voltage lines based on typical line designs would not (e.g., the typical capacity of 115 to 161 kV lines is approximately 220 megawatts, or MW).

3.2.2 Willow Rock Switchyard Characteristics

A general arrangement for the proposed onsite Willow Rock 230 kV switchyard is shown in Figure 2-4, Section 2, Project Description. The overall electrical one-line diagram for the WRESC is shown in **Figure 3-5**.

LOADING TABLE (KIPS)

DESCRIPTION	LOAD	CASE 1	CASE 2	CASE 3	CASE 4	CASE 5	CASE 6	CASE 7	CASE 8	CASE 9	CASE 10	CASE 11	CASE 12	CASE 13	CASE 14	CASE 15	CASE 16	CASE 17	CASE 18
OPGW	T1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	V1																		
	L1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1272 ACSS "BITTERN"	T3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	V3																		
	L3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
WIND ON STRUCTURE (PSF)	WIND	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



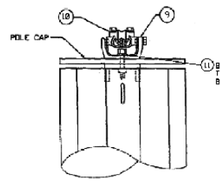
MECHANICAL LOADING CRITERIA

1 - NESC RULE 250B - LIGHT LOADING (INTACT): 9 PSF WIND, 3" ICE, 30 DEG F, INITIAL
LOAD FACTOR: TRANSVERSE=2.5, LONGITUDINAL=1.65, VERTICAL=1.5
2 - NESC RULE 250B - LIGHT LOADING (UPLIFT): 9 PSF WIND, 0" ICE, 30 DEG F, INITIAL
LOAD FACTOR: TRANSVERSE=2.5, LONGITUDINAL=1.65, VERTICAL=1
3 - NESC RULE 250B - LIGHT LOADING (DEADEND): 9 PSF WIND, 0" ICE, 30 DEG F, INITIAL
LOAD FACTOR: TRANSVERSE=2.5, LONGITUDINAL=1.65, VERTICAL=1.5
4 - NESC RULE 250C - EXTREME WIND (INTACT): 18.5 PSF WIND, 0" ICE, 60 DEG F, INITIAL
LOAD FACTOR: 1.0
5 - NESC RULE 250C - EXTREME WIND (DEADEND): 18.5 PSF WIND, 0" ICE, 60 DEG F, INITIAL
LOAD FACTOR: 1.0
6 - NESC RULE 261A - EXTREME WIND (WITHOUT CONDUCTORS): 18.5 PSF WIND, 0" ICE, 60 DEG F
LOAD FACTOR: 1.0
7 - ASCE 74/RUS 1724E-200 RESIDUAL STATIC LOAD (RSL): 0 PSF WIND, 0" ICE, 60 DEG F, INITIAL
LOAD FACTOR: TRANSVERSE 2.5, LONGITUDINAL 1.65, VERTICAL 1.5
8 - ASCE 7-10 EXTREME WIND: 31 PSF WIND, 0" ICE, 60 DEG F, INITIAL
LOAD FACTOR: 1.0
9 - GO-95 LIGHT LOADING (INTACT): 8 PSF WIND, 0" ICE, 25 DEG F, INITIAL
SAFETY FACTOR: 1.5
10 - GO-95 LIGHT LOADING (DEADEND): 8 PSF WIND, 0" ICE, 25 DEG F, INITIAL
SAFETY FACTOR: 1.5
11 - EVERYDAY/PRE-CAMBER: 0 PSF WIND, 0" ICE, 60 DEG F, INITIAL
LOAD FACTOR: 1.0
12 - SDG&E CASE 1 GO-95 LIGHT LOADING (INTACT): 9 PSF WIND, 0" ICE, 25 DEG F, INITIAL
SAFETY FACTOR: 1.5
13 - SDG&E CASE 1A FTZ VERY HIGH: 28 PSF WIND, 0" ICE, 60 DEG F, FINAL
SAFETY FACTOR: 1.5
14 - SDG&E CASE 2A TERMINAL DEADEND: 9 PSF WIND, 0" ICE, 25 DEG F, INITIAL
SAFETY FACTOR: 1.5
15 - SDG&E CASE 2B BROKEN PHASE: 9 PSF WIND, 0" ICE, 25 DEG F, FINAL
SAFETY FACTOR: 1.25
16 - SDG&E CASE 3 CAMBER: 8 PSF WIND, 0" ICE, 60 DEG F, FINAL
SAFETY FACTOR: 1.0
17 - SDG&E CASE 5 STRINGING WIRE: 13 PSF WIND, 0" ICE, 25 DEG F, INITIAL
SAFETY FACTOR: 1.25
CONDUCTORS STRUNG AT 30 DEGREES HORIZONTAL
VERTICAL LOAD OF 1500# RS
18 - SDG&E ARM DESIGN: 9 PSF WIND, 0" ICE, 25 DEG F, INITIAL
SAFETY FACTOR: 1.25
CONDUCTORS STRUNG AT 30 DEGREES HORIZONTAL
VERTICAL LOAD OF 1500# RS

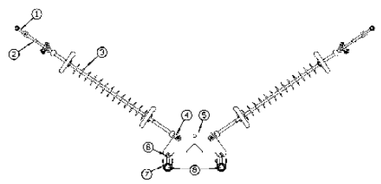
BILL OF MATERIALS

ITEM NO	ITEM DESCRIPTION	MANUFACTURER	CATALOG NO.	PROVIDED BY	MIN QTY	UNITS
1	ANCHOR SHACKLE, 38K	-	-	-	6	EA
2	LINK, CHAIN, 1/2" x 2-1/4", 38K	-	-	-	6	EA
3	INSULATOR, POLYMER, Y-CLEVIS BALL WITH CORONA RING, 38K	-	-	-	6	EA
4	Y-CLEVIS, SOCKET, 38K	-	-	-	6	EA
5	PLATE, Y-STRING YOKE, 40K	-	-	-	3	EA
6	EYE, Y-CLEVIS, 38K	-	-	-	6	EA
7	CLAMP, SUSPENSION, AL. ALLOY	-	-	-	6	EA
8	ARMOR RODS, ALUMINUM		-	-	6	EA
9	BRACKET, TRUNNION	-	-	-	1	EA
10	OPGW TRUNNION CLAMP	-	-	-	1	EA
11	OPTW BONDING WIRE ASSEMBLY	-	-	-	1	EA
12	GROUNDING WIRE, #2 COPPERWELD	-	-	-	20	FT
13	GROUND ROD CLAMP	-	-		2	EA
14	GROUNDING ROD, COPPERWELD, 5/8" X 8'	-	-	-	2	EA
15	COMP. TERM FOR #2 CU TO 2 HOLE NEMA	-	-	-	1	EA

- ALTERNATE MATERIALS MAY BE SUBMITTED FOR REVIEW AND APPROVAL.
- QUANTITIES ARE FOR INFORMATION ONLY



OPGW SUSPENSION CLAMP ASSEMBLY
230kV STEEL POLE
(NOT TO SCALE)



INSULATOR ASSEMBLY
POLYMER Y-STRING INSULATOR
230kV STEEL STRUCTURE
(NOT TO SCALE)

DESIGN NOTES

1. ALL LOADS ARE ULTIMATE LOADS AND INCLUDE OVERLOAD FACTORS AND WEIGHT OF INSULATORS, AND HARDWARE.
2. UNITS OF ENTRIES ON THE STRUCTURE LOADING TABLE ARE AS FOLLOWS: TRANSVERSE (T), VERTICAL (V), AND LONGITUDINAL (L) LOADS - KIPS; WIND PRESSURE (W) - LBS PER SQ FT.
3. THE TRANSVERSE LOADS (T) INCLUDE WIND REACTIONS ON THE WIRES AND THE TRANSVERSE LOAD DUE TO THE LINE ANGLE.
4. ALL STEEL POLES SHALL BE GALVANIZED STEEL.
5. THE POLE SHALL BE PRECAMBERED IF DEFLECTION EXCEEDS 1.6% OF THE STRUCTURE HEIGHT ABOVE GROUND UNDER LOAD CASE 11 & 16.
6. POLE CAP FOR TRUNNION CLAMP PER SDG&E DWG 17180.
7. CLIMBING AND WORKING STEPS PER SDG&E DWG 17105.
8. POLE GROUNDING PER SDG&E DWG 17136.
9. LOAD CASE 15 BREAKS TWO WIRES:
(1) OPGW
(1) TOP 230kV TRANSMISSION PHASE A
10. LOAD FOR CASE 15 SHALL BE APPLIED AT TIP OF CROSSARM.
11. THIS DRAWING SHOWS DESIGN LOADING, DIMENSIONS AND CONFIGURATIONS FOR INFORMATION, REFERENCE, FABRICATORS CALCULATIONS, AND DRAWINGS FOR FINAL STRUCTURE DESIGN AND DETAILS.

230KV TRANSMISSION LINE
SINGLE CIRCUIT STRUCTURE 1

Kiewit

SGL CKT STR1

REFERENCE(S)

1. 230KV TRANSMISSION LINESINGLE CIRCUIT STRUCTURE 1 (GL CKT STR1) - KIEWIT 2023

CLIENT
GEM A-CAES LLC

PROJECT
WILLOW ROCK ENERGY STORAGE CENTER
SUPPLEMENTAL AFC

TITLE
REPRESENTATIVE TRANSMISSION POLE, STRUCTURE 1

CONSULTANT
wsp

YYYY-MM-DD	2024-02-23
DESIGNED	SHL
PREPARED	SHL
REVIEWED	
APPROVED	

PROJECT NO.	CONTROL	REV.	FIGURE
31406639.003	01	0	3-1a

LOADING TABLE (KIPS)																				
DESCRIPTION	LOAD	CASE 1	CASE 2	CASE 3	CASE 4	CASE 5	CASE 6	CASE 7	CASE 8	CASE 9	CASE 10	CASE 11	CASE 12	CASE 13	CASE 14	CASE 15	CASE 16	CASE 17	CASE 18
OPGW	T1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	V1																		
	L1	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
1272 ACSS "BITTERN"	T3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	V3																		
	L3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
WIND ON STRUCTURE (PSF)	W,W0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

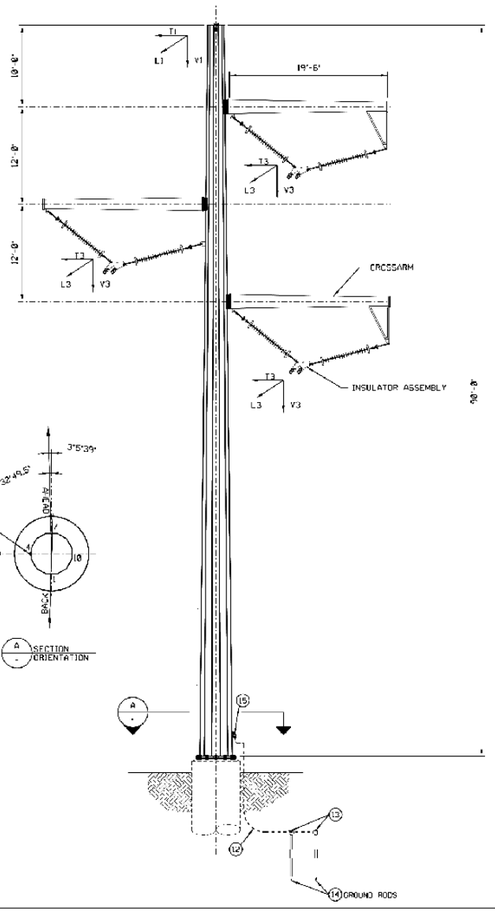
MECHANICAL LOADING CRITERIA

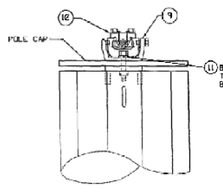
1 - NESC RULE 250B - LIGHT LOADING (INTACT): 9 PSF WIND, 0" ICE, 30 DEG F, INITIAL
LOAD FACTOR: TRANSVERSE-2.5, LONGITUDINAL-1.65, VERTICAL-1.5
2 - NESC RULE 250B - LIGHT LOADING (BROKEN): 9 PSF WIND, 0" ICE, 30 DEG F, INITIAL
LOAD FACTOR: TRANSVERSE-2.5, LONGITUDINAL-1.65, VERTICAL-1
3 - NESC RULE 250B - LIGHT LOADING (DEADEND): 9 PSF WIND, 0" ICE, 30 DEG F, INITIAL
LOAD FACTOR: TRANSVERSE-2.5, LONGITUDINAL-1.65, VERTICAL-1.5
4 - NESC RULE 250C - EXTREME WIND (INTACT): 18.5 PSF WIND, 0" ICE, 60 DEG F, INITIAL
LOAD FACTOR: 1.0
5 - NESC RULE 250C - EXTREME WIND (DEADEND): 18.5 PSF WIND, 0" ICE, 60 DEG F, INITIAL
LOAD FACTOR: 1.0
6 - NESC RULE 261A - EXTREME WIND (WITHOUT CONDUCTORS): 18.5 PSF WIND, 0" ICE, 60 DEG F
LOAD FACTOR: 1.0
7 - ASCE 74/RUS 1724E-200 RESIDUAL STATIC LOAD (RSL): 8 PSF WIND, 0" ICE, 60 DEG F, INITIAL
LOAD FACTOR: TRANSVERSE-2.5, LONGITUDINAL-1.65, VERTICAL-1.5
8 - ASCE 7-10 EXTREME WIND: 31 PSF WIND, 0" ICE, 60 DEG F, INITIAL
LOAD FACTOR: 1.0
9 - GO-95 LIGHT LOADING (INTACT): 8 PSF WIND, 0" ICE, 25 DEG F, INITIAL
SAFETY FACTOR: 1.5
10 - GO-95 LIGHT LOADING (DEADEND): 8 PSF WIND, 0" ICE, 25 DEG F, INITIAL
SAFETY FACTOR: 1.5
11 - EVERYDAY/ARE CAMDEN: 8 PSF WIND, 0" ICE, 60 DEG F, INITIAL
LOAD FACTOR: 1.0
12 - SDG&E CASE 1 (GO-95 LIGHT LOADING (INTACT): 9 PSF WIND, 0" ICE, 25 DEG F, INITIAL
SAFETY FACTOR: 1.5
13 - SDG&E CASE 1A FTZ VERY HIGH: 20 PSF WIND, 0" ICE, 60 DEG F, FINAL
SAFETY FACTOR: 1.5
14 - SDG&E CASE 2A TERMINAL DEADEND: 9 PSF WIND, 0" ICE, 25 DEG F, INITIAL
SAFETY FACTOR: 1.5
15 - SDG&E CASE 2B BROKEN PHASE: 9 PSF WIND, 0" ICE, 25 DEG F, FINAL
SAFETY FACTOR: 1.25
16 - SDG&E CASE 3 CAMBRIA: 6 PSF WIND, 0" ICE, 60 DEG F, FINAL
SAFETY FACTOR: 1.0
17 - SDG&E CASE 5 STRINGING WIRE: 13 PSF WIND, 0" ICE, 25 DEG F, INITIAL
SAFETY FACTOR: 1.25
CONDUCTORS STRUNG AT 30 DEGREES HORIZONTAL
VERTICAL LOAD OF 1500 LBS
18 - SDG&E ARM DESIGN: 9 PSF WIND, 0" ICE, 25 DEG F, INITIAL
SAFETY FACTOR: 1.25
CONDUCTORS STRUNG AT 30 DEGREES HORIZONTAL
VERTICAL LOAD OF 1500 LBS

BILL OF MATERIALS

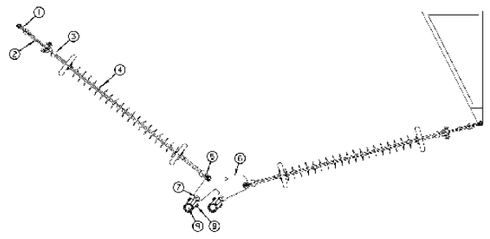
ITEM NO	ITEM DESCRIPTION	MANUFACTURER	CATALOG NO.	*PROVIDED BY	MIN QTY	UNITS
1	ANCHOR SHACKLE, 30K	-	-	-	6	EA
2	LINK, CHAIN, 1/2" x 2-1/4", 30K	-	-	-	6	EA
3	Y-CLEVIS, BALL, 50K, ANSI CLASS 52-8/11	-	-	-	6	EA
4	INSULATOR, POLYMER, Y-CLEVIS BALL WITH CORONA RING, 30K	-	-	-	6	EA
5	Y CLEVIS, SOCKET, 30K	-	-	-	6	EA
6	PLATE, Y-STRAND, 70KE, 40K	-	-	-	3	EA
7	EYE, Y-CLEVIS, 30K	-	-	-	6	EA
8	CLAMP, SUSPENSION, AL. ALLOY	-	-	-	6	EA
9	ARMOR RODS, ALUMINUM	-	-	-	6	LA
10	BRACKET, TRUNNION	-	-	-	1	EA
11	OPGW TRUNNION CLAMP	-	-	-	1	EA
12	OPGW BONDING WIRE ASSEMBLY	•	-	-	1	EA
13	GROUNDING WIRE, #2 COPPERWELD	-	-	-	20	FT
14	GROUND ROD CLAMP	-	-	-	2	EA
15	GROUNDING ROD, COPPERWELD, 5/8" X 8'	-	-	-	2	EA
16	COMP. TERM. FOR #2 CU TO 2 HOLE NEMA	•	-	-	1	EA

- ALTERNATE MATERIALS MAY BE SUBMITTED FOR REVIEW AND APPROVAL
- QUANTITIES ARE FOR INFORMATION ONLY





OPGW SUSPENSION CLAMP ASSEMBLY
230kV STEEL CIRCUIT
(NOT TO SCALE)



INSULATOR ASSEMBLY
POLYMER Y-STRING INSULATOR
230kV STEEL STRUCTURE
(NOT TO SCALE)

DESIGN NOTES

1. ALL LOADS ARE ULTIMATE LOADS AND INCLUDE OVERLOAD FACTORS AND WEIGHT OF INSULATORS, AND HARDWARE.
2. UNITS OF ENTRIES ON THE STRUCTURE LOADING TABLE ARE AS FOLLOWS: TRANSVERSE (T), VERTICAL (V), AND LONGITUDINAL (L) LOADS - KIPS; WIND PRESSURE (W) - LBS PER SQ FT.
3. THE TRANSVERSE LOADS (T) INCLUDE WIND REACTIONS ON THE WIRES AND THE TRANSVERSE LOAD DUE TO THE LINE ANGLE.
4. ALL STEEL POLES SHALL BE GALVANIZED STEEL.
5. THE POLE SHALL BE PRECAMBERED IF DEFLECTION EXCEEDS L/60 OF THE STRUCTURE HEIGHT ABOVE GROUND UNDER LOAD CASE 11 & 16.
6. POLE CAP FOR TRUNNION CLAMP PER SDG&E DWG 17188.
7. CLIMBING AND WORKING STEPS PER SDG&E DWG 17185.
8. POLE GROUNDING PER SDG&E DWG 17135.
9. LOAD CASE 15 BREAKS TWO WIRES:
(1) OPGW
(1) TOP 230kV TRANSMISSION PHASE A
10. LOAD FOR CASE 15 SHALL BE APPLIED AT TIP OF CROSSARM.
11. THIS DRAWING SHOWS DESIGN LOADING, DIMENSIONS AND CONFIGURATIONS FOR INFORMATION, REFERENCE FABRICATION'S CALCULATIONS, AND DRAWINGS FOR FINAL STRUCTURE DESIGN AND DETAILS.

230KV TRANSMISSION LINE
SINGLE CIRCUIT STRUCTURE 2

Kiewit

DRAWING NUMBER
SGL CKT STR2

REFERENCE(S)

1. 230KV TRANSMISSION LINESINGLE CIRCUIT STRUCTURE 2 (GL CKT STR2) - KIEWIT 2023

CLIENT
GEM A-CAES LLC

PROJECT
WILLOW ROCK ENERGY STORAGE CENTER
SUPPLEMENTAL AFC

TITLE
REPRESENTATIVE TRANSMISSION POLE, STRUCTURE 2

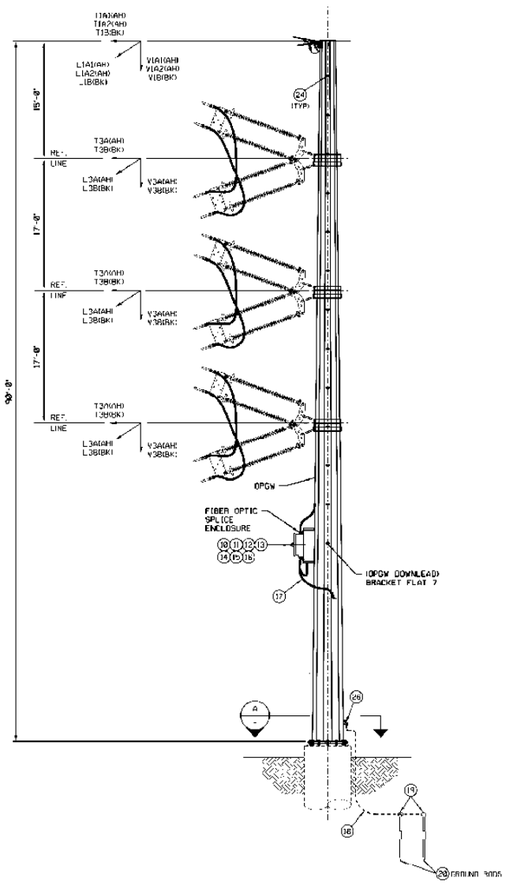
CONSULTANT
wsp

YYYY-MM-DD	2024-02-23
DESIGNED	SHL
PREPARED	SHL
REVIEWED	
APPROVED	

PROJECT NO.	CONTROL	REV.	FIGURE
31406639.003	01	0	3-1b

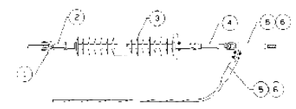
IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B

LOADING TABLE (KIPS)																				
DESCRIPTION	LOAD	CASE 1	CASE 2	CASE 3	CASE 4	CASE 5	CASE 6	CASE 7	CASE 8	CASE 9	CASE 10	CASE 11	CASE 12	CASE 13	CASE 14	CASE 15	CASE 16	CASE 17	CASE 18
OPGW AHEAD	T1A	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	V1A	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	L1A	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1/2" EHS SHIELD WIRE AHEAD	T1A1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
LOADS SHOWN APPLY TO EACH SHIELD WIRE	T1A2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	T1A3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2/2 ACSS "BITTERN" BACK	T2B	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	V2B	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	L2B	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2/2 ACSS "BITTERN" AHEAD	T2A	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	V2A	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	L2A	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
WIND ON STRUCTURE (PSF)	WIND	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

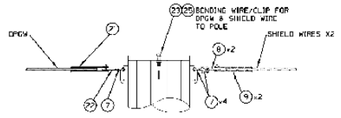


MECHANICAL LOADING CRITERIA

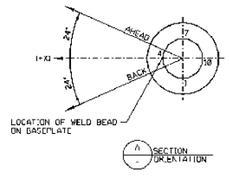
1 - NESC RULE 250B - LIGHT LOADING (ONTARIO): 9 PSF WIND, 0" ICE, 30 DEG F, INITIAL
LOAD FACTORS: TRANSVERSE=2.5, LONGITUDINAL=1.65, VERTICAL=1.0
2 - NESC RULE 250A - HEAVY LOADING (ICE): 4 PSF WIND, 0.5" ICE, 0 DEG F, INITIAL
LOAD FACTORS: TRANSVERSE=2.5, LONGITUDINAL=1.65, VERTICAL=1.0
3 - NESC RULE 250B - LIGHT LOADING (DEADEND): 9 PSF WIND, 0" ICE, 30 DEG F, INITIAL
LOAD FACTORS: TRANSVERSE=2.5, LONGITUDINAL=1.65, VERTICAL=1.0
4 - NESC RULE 250C - EXTREME WIND (ONTARIO): 16.5 PSF WIND, 0" ICE, 60 DEG F, INITIAL
LOAD FACTORS: 1.0
5 - NESC RULE 250C - EXTREME WIND (DEADEND): 18.0 PSF WIND, 0" ICE, 60 DEG F, INITIAL
LOAD FACTORS: 1.0
6 - NESC RULE 261A - EXTREME WIND (WITHOUT CONDUCTORS): 10.5 PSF WIND, 0" ICE, 60 DEG F
LOAD FACTORS: 1.0
7 - ASCE 74/IWIS (/24L-20R RESIDUAL STATIC LOAD (RSL): 2 PSF WIND, 0" ICE, 60 DEG F, INITIAL
LOAD FACTORS: TRANSVERSE=2.5, LONGITUDINAL=1.65, VERTICAL=1.0
8 - ASCE 7-10 EXTREME WIND: 21 PSF WIND, 0" ICE, 60 DEG F, INITIAL
LOAD FACTORS: 1.0
9 - CO-05 LIGHT LOADING (ONTARIO): 9 PSF WIND, 0" ICE, 25 DEG F, INITIAL
SAFETY FACTOR: 1.5
10 - CO-05 LIGHT LOADING (DEADEND): 0 PSF WIND, 0" ICE, 25 DEG F, INITIAL
SAFETY FACTOR: 1.5
11 - EVERYDAY/ME-CHAMBERS: 2 PSF WIND, 0" ICE, 60 DEG F, INITIAL
LOAD FACTORS: 1.0
12 - SDGE CASE 1 (DI-9E LIGHT LOADING (ONTARIO): 9 PSF WIND, 0" ICE, 25 DEG F, INITIAL
SAFETY FACTOR: 1.5
13 - SDGE CASE 1A FT2 VERY HIGH: 20 PSF WIND, 0" ICE, 60 DEG F, FINAL
SAFETY FACTOR: 1.0
14 - SDGE CASE 2A TERMINAL DEADEND: 9 PSF WIND, 0" ICE, 25 DEG F, INITIAL
SAFETY FACTOR: 1.5
15 - SDGE CASE 2B BROKEN PHASE: 9 PSF WIND, 0" ICE, 25 DEG F, FINAL
SAFETY FACTOR: 1.25
16 - SDGE CASE 3 (AMBER): 0 PSF WIND, 0" ICE, 60 DEG F, FINAL
SAFETY FACTOR: 1.0
17 - SDGE CASE 5 STRINGING WIRE: 13 PSF WIND, 0" ICE, 25 DEG F, INITIAL
SAFETY FACTOR: 1.25
CONDUCTORS STRUNG AT 30 DEGREES HORIZONTAL,
VERTICAL LOAD OF 1500 LBS
18 - SDGE ARM DESIGN: 9 PSF WIND, 0" ICE, 25 DEG F, INITIAL
SAFETY FACTOR: 1.25
CONDUCTORS STRUNG AT 30 DEGREES HORIZONTAL,
VERTICAL LOAD OF 1500 LBS



INSULATOR ASSEMBLY
POLYMER DEADEND INSULATOR SINGLE
CONDUCTOR-ACSR 230KV STEEL
STRUCTURE
(NOT TO SCALE)



SHIELD WIRE/OPGW ASSEMBLY
OHGW DEADEND ASSEMBLY
OPGW DEADEND ASSEMBLY
(NOT TO SCALE)



BILL OF MATERIALS

ITEM NO	ITEM DESCRIPTION	MANUFACTURER	CATALOG NO.	PROVIDED BY	MIN QTY	UNITS
1	ANCHOR SHACKLE, 80K	-	-	-	12	EA
2	BALL EYE-EYE, 30K	-	-	-	12	EA
3	INSULATOR, SUSPENSION, POLYMER, 1025-184" LONG, BALL SHOT END AND SOCKET, WITH CORONA RING, 30K	-	-	-	12	EA
4	Y CLEVIS, SOCKET, HOT LINE, 30K	-	-	-	12	EA
5	3D "BEND" COMPRESSION	-	-	-	12	EA
6	JOINT COMPOUND, 16 OZ. TUBE	-	-	-	4	EA
7	SHACKLE, ANCHOR, 30K	-	-	-	5	EA
8	EXTENSION 5" RAP, 2-1/2" x 5/8" x 4" LG., GALV. STEEL, 40K	-	-	-	2	EA
9	CLAMP, QUADRANT 2" BARK, DUCTILE IRON	-	-	-	2	EA
10	OPGW SPLICE ENCLOSURE	-	-	-	1	EA
11	OPGW COIL BRACKET	-	-	-	1	EA
12	OPGW CONNECTOR KIT	-	-	-	1	EA
13	ADSS CONNECTOR	-	-	-	1	EA
14	POLE BAND MOUNTING BRACKET	-	-	-	2	EA
15	POLE BAND FOR COIL BRACKET	-	-	-	2	EA
16	SPLICE PROTECTION SLEEVE	-	-	-	5	EA
17	ADSS	-	-	-		
18	GROUNDING WIRE, #2 COPPERWELD	-	-	-	20	FT
19	GROUND ROD CLAMP	-	-	-	2	EA
20	GROUNDING ROD, COPPERWELD, 5/8"X 8'	-	-	-	2	EA
21	OPGW BOLTED DEAD-END	-	-	-	1	EA
22	DEAD END LINK, PATE	-	-	-	1	EA
23	OPGW BONDING WIRE ASSEMBLY	-	-	-	1	EA
24	DOWNLEAD CLAMP, OPGW	-	-	-	15	PA
25	BONDING CLIP FOR SHIELD WIRE PER 1/2" BOLT	-	-	-	1	EA
26	COMP. TERM. FOR #2 CU TO 2 HOLE NEMA	-	-	-	1	EA

- ALTERNATE MATERIALS MAY BE SUBMITTED FOR REVIEW AND APPROVAL
- QUANTITIES ARE FOR INFORMATION ONLY

DESIGN NOTES

1. ALL LOADS ARE ULTIMATE LOADS AND INCLUDE OVERLOAD FACTORS AND WEIGHT OF INSULATORS, AND HARDWARE.
2. UNITS OF ENTRIES ON THE STRUCTURE LOADING TABLE ARE AS FOLLOWS: TRANSVERSE (T), VERTICAL (V), AND LONGITUDINAL (L) LOADS - KIPS; WIND PRESSURE (W) - LBS PER SQ FT.
3. THE TRANSVERSE LOADS (T) INCLUDE WIND REACTIONS ON THE WIRES AND THE TRANSVERSE LOAD DUE TO THE LINE ANGLE.
4. ALL STEEL POLES SHALL BE GALVANIZED STEEL.
5. THE POLE SHALL BE PRECAMBERED IF DEFLECTION EXCEEDS 1.5% OF THE STRUCTURE HEIGHT ABOVE GROUND UNDER LOAD CASE 11 & 16.
6. POLE CAP FOR TRUNNION CLAMP PER SDGE&E DWG 17188.
7. CLIMBING AND WORKING STEPS PER SDGE&E DWG 17185.
8. POLE GROUNDING PER SDGE&E DWG 17139.
9. FOR CASE 16 BREAKS TWO WIRES:
   1) OPGW
   2) 1 OF 230kV TRANSMISSION PHASE 4
10. LOAD FOR CASE 15 SHALL BE APPLIED AT TIP OF CROSSARM.
11. THIS DRAWING SHOWS DESIGN LOADING, DIMENSIONS AND CONFIGURATIONS FOR INFORMATION. REFERENCE FABRICATOR'S CALCULATIONS, AND DRAWINGS FOR FINAL STRUCTURE DESIGN AND DETAILS.

230KV TRANSMISSION LINE
SINGLE CIRCUIT STRUCTURE 3

Kiewit

DRAWING NUMBER
SGL CKT STR3

REFERENCE(S)
1. 230KV TRANSMISSION LINESINGLE CIRCUIT STRUCTURE 3 (GL CKT STR3) - KIEWIT 2023

CLIENT
GEM A-CAES LLC

PROJECT
WILLOW ROCK ENERGY STORAGE CENTER
SUPPLEMENTAL AFC

TITLE
REPRESENTATIVE TRANSMISSION POLE, STRUCTURE 3

CONSULTANT
wsp

YYYY-MM-DD	2024-02-23
DESIGNED	SHL
PREPARED	SHL
REVIEWED	
APPROVED	

PROJECT NO.	CONTROL	REV.	FIGURE
31406639.003	01	0	3-1c

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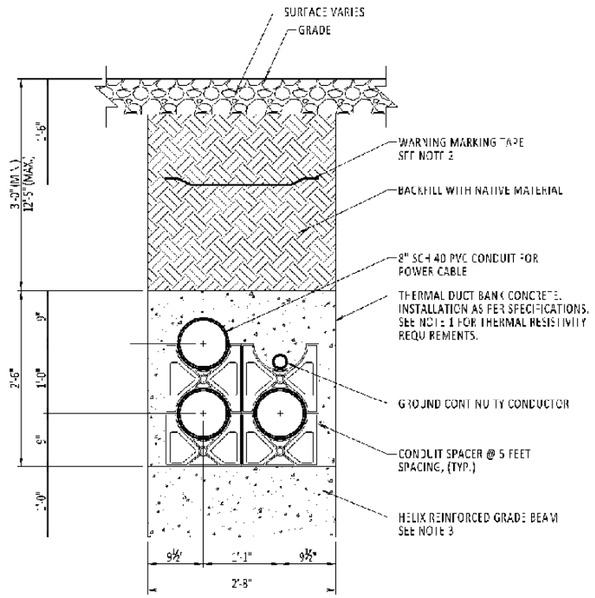


8" PVC CONDUIT
2 X 2 HELIX DUCT BANK

SCALE ½" = 1'-0"

NOTES:

1. THE THERMAL RESISTIVITY OF THE DUCT BANK CONCRETE SHALL BE NO MORE THAN 55° C-cm/W.
2. CONTRACTOR TO INSTALL WARNING MARKING TAPE ABOVE THE DUCT BANK AS SHOWN. CABLE MARKING TAPE SHALL BE PROVIDED BY THE CONTRACTOR TO COVER THE ENTIRE UNDERGROUND LENGTH OF THE CONCRETE DUCT BANK. CABLE MARKING TAPE WILL BE PER THE SPECIFICATION. THE TAPE SHALL BE INSTALLED FLAT AND DIRECTLY ABOVE THE DUCT BANK WITH THE PRINTED SIDE UP. TAPE SHALL BE INSTALLED AS INDICATED ON THE DRAWINGS.
3. CONTRACTOR SHALL USE APPROVED HELIX REINFORCED CONCRETE MIX DESIGN FOR SUPPORT OF THE DUCT BANK (5,000 P.S.I.).
4. CONCRETE CONSTRUCTION SHALL BE IN ACCORDANCE WITH THE BUILDING CODE REQUIREMENTS FOR HELIX REINFORCED CONCRETE (ACI-318) AND CAST-IN-PLACE CONCRETE SPECIFICATION, CLASS I.
5. 3 INCH MINIMUM EDGE TO EDGE SPACING SHALL BE MAINTAINED BETWEEN CONDUITS AT ALL LOCATIONS.

Kiewit

- PRELIMINARY -
NOT FOR CONSTRUCTION

A	*revision description		
	1st Init.Last Name	1st Init.Last Name	date
REV	DESIGN BY	CHECKED BY	DATE

KIEWIT DETAIL DRAWING STANDARDS
UNDERGROUND TRANSMISSION LINES

8" PVC CONDUIT
2X2 HELIX DUCT BANK

ENGINEERING ORDINATOR	1st Init.Last Name	DRAWING NUMBER
LEAD ENG	1st Init.Last Name	DS1132
ENG MGR	1st Init.Last Name	
PROJ MGR	1st Init.Last Name	

REFERENCE(S)
1. 8" PVC CONDUIT 2X2 HELIX DUCT BANK (DS1132) - KIEWIT 2023

CLIENT
GEM A-CAES LLC

PROJECT
WILLOW ROCK ENERGY STORAGE CENTER
SUPPLEMENTAL AFC

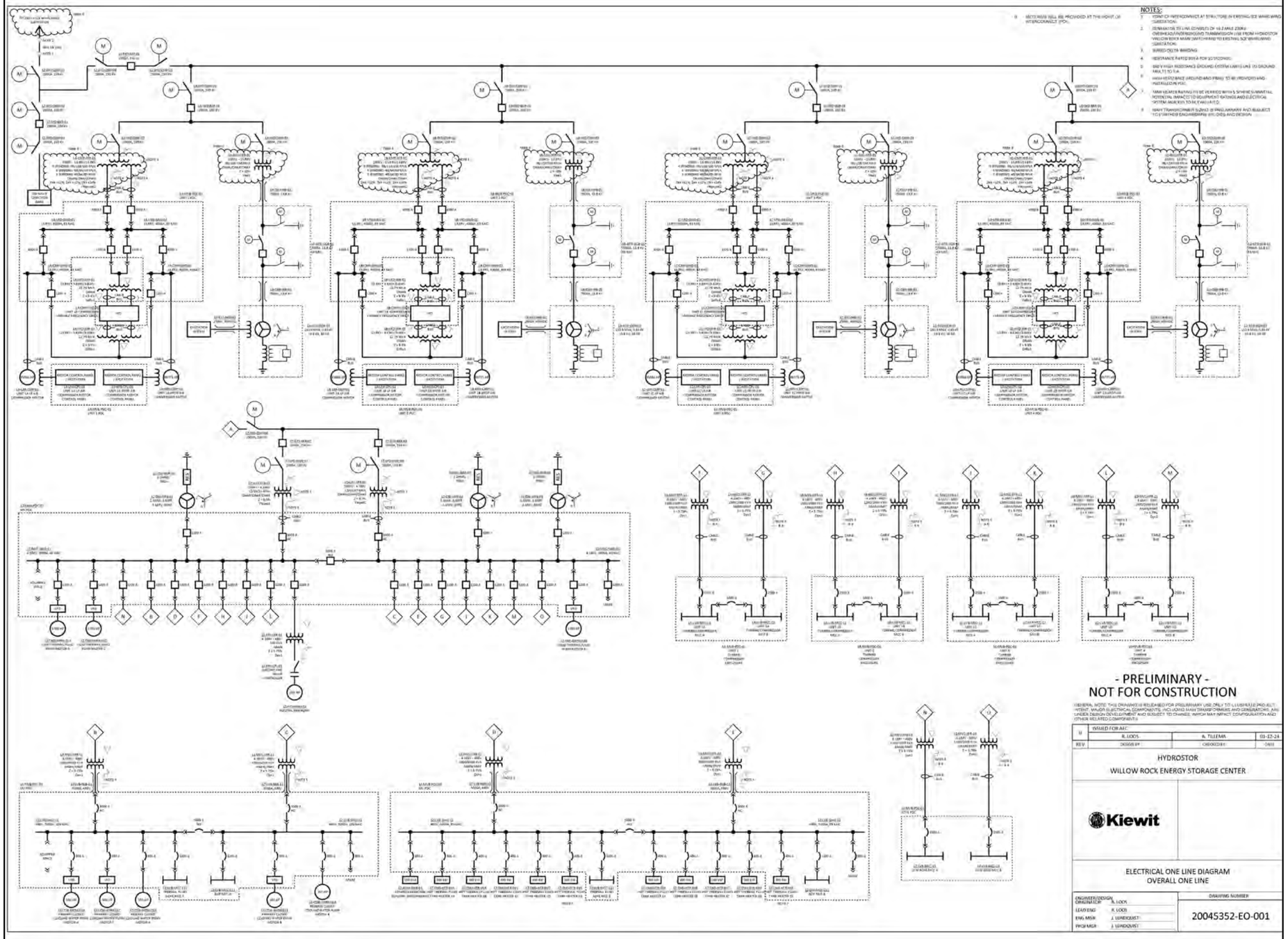
TITLE
230-KILOVOLT UNDERGROUND CABLE INSTALLATION EXAMPLE

CONSULTANT
wsp

YYYY-MM-DD	2024-02-23
DESIGNED	SHL
PREPARED	SHL
REVIEWED	
APPROVED	

PROJECT NO.	CONTROL	REV.	FIGURE
31406639.003	01	0	3-2

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B



REFERENCE(S)

1. ELECTRICAL ONE LINE DIAGRAM OVERALL ONE LINE (20045352-EO-001) - KIEWIT 2024

CLIENT
GEM A-CAES LLC

PROJECT
WILLOW ROCK ENERGY STORAGE CENTER
SUPPLEMENTAL AFC

TITLE
ELECTRICAL ONE-LINE DIAGRAM

CONSULTANT

YYYY-MM-DD	2024-02-23
DESIGNED	SHL
PREPARED	SHL
REVIEWED	
APPROVED	

PROJECT NO.	CONTROL	REV.	FIGURE
31406639.003	01	0	3-3

The Willow Rock switchyard will be on the northeastern corner of the WRESC Site. The substation will be of the tubular bus type with interconnecting conductors and will consist of high-voltage sulfur hexafluoride (SF6)-insulated dead-tank circuit breakers and no-load switches.

Connections to the aerial conductor cable will be provided from the two dual-winding transformers for the inter-tie to the utility grid. The high-voltage circuit breaker will be equipped with a no-load break, air-insulated, disconnect switch. A transformer circuit breaker and isolating disconnect switch will also be installed in each transformer connection to allow for transformer protection and isolation when the corresponding transformer is out of service. Tubular IPS bus type with interconnecting conductors will be used as the primary interconnection material within the switchyard. The IPS and conductors will be attached to post-insulator columns on structural steel supports. The main substation will transform power from 230 to 13.8 kV, and vice versa.

Current and voltage transformers will be located at points within the substation to provide metering and relaying. Control, protection, and monitoring for the substation will take place in the substation protection and control building. Monitoring and alarms will be available to the supervisory control system operator workstations in the control module. All protection and circuit breaker control will be powered from the station battery-backed 125-volt direct-current system.

Each motor/generator substation will have two dual-winding transformers with wye-delta for the generator and delta-wye for the motors. The 13.8 kV side will be fed with underground cables and will be International Organization for Standardization (ISO) phase bus duct connections with SF6 circuit breakers.

3.3 Gen-tie Interconnection Studies

Hydrostor A-CAES USA Inc., parent company to GEM, filed an Interconnection Request (IR) with the California Independent System Operator (CAISO) on behalf of the Applicant on April 15, 2020 (in the Cluster 13 IR window). CAISO, in cooperation with SCE, prepared the Phase I Interconnection Study (dated January 25, 2021, as modified by Addendum #1 dated March 10, 2021), which considered the potential system impacts of the proposed Willow Rock interconnect (see confidential docket TN#: 241428, December 12, 2021). As part of the Cluster 13 study process, Willow Rock was studied alongside other interconnection requests in Cluster 13, and, therefore, the Phase I Interconnection Study results represent the most-impacted scenario in terms of potential effects on the transmission system. The results of the Phase I study provided the California Energy Commission with the information that it needs to conduct an environmental assessment of the potential impacts of the WRESC interconnection facilities on the existing grid. As part of the interconnection process with CAISO and SCE, GEM will update the IR through the submission of a Material Modification Assessment application to align the IR with the most current design information. The Phase II Interconnection Study results were issued on November 22, 2021, and the 2022 Generator Reassessment Report was issued on July 29, 2022. The results were confidentially docketed (see docket TN#s: 247169 through 247183, October 13, 2022).

3.4 Gen-tie Line Safety and Nuisances

This section discusses safety and nuisance issues associated with the proposed electrical interconnection.

3.4.1 Electrical Clearances

Typical high-voltage overhead gen-tie lines are composed of bare conductors connected to supporting structures by means of porcelain, glass, or polymer insulators. The air surrounding the energized conductor acts as the insulating medium. Maintaining sufficient clearances, or air space, around the conductors to protect the public and utility workers is paramount to the safe operation of the line. The safety clearance required for the conductors is determined by considering factors such as the normal operating voltages, conductor temperatures, short-term abnormal voltages, windblown swinging conductors, contamination of the insulators, clearances for workers, and clearances for public safety. The line will conform to the minimum clearances specified in the California Public Utilities Commission (CPUC) General Order (GO) 95. Electric utilities, state regulators, and local ordinances may specify additional (more restrictive) clearances. Typically, clearances are specified for the following:

- Distance between the energized conductors
- Distance between the energized conductors and the supporting structure

- Distance between the energized conductors and other power or communication wires on the same supporting structure, or between other power or communication wires above or below the conductors
- Distance from the energized conductors to the ground and features such as roadways, railroads, driveways, parking lots, navigable waterways, and airports
- Distance from the energized conductors to buildings and signs
- Distance from the energized conductors to other parallel power lines

The gen-tie interconnection for Willow Rock will be designed to meet applicable national, state, and local clearance requirements.

3.4.2 Electrical Effects

The electrical effects of gen-tie lines fall into two broad categories: corona effects and field effects. Corona is the ionization of the air that occurs at the surface of the energized conductor and suspension hardware attributable to high electric field strength at the surface of the metal during certain conditions. Corona may result in radio and television reception interference, audible noise, light, and production of ozone. Field effects are the voltages and currents that may be induced in nearby conducting objects. A gen-tie line's inherent electric and magnetic fields cause these effects.

3.4.2.1 Electric and Magnetic Fields

Operating power lines, like energized components of electrical motors, home wiring, lighting, and other electrical appliances, produce electric and magnetic fields commonly referred to as an electromagnetic field (EMF). The EMF produced by the alternating current electrical power system in the United States has a frequency of 60 hertz, meaning that the intensity and orientation of the field changes 60 times per second.

Electric fields around gen-tie lines are produced by electrical charges on the energized conductor. Electric field strength is directly proportional to the line's voltage (i.e., increased voltage produces a stronger electric field). At a given distance from the gen-tie line conductor, the electric field is inversely proportional to the distance from the conductors, so that the electric field strength declines as the distance from the conductor increases. The strength of the electric field is measured in units of kV per meter. The electric field around a gen-tie line remains steady and is not affected by the common daily and seasonal fluctuations in usage of electricity by customers.

Magnetic fields around gen-tie lines are produced by the level of current flow, measured in terms of amperes, through the conductors. The magnetic field strength is also directly proportional to the current (i.e., increased amperes produce a stronger magnetic field). The magnetic field is inversely proportional to the distance from the conductors. Thus, like the electric field, the magnetic field strength declines as the distance from the conductor increases. Magnetic fields are expressed in units of milligauss. The amperes, and therefore the magnetic field around a gen-tie line, fluctuate daily and seasonally as the usage of electricity varies.

Considerable research has been conducted over the last 30 years on the possible biological effects and human health effects from EMFs. This research has produced many studies that offer no uniform conclusions about whether long-term exposure to EMFs is harmful. In the absence of conclusive or evocative evidence, some states, including California, have chosen not to specify maximum acceptable levels of EMF. Instead, these states mandate a program of prudent avoidance whereby EMF exposure to the public is minimized by encouraging electric utilities to use cost-effective techniques to reduce the levels of EMFs.

3.4.2.2 Audible Noise and Radio and Television Interference

Corona from a gen-tie line may result in the production of audible noise or radio and television interference. Corona is a function of the voltage of the line, the diameter of the conductor, and the condition of the conductor and suspension hardware. The electric field gradient is the rate at which the electric field changes and is directly related to the line voltage.

The electric field gradient is greatest at the surface of the conductor. Large-diameter conductors have lower electric field gradients at the conductor surface and, hence, lower corona than smaller conductors, everything else being equal. Also, irregularities (such as nicks and scrapes on the conductor surface) or sharp edges on

suspension hardware concentrate the electric field at these locations and, thus, increase corona at these spots. Similarly, contamination on the conductor surface such as dust or insects can cause irregularities that are a source for corona. Raindrops, snow, fog, and condensation are also sources of irregularities.

3.4.2.3 Electromagnetic Fields, Audible Noise, and Radio and Television Interference Assumptions

It is important to remember that EMFs, audible noise, and radio and television interference near power lines vary in line design, line loading, distance from the line, and other factors.

Electric fields, corona, audible noise, and radio and television interference depend on voltage and not on the level of power flow. Because line voltage remains nearly constant for a gen-tie line during normal operation, the audible noise associated with the 230 kV lines in the area will be of the same magnitude before and after the Project.

Corona typically becomes a design concern for gen-tie lines with voltages of 345 kV and above. Since the WRESC will be connected at 230 kV voltage level, it is expected that no corona-related design issues will be encountered.

A magnetic field is proportional to line loading (amperes), which varies as demand for electrical power varies and as generation from the generating facility is changed by the system operators to meet changes in demand.

Construction and operation of the WRESC, including the interconnection of the facility with SCE'S transmission system, are not expected to result in significant increases in EMF levels, corona, audible noise, or radio and television interference.

3.4.2.4 Induced Current and Voltages

A conducting object, such as a vehicle or person in an electric field, will experience induced voltages and currents. The strength of the induced current will depend on the electric field strength, the size and shape of the conducting object, and the object-to-ground resistance. When a conducting object is isolated from the ground and a grounded person touches the object, a perceptible current or shock may occur as the current flows to ground. The mitigation for hazardous and nuisance shocks is to ensure that metallic objects on or near the gen-tie right-of-way are grounded and that sufficient clearance is provided at roadways and parking lots to keep electric fields at these locations low enough to prevent vehicle short-circuit currents from exceeding 5 milliamperes.

Magnetic fields can also induce voltages and currents in conducting objects. Typically, this requires a long metallic object, such as a wire fence or aboveground pipeline, that is grounded at only one location. A person who closes an electrical loop by grounding the object at a different location will experience a shock like that described for an ungrounded object. Mitigation for this problem is to ensure multiple grounds on fences or pipelines, especially those oriented parallel to the gen-tie line.

The proposed 230 kV gen-tie interconnection line will be constructed in conformance with CPUC GO-95 and Title 8 California Code of Regulations (CCR) 2700 requirements. Therefore, hazardous shocks are unlikely to occur because of Project construction, operation, or maintenance.

3.4.3 Fire Hazards

The proposed 230 kV gen-tie interconnection will be designed, constructed, and maintained in accordance with applicable standards, including GO-95, which establishes clearances from other human-built and natural structures, as well as tree-trimming requirements to mitigate fire hazards.

The gen-tie corridor and immediate area will be maintained in accordance with existing regulations and accepted industry practices that will include identification and abatement of fire hazards.

3.5 Laws, Ordinances, Regulations, and Standards

This section provides a list of applicable LORS that apply to the proposed gen-tie line, substations, and engineering.

3.5.1 Design and Construction

Table 3-1 lists the LORS for the design and construction of the proposed gen-tie line and switchyard.

Table 3-1: Design and Construction Laws, Ordinances, and Regulations for the Proposed Gen-tie Line and Switchyard

LORS	Applicability
Title 8 CCR, Section 2700 et seq. "High Voltage Electrical Safety Orders"	*Establishes essential requirements and minimum standards for installation, operation, and maintenance of electrical installation and equipment to provide practical safety and freedom from danger.*
Title 8 CCR, Section 2700 et seq. "High Voltage Electrical Safety Orders"	*Applies to the design of facilities subject to CPUC's jurisdiction to provide or mitigate inductive interference.*
ANSI/IEEE 593, "IEEE Recommended Practices for Seismic Design of Substations"	*Recommends design and construction practices.*
IEEE 1119, "IEEE Guide for Fence Safety Clearances in Electric-Supply Stations"	*Recommends clearance practices to protect persons outside the facility from electric shock.* *Applies to the design of facilities subject to CPUC's jurisdiction to provide or mitigate inductive interference.*
IEEE 980, "Containment of Oil Spills for Substations"	*Recommends preventions for release of fluids into the environment.*

ANSI = American National Standards Institute; CCR = California Code of Regulations; CPUC = California Public Utilities Commission; IEEE = Institute of Electrical and Electronics Engineers; LORS = Laws, Ordinances, Regulations, and Standards

3.5.2 Electric and Magnetic Fields

The LORS pertaining to EMF are listed in **Table 3-2**.

Table 3-2: Electric and Magnetic Fields Laws, Ordinances, Regulations, and Standards

LORS	Applicability
Decision 93-11-013, CPUC	*CPUC position on EMF reduction.*
GO-131-D, CPUC, "Rules for Planning and Construction of Electric Generation, Line, and Substation Facilities in California"	*CPUC construction application requirements, including requirements related to EMF reduction.*
ANSI/IEEE 544-1994, "Standard Procedures for Measurement of Power Frequency Electric and Magnetic Fields from AC Power Lines"	*Standard procedure for measuring EMF from an electric line that is in service.*

AC = alternating current; ANSI = American National Standards Institute; CPUC = California Public Utilities Commission; EMF = electromagnetic field; IEEE = Institute of Electrical and Electronics Engineers; GO = General Order; LORS = Laws, Ordinances, Regulations, and Standards

3.5.3 Hazardous Shock

Table 3-3 lists the LORS regarding hazardous shock protection that apply to the gen-tie interconnection and the overall Project.

Table 3-3: Hazardous Shock Laws, Ordinances, Regulations, and Standards

LORS	Applicability
8 CCR 2700 et seq. "High Voltage Electrical Safety Orders"	*Establishes essential requirements and minimum standards for installation, operation, and maintenance of electrical equipment to provide practical safety and freedom from danger.*
ANSI/IEEE 80, "IEEE Guide for Safety in AC Substation Grounding"	*Presents guidelines for assuring safety through proper grounding of AC outdoor substations.*
NESC, ANSI C2, Section 9, Article 92, Paragraph E; Article 93, Paragraph C	*Covers grounding methods for electrical supply and communications facilities.*

AC = alternating current; ANSI = American National Standards Institute; IEEE = Institute of Electrical and Electronics Engineers; LORS = Laws, Ordinances, Regulations, and Standards; NESC = National Electrical Safety Code

3.5.4 Communications Interference

The LORS pertaining to communications interference are listed in **Table 3-4**.

Table 3-4: Communications Interference

LORS	Applicability
47 CFR 15.25, "Operating Requirements, Incidental Radiation"	*Prohibits operation of any device emitting incidental radiation that causes interference to communications; also requires mitigation for any device that causes interference.*
GO-52, CPUC	*Covers all aspects of the construction, operation, and maintenance of power and communication lines, and specifically applies to the prevention or mitigation of inductive interference.*

CFR = Code of Federal Regulations; CPUC = California Public Utilities Commission; GO = General Order

3.5.5 Aviation Safety

Table 3-5 lists the aviation safety LORS that may apply to the proposed gen-tie interconnection and the overall Project.

Table 3-5: Aviation Safety Laws, Ordinances, Regulations, and Standards

Title 14 CFR, Part 77, "Objects Affecting Navigable Airspace"	*Describes the criteria used to determine whether a "Notice of Proposed Construction or Alteration" (FAA Form 7450-1) is required for potential obstruction hazards.*
FAA Advisory Circular No. 70/7450-1G, "Obstruction Marking and Lighting"	*Describes the FAA standards for marking and lighting of obstructions as identified by FAA Regulations Part 77.*

CFR = Code of Federal Regulations; FAA = Federal Aviation Administration

Table 3-6 lists the LORS governing fire hazard protection for the proposed gen-tie interconnection and the overall Project.

Table 3-6: Fire Hazard Laws, Ordinances, Regulations, and Standards

LORS	Applicability
14 CCR Sections 1250-1258, "Fire Prevention Standards for Electric Utilities"	*Provides specific exemptions from electric pole and tower firebreak and electric conductor clearance standards and specifies when and where standards apply.*
GO-95, CPUC, "Rules for Overhead Electric Line Construction," Section 35	*CPUC rule covers all aspects of design, construction, operation, and maintenance of electric transmission lines and fire safety (hazards).*
ANSI/IEEE 80, "IEEE Guide for Safety in AC Substation Grounding"	*Presents guidelines for assuring safety through proper grounding of AC outdoor substations.*

AC = alternating current; ANSI = American National Standards Institute; CCR = California Code of Regulations; CPUC = California Public Utilities Commission; GO = General Order; IEEE = Institute of Electrical and Electronics Engineers; LORS = Laws, Ordinances, Regulations, and Standards

3.5.6 Jurisdiction

Table 3-7 identifies national, state, and local agencies with jurisdiction to issue permits or approvals, conduct inspections, or enforce the above-referenced LORS. **Table 3-7** also identifies the responsibilities of these agencies as they relate to construction, operation, and maintenance of the WRESC.

Table 3-7: National, State and Local Jurisdiction over Applicable Laws, Ordinances, Regulations, and Standards

Agency or Jurisdiction	Responsibility
Federal Aviation Administration	*Establishes regulations for marking and lighting of obstructions in navigable airspace (AC No. 70/7450-1G).*
California Energy Commission	*Jurisdiction over new gen-tie lines associated with thermal power plants that are 50 MW or more (PRC 25500) to the first point of interconnection with the grid.*
California Public Utilities Commission	*Regulates construction and operation of overhead transmission lines (GO-95).*
California Public Utilities Commission	*Regulates construction and operation of power and communications lines for the prevention of inductive interference (GO-52).*
Local Electrical Inspector	*Jurisdiction over safety inspection of electrical installations that connect to the supply of electricity (NFPA 70).*
Kern County	*Establishes and enforces zoning regulations for specific land uses. Issues variances in accordance with zoning ordinances.* *Issues and enforces certain ordinances and regulations concerning fire prevention and electrical inspection.*

AC = Advisory Circular; GO = General Order; MW = megawatts; NFPA = National Fire Protection Association; PRC = Public Resources Code

4.0 NATURAL GAS SUPPLY

GEM A-CAES LLC's (GEM, the Applicant) Willow Rock Energy Storage Center (WRESC) will be located on approximately 88.6 acres of private land immediately north of Dawn Road and between State Route 14 and Sierra Highway within unincorporated, southeastern Kern County, California. The WRESC will be a nominal 520-megawatt (MW) gross (500 MW net) and 4,160 megawatt-hour (MWh) gross (4,000 MWh net) facility using Hydrostor, Inc.'s proprietary, advanced compressed air energy storage technology. Energy stored at the WRESC will be delivered to Southern California Edison's Whirlwind Substation located southwest of the WRESC at the intersection of 170th Street W and Rosamond Boulevard, via a new approximately 19-mile 230-kilovolt generation-tie (gen-tie) line. The WRESC will be capable of operating on a 24-hour basis, 365 days a year with an approximately 50-year lifespan.

The Project or Project Area encompasses the WRESC Site, the parcels within the Project Boundary, and the right-of-way associated with the WRESC's gen-tie line. The Project Boundary encompasses the WRESC Site and the parcels of land (an additional 133 acres of private land surrounding the WRESC) that will be allocated for potential temporary staging and laydown area (referred to herein as the Staging Area) during construction, or the construction of a permanent architectural berm constructed from the material excavated during cavern construction. The Staging Area consists of groups of accessors parcels referred to as P1, P2N, P2S, and VH.

Natural gas will not be used for either construction or operation of the WRESC. Consequently, the Project will not have an impact on natural gas supplies.

5.0 Environmental Analysis

GEM A-CAES LLC's (GEM, the Applicant) Willow Rock Energy Storage Center (WRESC, or Willow Rock) will be located on approximately 88.6 acres of private land immediately north of Dawn Road and between State Route (SR) 14 and Sierra Highway within unincorporated, southeastern Kern County, California. The WRESC will be a nominal 520-megawatt (MW) gross (500 MW net) and 4,160 megawatt-hour (MWh) gross (4,000 MWh net) facility using Hydrostor, Inc.'s (Hydrostor's) proprietary, advanced compressed air energy storage (A-CAES) technology. Energy stored at the WRESC will be delivered to Southern California Edison's (SCE's) Whirlwind Substation located southwest of the WRESC at the intersection of 170th Street W and Rosamond Boulevard, via a new approximately 19-mile 230-kilovolt (kV) generation-tie (gen-tie) line.

The Project or Project Area encompasses the WRESC Site, the parcels within the Project Boundary, and the right-of-way (ROW) associated with the WRESC's gen-tie line. The Project Boundary encompasses the WRESC Site and the parcels of land (an additional 133 acres of private land surrounding the WRESC) that will be allocated for potential temporary staging and laydown area (referred to herein as the Staging Area) during construction, or the construction of a permanent architectural berm constructed from the material excavated during cavern construction. The Staging Area consists of groups of accessors parcels referred to as P1, P2N, P2S, and VH.

Table 5.0-1 summarizes what parcels constitute specific terms that refer to the Project and identifies the Assessor's Parcel Numbers (APN) for the parcels within each term. **Figure 5.0-1** identifies the WRESC Site, Project Boundary, and Staging Areas (e.g., P1, P2N, P2S, and VH).

This chapter contains 17 individual sections. The sections represent the standard environmental, public health and safety, and local impact assessment disciplines for which the California Energy Commission (CEC) Energy Facilities Siting Regulations (Title 20, California Code of Regulations, Section 1704, Appendix B) require information in an Application for Certification.

Most of the sections use a standardized format containing the following headings and associated content:

- Affected Environment includes relevant background information about the project's environmental, social, and regulatory settings.
- Environmental Analysis addresses the potential environmental consequences of the construction and operation of the Project. The section begins with a list of the criteria used to determine whether environmental effects of the Project qualify as significant adverse environmental impacts.
- Cumulative Effects discusses potential effects of the WRESC that are not significant adverse impacts, but that could reach significance cumulatively in combination with other projects.
- Mitigation Measures describes any mitigation measures necessary to reduce potential impacts below the level of significance.
- Laws, Ordinances, Regulations, and Standards (LORS) lists those that pertain to the Project for a given discipline, and includes a demonstration that the Project, as designed, would comply with all applicable LORS.
- Agencies and Agency Contacts is a list of federal agencies with permitting authority over the Project, and state and local regulatory agencies that would have such permitting authority, but for the exclusive purview of the CEC to license thermal power plants with a capacity of 50 megawatts or more in California. This section also contains a list of regulatory agency staff and their locations.
- Permits and Permit Schedules identifies applicable permits and their schedules.

Table 5.0-1: Breakdown of Project Area, Project Boundary, and Staging Area

		Assessor's Parcel Number (APN)	Temporary Use During Construction	Potential Long-Term Use
Project Area / Project Boundary / Staging Area	WRESC Site	431-022-13	WRESC Construction	WRESC Facility
	P1	431-122-18	Laydown/Parking	Architectural Berm
		431-122-14	Not Required	Architectural Berm
		431-122-15	Not Required	Architectural Berm
		431-122-16	Not Required	Architectural Berm
		431-122-17	Not Required	Architectural Berm
		431-122-03	Not Required	Architectural Berm
		431-122-07	Not Required	Architectural Berm
		431-122-08	Not Required	Architectural Berm
		431-022-12	Laydown/Parking	Architectural Berm
		431-022-11	Laydown/Parking	Architectural Berm
	P2N	431-111-30[1]	Laydown	No Long-Term Use
		431-112-24[1]	Laydown	No Long-Term Use
		431-112-25[1]	Laydown	No Long-Term Use
		431-112-26[1]	Laydown	No Long-Term Use
		431-112-27[1]	Laydown	No Long-Term Use
		431-122-01[2]	Laydown/Parking	No Long-Term Use
		431-122-02[2]	Laydown/Parking	No Long-Term Use
		431-122-04[2]	Laydown/Parking	No Long-Term Use
	P2S	471-061-05[1]	Laydown/Parking	No Long-Term Use
		471-061-06[1]	Laydown/Parking	No Long-Term Use
		471-061-07[1]	Laydown/Parking	No Long-Term Use
		471-061-08[1]	Laydown/Parking	No Long-Term Use
	VH	431-022-08	Laydown/Parking	No Long-Term Use
	Gen-Tie Line ROW	VARIES	Gen-Tie Construction	Gen-Tie

Notes:

The Study Area for each resource is dependent on specific requirements for each resource. Therefore, each resource's Study Area is defined at the beginning of each resource's section.

1 Parcels to be used only if additional parking and laydown area is needed during construction.

2 Parcels to be used only for laydown and additional parking during Gen-Tie Line construction.

Section 32

Section 33

Section 34

Section 5

Section 4

Section 3

VH

P2 N

P1

P2 S

WRESC Site

Project Boundary

CA-14 S

CA-14 N

Sierra Hwy

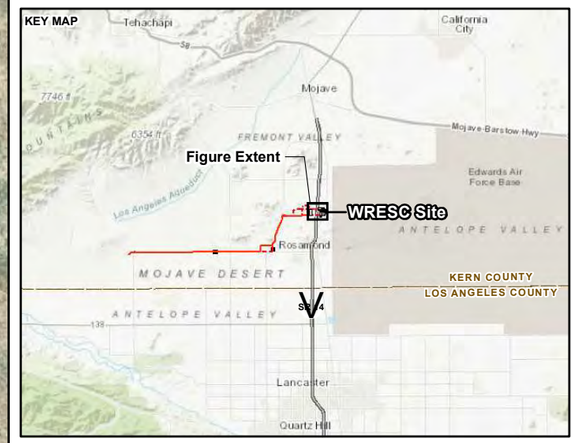
T10N R12W

T09N R12W

LEGEND

- Project Boundary
- WRESC Site
- P1
- P2 N
- P2 S
- VH
- Project Parcel Boundary
- PLSS Township and Range
- PLSS Section

KEY MAP



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1 " = 700 feet FEET

REFERENCE(S)

1. PARCEL BOUNDARIES - KERN COUNTY GIS DEPT.
2. PLSS SECTION, TOWNSHIP, AND RANGE - CA DEPT. CONSERVATION
3. COORDINATE SYSTEM: NAD 1983 STATEPLANE CALIFORNIA V FIPS 0405 FEET
4. MAP SERVICE LAYER CREDITS: SOURCES: ESRI, HERE, GARMIN, INTERMAP, INCREMENT P CORP., GEBCO, USGS, FAO, NPS, NRCAN, GEOBASE, IGN, KADASTER NL, ORDNANCE SURVEY, ESRI JAPAN, METI, ESRI CHINA (HONG KONG), (C) OPENSTREETMAP CONTRIBUTORS, AND THE GIS USER COMMUNITY SOURCE: ESRI, MAXAR, EARTHSTAR GEOGRAPHICS, AND THE GIS USER COMMUNITY

CLIENT
GEM A-CAES LLC

PROJECT
WILLOW ROCK ENERGY STORAGE CENTER
SUPPLEMENTAL AFC

TITLE
PROJECT DEFINED AREAS

CONSULTANT

YYYY-MM-DD	2024-02-22
DESIGNED	SHL
PREPARED	MK
REVIEWED	SH
APPROVED	VG/LL

PROJECT NO.	PHASE	REV.	FIGURE
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5.0.1 Cumulative Projects

Cumulative impacts are the WRESC's impacts combined with the impacts of other related past, present, and reasonably foreseeable future projects. As set forth in the CEQA Guidelines, the discussion of cumulative impacts must reflect the severity of the impacts, as well as the likelihood of their occurrence; however, the discussion need not be as detailed as the discussion of environmental impacts attributable to the project alone. As stated in CEQA, Title 14, Section 21083(b), "a project may have a significant effect on the environment if the possible effects of a project are individually limited but cumulatively considerable."

According to the CEQA Guidelines:

> *"Cumulative impacts" refer to two or more individual effects which, when considered together, are considerable and which compound or increase other environmental impacts.*
>
> *(a) The individual effects may be changes resulting from a single project or a number of separate projects.*
>
> *(b) The cumulative impact from several projects is the change in the environment, which results from the incremental impact of the project when added to other closely related past, present, and reasonable foreseeable probable future projects. Cumulative impacts can result from individually minor but collectively significant projects taking place over a period of time" (California Code of Regulations [CCR], Title 14, Division 6, Chapter 3, Section 15355).*

In addition, as stated in CEQA Guidelines, it should be noted that:

> *"The mere existence of significant cumulative impacts caused by other projects alone shall not constitute substantial evidence that the project's incremental effects are cumulatively considerable." (CCR, Title 14, Division 6, Chapter 3, Section 15064[h][5]).*

Cumulative impact discussions for each environmental topic area are provided at the end of each technical analysis presented in Chapter 5 of this AFC.

The geographic scope for the cumulative impact analysis is the western portion of Antelope Valley. The central portion of the Antelope Valley is entirely within Kern County with the eastern portion bordering San Bernardino County and the southern portion bordering Los Angeles County. The valley is formed by the Tehachapi Mountains to the northwest and San Gabriel Mountains to the southwest. The western Antelope Valley is triangularly shaped and is about 35 miles from west to east and 40 miles from north to south at its widest points. This geographic scope is selected because of its relatively uniform terrain, soil conditions, climate, habitat value, low population and development density relative to areas east of SR-14, and the region's common groundwater basin and water supply considerations. However, when appropriate (as determined by the impact being analysed), a smaller or larger geographic scope was selected.

Table Error! No text of specified style in document..0-2 lists the related projects considered in the cumulative analysis. **Figure 5.0-2** displays the WRESC in relation to the location of other known projects in the area.

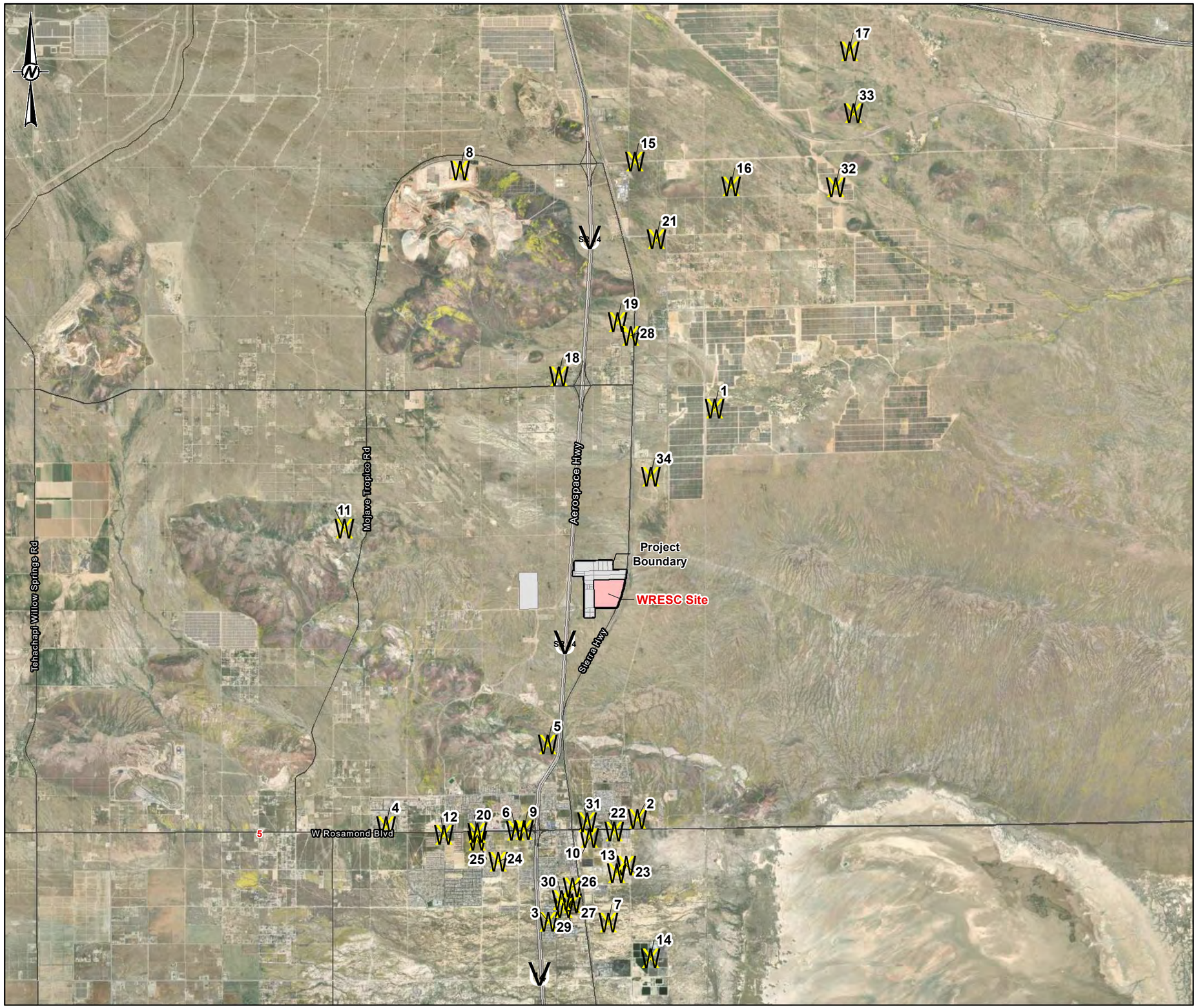
Table Error! No text of specified style in document..0-2: Cumulative Projects List

Identifier Number	Project Name	Project Description	Project Site APN	Acreage	Project Status
1	Edwards Air Force Base Solar Project	Solar energy facility anticipated to produce between 100MW to 750MW	Multiple	4,876	Completed/ Constructed
2	Investment Concepts, Inc.	Conditional Use Permit 118 Multi Unit apartment complex	471-112-06	13.34	Applied
3	Dewalt Corporation for Rosemond 5 Properties, LLC	A proposal to construct an 89-unit multifamily project	473-022-23	16.4	Approved
3	Dewalt Corporation	Precise development plan to facilitate development of 87 duplex structures (174 units)	473-022-23	16.4	Approved
4	Investment Concepts, Inc.	Conditional use permit for an apartment complex	252-161-49	2.51	Approved
4	Kern County Planning Department	Kern County Housing Element Implementation 2022; Zone Change to R-3; Site No. 6	252-161-49	2.52	Approved
5	Westpark, LLC – Howard Field	Proposed Hotel Development	471-022-07	460	Applied
6	Halferty Development Company, LLC	Precise development plan for mixed commercial, retail development	251-181-145; 251-181-152	18.61	Approved
7	BHT Developers, LLC	Auto Auction Facility	473-023-042; 473-023-059; 473-023-067; 473-040-061	172	Applied
8	Golden Queen Mining Company, LLC	Proposed addendum to an EIR approved for a surface mining and reclamation plan	429-190-069	44.18	Approved
9	Intertex Property Advisors, Inc.	Precise development plan for Auto Service Station, Motel, Retail, and Restaurants.	251-120-010	49.41	Applied
10	R.E. McCollum LLC	Precise development plan for self- storage facility	258-090-02	28.93	Applied
11	CalPortland Company	New mining and Reclamation; 15MM Tonnes of volcanic tuff Gem Hill - Nov 2021 NOP Circulating; portions of five APNs	345-294-17; Multiple	58.14	Approved
12	FH II LLC dba Frontier Communities	Change in zoning to allow for 120 Unit SFR Development	472-100-63	30.15	Approved

Identifier Number	Project Name	Project Description	Project Site APN	Acreage	Project Status
13	Garo Karakoulian	Conditional Use Permit to allow an auto dismantling & recycling facility	258-160-26	5	Applied
14	SSI Rosamond Solar, LLC	Solar Array Accessory to Water Treatment Facility	471-040-01	163.9	Approved
15	True North Renewable Energy, LLC by QK	GPA and SPA to Kern County General Plan and Willow Spring Specific Plan to designate the site as Solid Waste Disposal Facility and CUP to allow a renewable energy facility on 117 acres.	429-101-30 through 429-101-37	117	Approved
16	Capella Solar Energy Project by Heliogen SR1, LLC	A change in zone classification from A-1 to A; A Conditional Use Permit to allow 5 MW modular commercial concentrating solar power plant and a 330 ft tall power tower; and a Street Vacation of Farlin Street which runs thru center of property on 142 acres.	429-060-13 through 429-060-19	142	Processing
17	Enterprise Solar Storage, LLC	600-megawatt (MW) photovoltaic (PV) solar facility with battery energy storage capacity of up to 4,000 megawatt-hours (MWh) on approximately 2,658 acres across 152 privately owned parcels	428-171-07; Multiple	2,658	Processing
18	Castellanos Truck Parking and Storage	General Plan Amendment, Zone Classification Change, Precise Development plan to allow a Truck Parking and Storage Facility	430-053-08	9.55	Applied
19	Babkan Safarian & Denise Rodriquez	General Plan Amendment, Zone Classification Change to allow vehicle & cargo container storage	430-141-27	2.54	Applied
20	Irvine Carrillo	Precise Development Plan for commercial development	472-100-15	5.58	Applied
21	Antonio & Jeanette Vergara	Conditional Use Permit for construction materials recycling facility	429-010-02	39.09	Applied
22	Carl Wood	Precise Development Plan for new retail development	258-170-16 & 258-170-17	4.77	Applied
23	Walter DeBoer, BRPH	Modification to Precise Development Plan for change of occupancy to manufacturing	258-160-42	9.32	Applied

Identifier Number	Project Name	Project Description	Project Site APN	Acreage	Project Status
24	Silvia Valdez	Conditional Use Permit for installation of mobile home greater than 10 years old	251-191-13	2.52	Applied
25	Aaron Rivani by Cindy Parra	Zone Classification Change from A-1 (Limited Agriculture) to R-1 (Low- density Residential)	472-100-16	5.58	Applied
26	Kern County Planning Department	Kern County Housing Element Implementation 2022; Zone Change to R-3; Site No. 4	258-120-12; 258-130-16; 258-150-02; 258-130-23	8.89	Approved
27	Kern County Planning Department	Kern County Housing Element Implementation 2022; Specific Plan Amendment to 5.1/2.5 and Zone Classification Change to R-3; Site No. 9	473-031-03	4.92	Approved
28	Kern County Planning Department	Kern County Housing Element Implementation 2022; Zone Change to R-3; Site No. 2	430-030-10	6.97	Approved
29	Kern County Planning Department	Kern County Housing Element Implementation 2022; Zone Change to R-3; Site No. 7	473-031-09	2.5	Approved
30	Kern County Planning Department	Kern County Housing Element Implementation 2022; Zone Change to R-3; Site No. 5	473-031-27	2.09	Approved
31	Matthew McCormick	Conditional Use Permit for single family residence in C-2 (General Commercial) District	251-025-09	0.15	Applied
32	Sanborn Solar, LLC	300 MW Solar Facility with 3 GW of energy storage on approx. 2,006 acres.	Multiple	2,006	Approved
33	Bellefield Solar Project by 50LW 8me LLC	1,500 MW solar photovoltaic power generating facility with approximately 1,500 MWh storage on approximately 8,371 acres	Multiple	8,371	Approved
34	Mojave Micro Mill by PSGM3 Holdings Corp (Pacific Steel Group)	An approximate 489,200 square-foot steel mill facility with an additional 61,721 square feet of accessory buildings and structures, for a total of 550,921 square feet. The proposed project would include an approximate 63-acre accessory solar array	Multiple	174	Applied

Source: Kern County Planning and Natural Resources Department, 2023

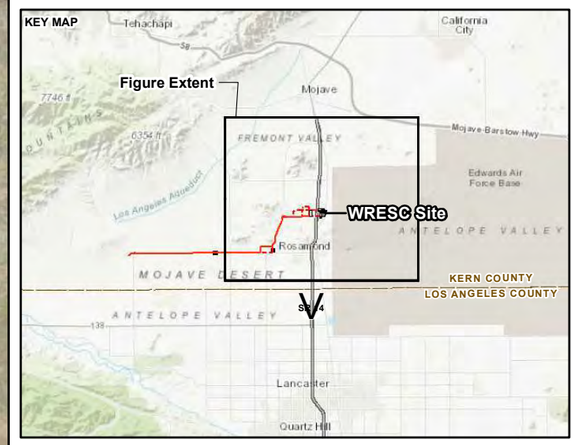


LEGEND

- Cumulative Projects

Project Components

- WRESC Site
- Other Project Parcels
- Project Boundary



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1 " = 7,000 feet FEET

REFERENCE(S)

1. CUMULATIVE PROJECTS - KERN COUNTY PLANNING AND NATURAL RESOURCES DEPARTMENT
2. PARCEL BOUNDARIES - KERN COUNTY GIS DEPT.
3. COORDINATE SYSTEM: NAD 1983 STATEPLANE CALIFORNIA V FIPS 0405 FEET
4. MAP SERVICE LAYER CREDITS: SOURCES: ESRI, HERE, GARMIN, INTERMAP, INCREMENT P CORP., GEBCO, USGS, FAO, NPS, NRCAN, GEOBASE, IGN, KADASTER NL, ORDNANCE SURVEY, ESRI JAPAN, METI, ESRI CHINA (HONG KONG), (C) OPENSTREETMAP CONTRIBUTORS, AND THE GIS USER COMMUNITY SOURCE: ESRI, MAXAR, EARTHSTAR GEOGRAPHICS, AND THE GIS USER COMMUNITY

CLIENT
GEM A-CAES LLC

PROJECT
WILLOW ROCK ENERGY STORAGE CENTER
SUPPLEMENTAL AFC

TITLE
CUMULATIVE PROJECTS

CONSULTANT

YYYY-MM-DD	2024-02-19
DESIGNED	SHL
PREPARED	SHL
REVIEWED	SH
APPROVED	VG/LL

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5.1 Air Quality

5.1.1 Introduction

GEM A-CAES LLC's (GEM, the Applicant) Willow Rock Energy Storage Center (WRESC, or Willow Rock) will be located on approximately 88.6 acres of private land immediately north of Dawn Road and between State Route (SR) 14 and Sierra Highway within unincorporated, southeastern Kern County, California. The WRESC will be a nominal 520-megawatt (MW) gross (500 MW net) and 4,160 megawatt-hour (MWh) gross (4,000 MWh net) facility using Hydrostor, Inc.'s (Hydrostor's) proprietary, advanced compressed air energy storage (A-CAES) technology. Energy stored at the WRESC will be delivered to Southern California Edison's (SCE's) Whirlwind Substation located southwest of the WRESC at the intersection of 170th Street W and Rosamond Boulevard, via a new approximately 19-mile 230-kilovolt (kV) generation-tie (gen-tie) line. The WRESC will be capable of operating on a 24-hour basis, 365 days a year with an approximately 50-year lifespan.

The Project or Project Area encompasses the WRESC Site, the parcels within the Project Boundary, and the right-of-way associated with the WRESC's gen-tie line. The Project Boundary encompasses the WRESC Site and the parcels of land (an additional 133 acres of private land surrounding the WRESC) that will be allocated for potential temporary staging and laydown area (referred to herein as the Staging Area) during construction, or the construction of a permanent architectural berm constructed from the material excavated during cavern construction. The Staging Area consists of groups of assessor's parcels referred to as P1, P2N, P2S, and VH.

This section presents the methodology and results of an analysis performed to assess the potential impacts of airborne emissions from the construction and operation of the WRESC and the Project's compliance with applicable air quality laws, ordinances, regulations, and standards. The report was prepared following the Kern County Planning Department's Guidelines for Preparing an Air Quality Assessment for Use in Environmental Impact Reports (Kern County 2006), Eastern Kern Air Pollution Control District's (EKAPCD) Guidelines for Implementation of the California Environmental Quality Act (CEQA) (EKAPCD 1999), and Appendix B - Information Requirements for an Application for Certification (AFC) or Small Power Plant Exemption (SPPE) (Title 20, California Code of Regulations, Division 2, Chapter 5, Appendix B).

Section 5.1.1 presents the introduction, Applicant information, and the EKAPCD rules applicable to the WRESC. Section 5.1.2 presents data on the emissions of criteria and air toxic pollutants from the WRESC. Section 5.1.3 presents the Willow Rock Project description, both current and proposed. Section 5.1.4 presents emissions evaluation data. Section 5.1.5 discusses the best available control technology (BACT) evaluations for the WRESC. Section 5.1.6 presents the air quality impact analysis for the WRESC. Section 5.1.7 discusses the meteorological data selection process required to analyze the impacts of the WRESC. Section 5.1.8 presents applicable laws, ordinances, regulations, and standards (LORS). Section 5.1.8.3 presents agency contacts. Section 5.1.8.4 presents permit requirements and schedules. Section 5.1.9 contains references cited or consulted in preparing this section. Appendices 5.1A to 5.1F contain the emissions calculations for operation and construction, air quality impact analysis for construction and operation phases, ambient air quality data, and the modeling and health risk assessment methodology support data.

The WRESC will be a 500-megawatt (MW) (net) A-CAES process that includes aboveground electric air compression and power generation equipment, an underground air storage cavern, heat exchangers, and three diesel fuel-fired internal combustion engines driving 2.5 MW emergency generators, as well as a diesel fuel-fired fire pump engine. A detailed description of the WRESC is presented in Chapter 2, Project Description.

Air will be the dominant pathway for public exposure to chemical substances released by the WRESC. Emissions to the air will consist primarily of combustion by-products produced by testing of the internal combustion engines driving emergency generators. Potential health risks from combustion emissions will occur almost entirely by direct inhalation.

During construction, regulated air emissions will be emitted to the atmosphere due to combustion of fuel in reciprocating internal combustion engines (off-road and on-road mobile sources), traffic on internal site unpaved roads, bulldozing, wind erosion, grading, rock crushing, a cement batch plant, and material movement.

During operations, the WRESC will not routinely operate combustion units or emit regulated pollutants to the atmosphere. Regulated emission of air pollutants will only occur from the stationary internal combustion engines for maintenance and readiness testing or in the emergency event of a fire or power outage. Only two of the 2.5 MW engines are required to support critical loads. The third engine is redundant and only one engine is assumed to operate at any given time for purposes of maintenance and readiness testing.

5.1.2 Regulatory Items Affecting New Source Review

Regulated air emissions from Willow Rock operations will not exceed federal major source thresholds under nonattainment New Source Review (NSR) or Prevention of Significant Deterioration (PSD); therefore, federal NSR will not apply to this project. Because nonattainment NSR does not apply, emission offsets are not required.

The WRESC Site is located in an area that is considered severe nonattainment for 8-hour ozone (2008) and moderate nonattainment for 8-hour ozone (2015) (1987) (EKAPCD 2017). The area is attainment and/maintenance for all other criteria pollutants.

EKAPCD has an NSR process with lower limits than the federal program, which is organized into New Stationary Source Review (NSSR) under APCD Rule 210.1 and Major New Stationary Source Review (MNSSR) under APCD Rule 210.1A.

NSSR identifies a “major” source to have potential emissions at or above 50 tons per year of any affected pollutant. Potential emissions from the WRESC will not exceed this major source level. The NSSR process requires the following considerations:

- Emission units must meet BACT. BACT will be met by purchasing engines that conform to the U.S. Environmental Protection Agency (U.S. EPA) Tier 4 emission standards for the emergency generator engines, and Tier 3 emissions standards for the proposed fire pump engine, and combust diesel fuel that contains no more than 15 parts per million (ppm) sulfur.
- The operation of the WRESC will not require air emission offsets because all proposed emission units are defined as “emergency equipment” and under APCD Rule 210.1(III)(B)(2)(a), emission offsets are not required for emergency equipment not operated more than 200 hours per year.

MNSSR only applies to sources identified as “major,” which is defined as a new source that has potential emissions at or above 100 tons per year of any affected pollutant. Operations at the WRESC will not be a major source and are not subject to the requirements of MNSSR.

The proposed emergency engine emission units will likely use catalytic oxidation and/or selective catalytic reduction, as well as diesel particulate filters to meet Tier 4 standards. These control technologies are not an integral part of the engine and are considered as add-on pollution control equipment. The proposed control systems are positioned between the engines and the exhaust stack and, as such, they cannot be bypassed by the operator. As noted above, the proposed fire pump engine will comply with the Tier 3 standards.

The direct construction and operation emissions impacts associated with the Project are analyzed according to APCD and California Energy Commission (CEC) modeling requirements. An air quality analysis was conducted to demonstrate that impacts from nitrogen oxides (NO_X), carbon monoxide (CO), sulfur dioxide (SO_2), particulate matter (PM)10, and PM2.5 will comply with the California and National Ambient Air Quality Standards (CAAQS/NAAQS) for the applicable averaging periods. Impacts from nearby sources are not anticipated to be significant but will be assessed for criteria pollutants under separate cover if requested by EKAPCD or the CEC. The need for a cumulative source analysis will be assessed after the CEC data adequacy review. A search of the California Air Resource Board (CARB) Pollution Mapping Tool shows that there are no significant sources located within a 6-mile radius of the WRESC Site; therefore, no cumulative air quality modeling protocol is provided in this study.

Worst-case annual potential to emit (PTE) emissions for operation are summarized in **Table 5.1-1**.

Table 5.1-1: Facility Potential to Emit Summary and Major Source/Attainment Status for Operation

Pollutant	WRESC PTE (tpy)	Federal Attainment	State Attainment	APCD Rule 210.1A Major Source Threshold (tpy)	Federal NA NSR Major Source Threshold (tpy)	Federal PSD Major Source Threshold (tpy)
NO_X	1.49	Yes	Yes	25 (severe for ozone)	50 (severe for ozone)	250
CO	6.50	Yes	Yes	100	N/A	250
VOC	0.35	N/A	N/A	25 (severe for ozone)	50 (severe for ozone)	250
SO_2	0.013	Yes	Yes	100	N/A	250
PM10	0.063	Yes/Maintenance	No	100	100	250
PM2.5	0.063	Yes	Yes	100	N/A	250
GHG (CO_2e)	1,225	N/A	N/A	N/A	N/A	75,000
Ozone	N/A	N, severe	N	N/A	N/A	N/A

Source: Attainment Status (EKAPCD 2018)
Note: GHG can only be a major source under PSD if another regulated pollutant is major for PSD.
APCD = air pollution control district; CO = carbon monoxide; CO_2e = carbon dioxide equivalent; GHG = greenhouse gas; N/A = not applicable; NSR = new source review; PM10 = particulate matter less than 10 microns; PM2.5 = particulate matter less than 2.5 microns; PSD = prevention of significant deterioration; PTE = potential to emit; NO_X = nitrogen oxides; SO_2 = sulfur dioxide; tpy = tons per year; VOC = volatile organic compound; WRESC = Willow Rock Energy Storage Center

5.1.3 Project Description

The following sections describe the Project. A detailed project description and location data are presented in Section 2.0.

5.1.3.1 Willow Rock Energy Storage Site Location

The WRESC will be located in Kern County approximately 0.22 miles east of the center of the Highway 14 interchange at Dawn Road. The WRESC Site lies approximately 3.5 miles north of Rosamond, California, within the EKAPCD.

Figures 1-4 and 1-5, in Chapter 1, Introduction, show the Willow Rock site and the immediate vicinity.

5.1.3.2 Project Equipment Specifications

The WRESC will consist of the following major equipment and operations:

- Three 2.5 MW diesel-fired internal combustion engines driving generators for emergency use (only one engine will operate at any given time during maintenance and readiness testing).
- One diesel-fired internal combustion engine driving a 460 brake horsepower (BHP) fire pump.

All power from the facility will be delivered to the SCE's Whirlwind substation.

Equipment specifications are summarized in **Table 5.1-2**.

Table 5.1-2: Equipment Specification

Parameter	Emergency Diesel Generators (each)	Emergency Fire Pump
Manufacturer	Kohler	Cummins
Model	KD2500-4	CFP15EVS-F10
Engine Power	2,500 bkW	343 bkW
Fuel	Ultra-low sulfur diesel	Ultra-low sulfur diesel
Maximum Fuel Consumption	174.6 gallons per hour	22.5 gallons per hour
Annual Limits	200 hours per year	200 hours per year
Exhaust Flow, acfm	9734 (each stack)	2881
Exhaust Temperature	914°F	1,025°F

Source: Kohler KD2500-4 and Cummins CFP15EVS-F10 Specifications
°F= Fahrenheit; acfm = actual cubic feet per minute; bkW = brake kilowatt; G/bkw-hr = grams per brake kilowatt-hour

During the operational phase, the diesel generators will supply emergency power for critical loads. These generators are the only stationary sources that will combust fossil fuel and are anticipated to operate for 50 hours (each) per year for readiness testing and maintenance but will be limited to 200 hours per year each in an air permit. This analysis includes emissions from the operation of the three emergency diesel generators and the single fire pump. **Table 5.1-3** provides the location and source characteristics for each generator stack. **Figure 5.1-1** shows the WRESC Site property boundary and location of the four engine emission sources.

Table 5.1-3: Emission Unit Specification

Source ID	Description	UTM Easting Coordinate (meters)	UTM Northing Coordinate (meters)	Stack Height from grade (feet)	Stack Inside Diameter (feet)	Stack Elevation AMSL (feet)	Exhaust Gas Temperature (°F)	Exhaust Gas Flowrate (actual cfm)	Exhaust Velocity (ft/s)
EGEN 1	Emergency Diesel Generator 2.5 MW	394,612.1	3,863,819.9	22.93	1.033	~2,554	914	19,468	193.5
EGEN 2	Emergency Diesel Generator 2.5 MW	3,946,22.3	3,863,816.8	22.93	1.033	~2,554	914	19,468	193.5
EGEN 3	Emergency Diesel Generator 2.5 MW	394,632.4	3,863,813.7	22.93	1.033	~2,554	914	19,468	193.5
FP	Diesel Fire Pump 460 bhp	394,606.4	3,864,004.4	15	0.5	~2,554	1,025	2,881	245

Source: Kohler KD2500-4 and Cummins CFP15EVS-F10 Specifications
Coordinate datum = UTM Zone 11, NAD83 North.
°F = Fahrenheit; AMSL= above mean sea level; bhp = brake horsepower; cfm = cubic feet minute; ft/s = ft per second; MW = megawatts
NAD83 = North American Datum of 1983; UTM = Universal Transverse Mercator

Figure 5.1-1: Location of Willow Rock Energy Storage Center Emission Sources during Operation Phase (No-Architectural Berm Option)

5.1.3.3 Fuels

Fuel use at the WRESC will be limited to ultra-low sulfur diesel fuel. For this application, diesel fuel is assumed to have a heating value of 137,000 British thermal units per gallon (Btu/gallon) as referenced in the calculations (Appendices 5.1A and 5.1C).

5.1.4 Emissions Evaluation

5.1.4.1 Facility Emissions and Permit Limitations

The approximate 88.6-acre proposed Willow Rock site is currently vacant and there are no current air pollution sources located on the WRESC Site.

5.1.4.2 Facility Emissions

Operation of the WRESC will not result in stationary source emissions greater than 250 tons per year (tpy) for any criteria pollutants; as such, the WRESC will be considered a minor NSR source for NO, CO, VOC, and PM10/PM2.5 under the federal regulations. The WRESC will not trigger the requirements of the federal PSD program because the emissions of one or more criteria pollutants will not exceed the 250 tpy major source applicability thresholds. The facility is expected to be a minor source under the APCD NSR rules. Criteria pollutant emissions from the emission units are presented in the following sections, while emissions of hazardous air pollutants are presented in Section 5.9, Public Health. Detailed calculations for criteria air pollutant emission calculations are provided in Appendix 5.1A.

Hourly, daily, and annual emissions for criteria pollutants are based upon the highest emissions for each pollutant considering that the emission units are classified as emergency use and are limited to 200 hours per year of operation.

5.1.4.3 Normal Operations

Operation of the emergency engines at the WRESC will result in emissions to the atmosphere of both criteria and toxic air pollutants. Criteria pollutant emissions will consist primarily of NO_X, CO, VOCs, SO_X, PM10, PM2.5, and CO_2e. Air toxic pollutants will consist of diesel particulate matter, which is the approved surrogate compound for a combination of hazardous air pollutants and other compounds that are commonly generated from the combustion of diesel fuel. **Table 5.1-4** lists the pollutants that may potentially be emitted from the WRESC. Other than the operation of the generators for testing and maintenance, there are no additional significant sources of air emissions from the maintenance or operation of the WRESC. Commissioning of emergency generators is not anticipated to take a significant amount of time and will result in emissions that are characteristically similar to normal operation; no air emission testing is anticipated during commissioning.

Table 5.1-4: Chemical Substances Potentially Emitted to the Air from the Willow Rock Energy Storage Center

Criteria Pollutants	Greenhouse Gases	Other Compounds
Particulate Matter (PM)	Carbon Dioxide (CO_2)	Diesel particulate matter is considered the approved surrogate toxic for all diesel exhaust constituents for purposes of the cancer and chronic health risk assessment analysis.)
PM less than 10 microns (PM10)	Methane (CH_4)	
PM less than 2.5 microns (PM2.5)	Nitrous Oxide (N_2O)	
Carbon Monoxide (CO)		
Nitrogen Oxides (NO_X)		
Volatile Organic Compounds (VOC)		

Source: Appendix 5.1A, and 5.1B, and Section 5.9, Public Health, Appendix 5.9C

5.1.4.4 Operational Criteria Pollutant Emissions

Table 5.1-5 presents a summary of the maximum short-term and annual criteria pollutant emissions for the worst-case operational scenario during operation, i.e., 50 hours per year of readiness testing per engine plus 150 hours per year of emergency operations per engine, for a total of 200 hours per year. The 150 hours of emergency operation is an EKAPCD permitting requirement, but the facility will be limited to only 50 hours per year of maintenance/readiness testing as required by the California Air Toxics Control Measure. Only one engine will be tested during any single hour. The annual emissions in **Table 5.1-5** are based on all three emergency generators and the single fire pump. Detailed calculations for criteria air pollutant emission calculations for operation are provided in Appendix 5.1A.

Table 5.1-5: Facility Maximum Emission Rate and Potential to Emit Summary for Operation of the Proposed Diesel Engines

Pollutant	Maximum Emission Rate (lb/hr) Single Emergency Generator	Maximum Emission Rate (lb/hr) Fire Pump Engine	Potential to Emit (tpy) All Engines	Exceeds EKAPCD CEQA Thresholds?
NO_X	3.991	2.890	1.49	No
CO	20.758	2.637	6.50	No
VOC	1.118	0.152	0.35	No
SO_2	0.040	0.005	0.013	No
PM10	0.160	0.152	0.063	No
PM2.5	0.160	0.152	0.063	No
GHG (CO_2e)	N/A	N/A	1,225	No

Source: Appendix 5.1A.
CO = carbon monoxide; CO_2e = carbon dioxide equivalent; GHG = greenhouse gas; lb/hr = pound per hour; N/A = not applicable; NO_X = nitrogen oxides; PM10/PM2.5 = particulate matter less than 10 or less than 2.5 microns; SO_2 = sulfur dioxide; tpy = tons per year; VOC = volatile organic compounds

In addition to the combustion-related engine emissions, there will be a very insignificant amount of volatile organic compound (VOC) emissions from the engine fuel tanks. These VOC emissions were calculated to be 0.00103 tpy, or 0.00564 pounds per day. Appendix 5.1A contains the emissions calculation support data for these VOC emissions.

Under EKAPCD's Guidelines for Implementation of CEQA, dated July 1, 1999, the operation of projects meeting the following thresholds are determined not to result in air quality a significant impact as defined by CEQA Section 21068:

Operation of the project will:

Emit (from all project sources subject to KCAPCD (now EKAPCD) Rule 201) less than offsets trigger levels set forth in Subsection III.B.3 of KCAPCD (now EKAPCD) Rule 210.1 (New and Modified Source Review Rule. The applicable offset trigger limits per Rule 210.1 are as follows:

a. *NO_X – 25 tpy*
b. *VOCs – 50 tpy*
c. *PM10 – 70 tpy,*

Emit less than 137 pounds per day of NO_x or reactive organic compounds from motor vehicle trips (indirect sources only),

Not cause or contribute to an exceedance of any CAAQS or NAAQS,

Not exceed the EKAPCD health risk public notification thresholds adopted by the KCAPCD (now EKAPCD) Board (see Section 5.9, Public Health),

Be consistent with adopted federal and state air quality attainment plans.

In addition, since greenhouse gas emissions (GHG) of 1,225 tons per year are less than the EKAPCD guideline significance threshold of 25,000 tons/year, GHG emissions during operation are considered insignificant.

Section 5.10, Socioeconomics lists the number of workers during normal facility operations at 40 full time equivalents. It is expected that all 40 employees will live within Kern County for the assumption of 50 miles per round trip, which corresponds to 2,000 vehicle miles traveled per day. Using 2029 standard vehicle mix, the indirect project emissions would be well below the 137 pounds per day CEQA threshold:

NO_x = 0.283 lbs/day

VOCs = 0.0445 lbs/day

Based on the operational emissions of the Project in Table 5.1-5 to the EKAPCD offset thresholds in Rules 201 and 210.1, the indirect emissions of NO_x and VOCs from worker vehicle trips (commute) and the results of the health risk assessment in Section 5.9, the operation of the Project will not result in significant impacts as defined by the EKAPCD CEQA Guidelines.

5.1.4.4.1 Operational Greenhouse Gas Emissions

Greenhouse gas (GHG) emissions have been estimated for both the construction and operation phases of the WRESC. **Table 5.1-5** of Section 5.1.4.4 presents the GHG emissions for 50 hours of routine operation plus an additional 150 hours of emergency operation, as per the permitting requirements of EKAPCD. Appendix 5.1B shows the GHG emissions for onsite and offsite construction.

5.1.4.5 Operational Hazardous Air Pollutants

See Section 5.9, Public Health, for a detailed discussion and quantification of hazardous air pollutant emissions from the WRESC and the results of the health risk assessment.

5.1.4.6 Construction Emissions

The construction phase of the WRESC is expected to take approximately 60 months (followed by several months of start-up and commissioning). Construction-related emissions are based on the 12-month period during the construction process, which has activities that will produce the highest estimated emissions. Construction emissions at the Willow Rock site are consistent with emissions encountered at most construction sites, including:

- Combustion of fuel in vehicles onsite (direct)
- Fugitive dust from vehicle travel on unpaved roads onsite (direct)
- Fugitive dust from wind erosion, land clearing and material movement onsite (direct)
- Fugitive dust from rock screening and crushing (direct)
- Fugitive dust from concrete batch plant operations (direct)
- Combustion of fuel in vehicles and both onsite and offsite equipment (direct and indirect)
- Fugitive dust from vehicle travel on paved and unpaved roads offsite (indirect)

Detailed construction emissions used to establish construction-related impacts are in Appendix 5.1B. The construction emissions as delineated in Appendix 5.1B are presented for the following two scenarios; with the architectural berm and without the architectural berm. The scenario with the architectural berm assumes that the cavern rock will be used to build an architectural berm. Under this scenario, approximately 25 percent of the cavern rock will be processed through the proposed onsite crushing/screening plant before being delivered to the architectural berm construction area along with the remaining 75 percent of the cavern rock. The no architectural berm scenario conservatively assumes that virtually all the cavern rock will be processed through the crushing/screening plant and subsequently hauled offsite to an existing materials site for future use.

Emissions used in the annual dispersion modeling analysis are based on the estimated highest consecutive 12-month period, which was determined as months 25 through 36 for the" architectural berm" option, and months 30 through 41 for the "no architectural berm" option. These 12-month periods considered manpower values, equipment numbers, and use rates, as well as site activities (both aboveground and belowground). The estimated highest monthly emissions are based on the annual emissions divided by 12, while the highest daily emissions are based on the highest monthly emissions divided by 30 days per month. This procedure is consistent with the evaluation and breakdown of annual emissions data to monthly and daily emissions values from the CalEEMod model (Version 2020.4.0). Additional details are contained in Appendix 5.1B.

The Applicant proposes the incorporation of the following for this site as described in the air pollutant mitigation measures for construction sites by the EKAPCD:

- Land Preparation, Excavation, and/or Demolition Activities
  - All soil excavated or graded should be sufficiently watered to prevent excessive dust. Watering should occur as needed with complete coverage of disturbed soil areas. Watering should be performed at a minimum of twice daily on unpaved/untreated roads and on disturbed soil areas with active operations.
  - All clearing, grading, earth moving, and excavation activities should cease
    - during periods of winds greater than 20 miles per hour (mph) (averaged over 1 hour), if disturbed material is easily windblown, or
    - when dust plumes of 20 percent or greater opacity impact public roads, occupied structures, or neighboring property.
  - All fine material transported offsite should be sufficiently watered or securely covered to prevent excessive dust.
  - If more than 5,000 cubic yards of fill material will be imported or exported from the WRESC Site, all haul trucks should be required to exit the WRESC Site via an access point where a gravel pad or grizzly has been installed.
  - Areas disturbed by clearing, earth moving, or excavation activities should be minimized at all times.
  - Stockpiles of soil or other fine loose material shall be stabilized by watering or other appropriate method to prevent windblown fugitive dust.
- Where acceptable to the fire department, weed control should be accomplished by mowing instead of discing, thereby, leaving the ground undisturbed and with a mulch covering.
- Onsite Rock Crushing and Cement Batch Plant Operations

  Use of dust suppression methods including spay bars for the rock crushing and bag houses for batch cement plant operations.
- Building Construction Activities
  - Once initial leveling has ceased, all inactive soil areas within the construction site should either be seeded and watered until plant growth is evident, treated with a dust palliative, or watered twice daily until soil has sufficiently crusted to prevent fugitive dust emission.
  - All active disturbed soil areas should be sufficiently watered to prevent excessive dust, but no less than twice per day.
- Vehicular Activities
  - Onsite vehicle speed should be limited to 15 mph.
  - All areas with vehicle traffic should be paved, treated with dust palliatives, or watered a minimum of twice daily.
  - Streets adjacent to the WRESC Site should be kept clean and accumulated silt removed.
  - Access to the WRESC Site should be by means of an apron into the Project from adjoining surfaced roadways. The apron should be surfaced or treated with dust palliatives. If operating on soils that cling to the wheels of the vehicles, a grizzly or other such device should be used on the road exiting the Project, immediately prior to the pavement, to remove most of the soil material from the vehicle's tires.
  - Properly maintain and tune all internal combustion engine powered equipment.
  - Require employees and subcontractors to comply with California's idling restrictions for compression ignition engines.
  - Use low sulfur (CARB) diesel fuel.

Based on the nature and the time frame for construction, these measures will reduce construction emissions and impacts to levels that are less than significant. Appendix 5.1B presents the evaluation of construction-related emissions while Appendix 5.1D presents data on the construction-related ambient air quality impacts.

As noted in Section 5.1.4.4, these thresholds do **not** apply to construction emissions. The thresholds noted above only apply to emissions from operation of the facility subsequent to the construction phase. Both the onsite and offsite construction emissions are summarized in **Table 5.1-6** and **Table 5.1-7** below**.**

Table 5.1-6: Onsite and Offsite Construction Emissions Summary for the Architectural Berm Option

Parameter	NO_X	CO	VOC	PM10	PM2.5	SO_2	CO_2e
Onsite, tpy	27.13	32.88	3.37	15.54	3.90	0.08	8060.5
Onsite, lb/day	150.7	182.7	18.7	86.3	21.7	0.4	N/A
Offsite, tpy	1.4	7.4	0.6	2.9	0.5	0.04	3403
Offsite, lb/day	7.6	40.9	3.3	15.9	2.5	0.2	N/A

Note: Emissions are for the maximum 12-month period (months 25 to 36)
CO = carbon monoxide; CO_2e = carbon dioxide equivalent; lb/day = pounds per day; PM10/PM2.5 = particulate matter less than 10 or less than 2.5 microns; SO_2 = sulfur dioxide; tpy = tons per year; VOC = volatile organic compounds, N/A = not applicable

Table 5.1-7: Onsite and Offsite Construction Emissions Summary for the No-Architectural Berm Option

Parameter	NO_X	CO	VOC	PM10	PM2.5	SO_2	CO_2e
Onsite, tpy	42.70	60.03	6.47	14.60	3.86	0.17	18,246.6
Onsite, lb/day	237.2	333.5	36.0	81.1	21.4	1.0	N/A
Offsite, tpy	9.5	7.7	1.6	7.8	0.9	0.11	11,756
Offsite, lb/day	52.9	42.7	8.7	43.4	4.7	0.6	N/A

Note: Emissions are for the maximum 12-month period (months 30 to 41)
CO = carbon monoxide; CO_2e = carbon dioxide equivalent; lb/day = pounds per day; PM10/PM2.5 = particulate matter less than 10 or less than 2.5 microns; SO_2 = sulfur dioxide; tpy = tons per year; VOC = volatile organic compounds, N/A = not applicable

This Project will not require a federal air permit. The Project may receive federal government financial assistance, in which case, the provisions of general conformity under 40 Code of Federal Regulations (CFR) Part 93 Subpart B and EKAPCD Rule 210.7 may apply to the WRESC. An air quality conformity analysis is provided with this application (see Appendix 5.1D) and demonstrates that the proposed Project will comply with all applicable air quality rules and standards.

5.1.5 Best Available Control Technology Evaluation

5.1.5.1 Current Control Technologies

BACT will be met by purchasing engines (emergency electrical generators) certified to meet U.S. EPA Tier 4 emissions for the applicable size and type of engine. Based on the proposed engines for Willow Rock operation, the following emission limits must be met (EKAPCD 2018):

- NO_X ≤ 0.5 grams per brake horsepower-hour (g/bhp-hr)
- SO_2: combust diesel fuel with a sulfur content no greater than 15 ppm
- CO ≤ 2.6 g/bhp-hr
- PM ≤ 0.02 g/bhp-hr
- Non-methane Hydrocarbons ≤ 0.14 g/bhp-hr

BACT for the proposed fire pump engine will be met by compliance with the Tier 3 emissions standards as follows:

- NO_X ≤ 2.85 g/bhp-hr
- SO_2: combust diesel fuel with a sulfur content no greater than 15 ppm
- CO ≤ 2.6 g/bhp-hr
- PM ≤ 0.15 g/bhp-hr

- Non-methane Hydrocarbons ≤ 0.15 g/bhp-hr

5.1.5.2 Proposed Best Available Control Technology

The emergency generators installed at the WRESC will conform to U.S. EPA and CARB Tier 4 emission standards noted in the previous section, which will satisfy the requirements for BACT, as summarized in the EKAPCD rules. The proposed fire pump engine will meet BACT by complying with the Tier 3 emissions standards. Meeting BACT is considered appropriate mitigation for emissions for emergency generators and fire pump. The EKAPCD permit that will be required for construction and operation of the generator and fire pump engines will include conditions/monitoring requirements, such as logging hours of operation, keeping records of sulfur content of the fuel combusted, and performing manufacturer-recommended maintenance to verify that the emissions are controlled to the levels established by BACT.

5.1.6 Air Quality Impact Analysis for Operations and Construction

This section describes the results, in both magnitude and spatial extent of ground level concentrations resulting from emissions from the WRESC during construction and operations. The maximum modeled concentrations were added to the maximum background concentrations to evaluate the potential total Project impact.

Dispersion modeling methods follow U.S. EPA-approved methods established in 40 CFR Part 51 Appendix W. Descriptions of the air modeling process, model options, and parameters are presented in the following sections. Modeling inputs/outputs will be provided to the CEC and EKAPCD staff in electronic form.

It should be noted that two Project designs were assessed in the dispersion modeling analyses: the Project with an approximate 10-foot-high architectural berm placed in the northern and western portions of the Project and the Project without the architectural berm. The only difference with regards to the modeling assessment will be the use of an expanded Project fence line for the architectural berm and no-architectural berm options.

5.1.6.1 Climate and Meteorology

The climate of the area surrounding the WRESC is influenced by the local terrain and geography. The terrain surrounding the WRESC is relatively flat with some local elevated areas immediately to the south and southeast. The southern end of the Sierra Nevada Mountain Range is located approximately 12 miles to the northwest. Summers are hot, arid, and clear. Winters are cold and partly cloudy. The average high temperatures range from 98 degrees Fahrenheit (°F) in the summer to 56°F in the winter, and average low temperatures range from 69°F in the summer to 33°F in the winter. The area is arid with the wetter season occurring from the end of November to the beginning of April. The dew point generally does not exceed 60°F. Wind is most often out of the west and southwest with an average wind speed of 11.8 mph. Quarterly and annual wind roses, based on the meteorological data obtained from the General William J. Fox Field Airport (Fox Field; Lancaster, California), are presented in Appendix 5.1D. Fox Field is considered representative of the WRESC Site and was used in the air quality modeling analyses (see Appendix 5.1D).

5.1.6.2 Dispersion Modeling

To estimate ambient air concentrations, the latest version (version 23132) of the AERMOD dispersion model was used (U.S. EPA 2021a). AERMOD is appropriate for use in estimating ground-level short-term ambient air concentrations resulting from non-reactive buoyant emissions from sources located in simple, intermediate, and complex terrain. AERMOD is the preferred guideline model recommended by the U.S. EPA for these types of assessments and is based on conservative assumptions (i.e., the model tends to overpredict actual impacts by assuming steady state conditions, no pollutant loss through conservation of mass, no chemical reactions, steady state meteorological conditions, steady state emission rates and instantaneous transport of the plume to the receptors). AERMOD can assess impacts from a variety of source types, such as point, area, line, and volume sources; downwash effects; gradual plume rise as a function of downwind distance; time-dependent exponential decay of pollutants; and can account for settling and dry deposition of particulates (all Project emissions were conservatively modeled as non-reactive gaseous emissions). The model can calculate concentrations for a wide range of averaging times (from 1 hour to the entire period of meteorological data provided).

AERMOD calculates ambient concentrations in areas of simple terrain (receptor base elevations below the stack release heights), intermediate terrain (receptor base elevations between stack release and final plume height), and complex terrain (receptor base elevations above final plume height). AERMOD assesses these impacts for all meteorological conditions, including those that would limit the amount of final plume rise. Plume impaction on elevated terrain, such as on the slope of a nearby hill, can cause high ground level concentrations, especially under stable atmospheric conditions. Due to the relatively flat nature of the Project terrain area, including the surrounding properties, plume impaction effects would not be expected to occur. AERMOD also considers receptors located above the receptor base elevation, called flagpole receptors.

Another dispersion condition that can cause high ground level pollutant concentrations is caused by building downwash. Building downwash can occur during high wind speeds or a building or structure is in close proximity to the emission source. This can result in building wake effects where the plume is drawn down toward the ground by the lower pressure region that exists in the lee side (downwind) of the building or structure. This AERMOD feature was also used in modeling the operational Project emission sources as described later.

5.1.6.2.1 Model Input Options

Model options refer to user selections that account for conditions specific to the area being modeled or to the emissions source that needs to be examined. Examples of model options selected for this analysis include the use of downwash and the rural dispersion option.

Land use in the immediate area surrounding the WRESC Site is characterized as “rural” utilizing the approach by Auer. Here, land uses within the area circumscribed by a 3 km radius around the WRESC Site is greater than 50 percent rural. This is consistent with the current land use and zoning designation for the WRESC Site. Therefore, in the modeling analyses, the rural dispersion option was selected.

AERMOD also supplies recommended defaults for the user for other model options. This analysis was conducted using AERMOD in the regulatory default mode, which includes the following additional modeling control options:

- adjusting stack heights for stack-tip downwash,
- using upper-bound concentration estimates for sources influenced by building downwash from super-squat buildings,
- incorporating the effects of elevated terrain,
- employing the U.S. EPA-recommended calms processing routine, and
- employing the U.S. EPA-recommended missing data processing routine.

Calculation of chemical concentrations for use in the impact and exposure analysis requires the selection of appropriate concentration averaging times. Average pollutant concentrations ranging from 1 hour to annual based on the meteorological data were calculated for each Project source and the facility in total.

All NO_2 concentrations were estimated using the Ambient Ratio Method Version 2, which is a regulatory default option and commonly used in practice. The default minimum NO_2/NO_X conversion ratio of 0.5 and maximum conversion ratio of 0.9 were used for both 1 hour and annual averaging periods.

5.1.6.3 Meteorological Data Selection

AERMOD requires a meteorological input file to characterize the transport and dispersion of pollutants in the atmosphere. Surface and upper air meteorological data inputs, along with surface parameter data describing the land use and surface characteristics near a site, are first processed using AERMET, the meteorological preprocessor to AERMOD. The output files generated by AERMET are the surface and upper air meteorological input files required by AERMOD.

The proposed WRESC Site is in southeastern Kern County in the EKAPCD. The project is about 70 miles from the Pacific Ocean in the northern end of the Antelope Valley in the westernmost part of the Mojave Desert. Terrain surrounding the WRESC is mostly flat or rolling and gradually increases toward the north and west.

Locally there is a series of separated elevated landmasses to the southeast, south, and southwest of the WRESC site. The Sierra Nevada Mountain Range is approximately 17 miles to the northwest of the WRESC site. Land use characteristics along with terrain considerations were considered to determine which meteorological and air quality data set is most representative of the Project area.

AERMOD uses hourly meteorological data to characterize plume dispersion. AERMOD calculates the dispersion conditions for each hour of meteorological data for the emission sources modeled at the user-specific receptor locations. The resulting 1-hour impacts are then averaged by AERMOD for the averaging time(s) specified by the user (accounting for calm winds and missing meteorological data as specified in the model options). Five years of surface meteorological data (2018 to 2022) from the Lancaster/Fox Field Airport (approximately 19 km south of the WRESC Site) were combined with concurrent upper air data from Harry Reid International Airport in Las Vegas, Nevada. While Edwards Air Force Base does collect both surface and upper air data, the data recovery statistics were less than 90 percent on both a quarterly and annual basis. Harry Reid International Airport was the closest and most representative upper air site and was chosen for the Project. The representativeness of the meteorological data is dependent on the proximity of the meteorological monitoring site to the area under consideration; the complexity of the terrain, the exposure of the meteorological monitoring site, and the period of time during which the data are collected. The data was processed with both AERMINUTE (version 15272) and AERMET (version 23132), which are the AERMOD meteorological data preprocessor modules.

Meteorological Data Representativeness: The use of the five (5) years of Lancaster/Fox Field surface and Harry Reid Airport upper air meteorological data would satisfy the definition of onsite data. The U.S. EPA defines the term “onsite data” to mean data that would be representative of atmospheric dispersion conditions at the source and at locations where the source may have a significant impact on air quality. Specifically, the meteorological data requirement originates from the Clean Air Act in Section 165(e)(1), which requires an analysis “of the ambient air quality at the facility and in areas which may be affected by emissions from such facility for each pollutant subject to regulation under [the Act] which will be emitted from such facility.” This requirement and U.S. EPA’s guidance on the use of onsite monitoring data are also outlined in the On-Site Meteorological Program Guidance for Regulatory Modeling Applications (U.S. EPA 1987). The representativeness of meteorological data is dependent upon: (a) the proximity of the meteorological monitoring site to the area under consideration; (b) the complexity of the topography of the area; (c) the exposure of the meteorological sensors; and (d) the period of time during which the data are collected.

First, the Lancaster/Fox Field Airport is near the WRESC Site and has the exact same base elevations and exposures to terrain toward the northwest. Second, both locations are located in the same area of the broad and relatively flat Antelope Valley. Third, the meteorological instrumentation at Lancaster/Fox Field is properly exposed and not adjacent to structures or terrain. Fourth, the period of meteorological data selected at the time of the modeling analyses (2018-2022) would be expected to be the most representative of current conditions, with the same general land uses surrounding the airport location as well as the proposed WRESC Site. In fact, a review of historical and current Google Earth photo aerials shows that nearby land uses now at both locations are similar to the land uses reflected in the 2020 National Land Cover Database.

Representativeness is defined in the document “Workshop on the Representativeness of Meteorological Observations” (Nappo et. al., 1982) as “the extent to which a set of measurements taken in a space-time domain reflects the actual conditions in the same or different space-time domain taken on a scale appropriate for a specific application.” Judgments of representativeness should be made only when sites are climatologically similar, as is the case with the meteorological monitoring site and the proposed Project location. In determining the representativeness of the meteorological data set for use in the dispersion models at the WRESC Site, the consideration of the correlation of terrain features to prevailing meteorological conditions, as discussed earlier, would be nearly identical to both locations since the orientation and aspect of terrain at the proposed project location correlates well with the prevailing wind fields as measured by and contained in the meteorological dataset. In other words, the same mesoscale and localized geographic and topographic features that influence wind flow patterns at the meteorological monitoring site also influence the wind flow patterns at the proposed WRESC Site. Comparisons with the available data collected at Edwards Air Force Base and the 2018-2022 Lancaster Fox Field ASOS derived data show very good correlation between the two data sets. Additionally, runway alignment at Lancaster/Fox Field and Edwards Air Force Base are identical and align with the predominant wind direction.

For these reasons, the Lancaster/Fox Field ASOS data was selected for use in modeling emissions from the proposed project and is expected to satisfy the definition of representative meteorological data and are similar to the dispersion conditions at the WRESC Site and to the regional area. The U.S. EPA-recommended 90 percent completeness criteria are met for all modeled parameters in the surface and upper air meteorological data. Quarterly and annual wind rose plots are presented in Appendix 5.1D as Figures 5.1D-1 through 5.1D-5.

5.1.6.4 Good Engineering Practice Stack Height Analysis

The effects of building downwash on facility operational emissions were included in the modeling assessment. The Plume Rise Model Enhancements to the U.S.EPA Building Profile Input Program (BPIP-PRIME, version 04274) was used to determine the direction-specific building downwash parameters. The BPIP-PRIME enhancements in AERMOD calculate fields of turbulence intensity, wind speed, and slopes of the mean streamlines as a function of projected building shape. Using a numerical plume rise model, the BPIP-PRIME enhancements in AERMOD determine the change in plume centerline location and the rate of plume dispersion with downwind distance. Concentrations are then predicted by AERMOD in both the near and far wake regions, with the plume mass captured by the near wake treated separately from the uncaptured primary plume and re-emitted to the far wake as a volume source.

Good Engineering Practice (GEP) stack height represents the stack height above which the associated building does not influence the plume and is estimated as the greater of 65 meters or the height based on U.S. EPA formulas for the various onsite and offsite structures and their locations and orientations to the WRESC stacks. GEP stack heights were calculated for each proposed stack and were all such that building downwash will be applied to the stacks.

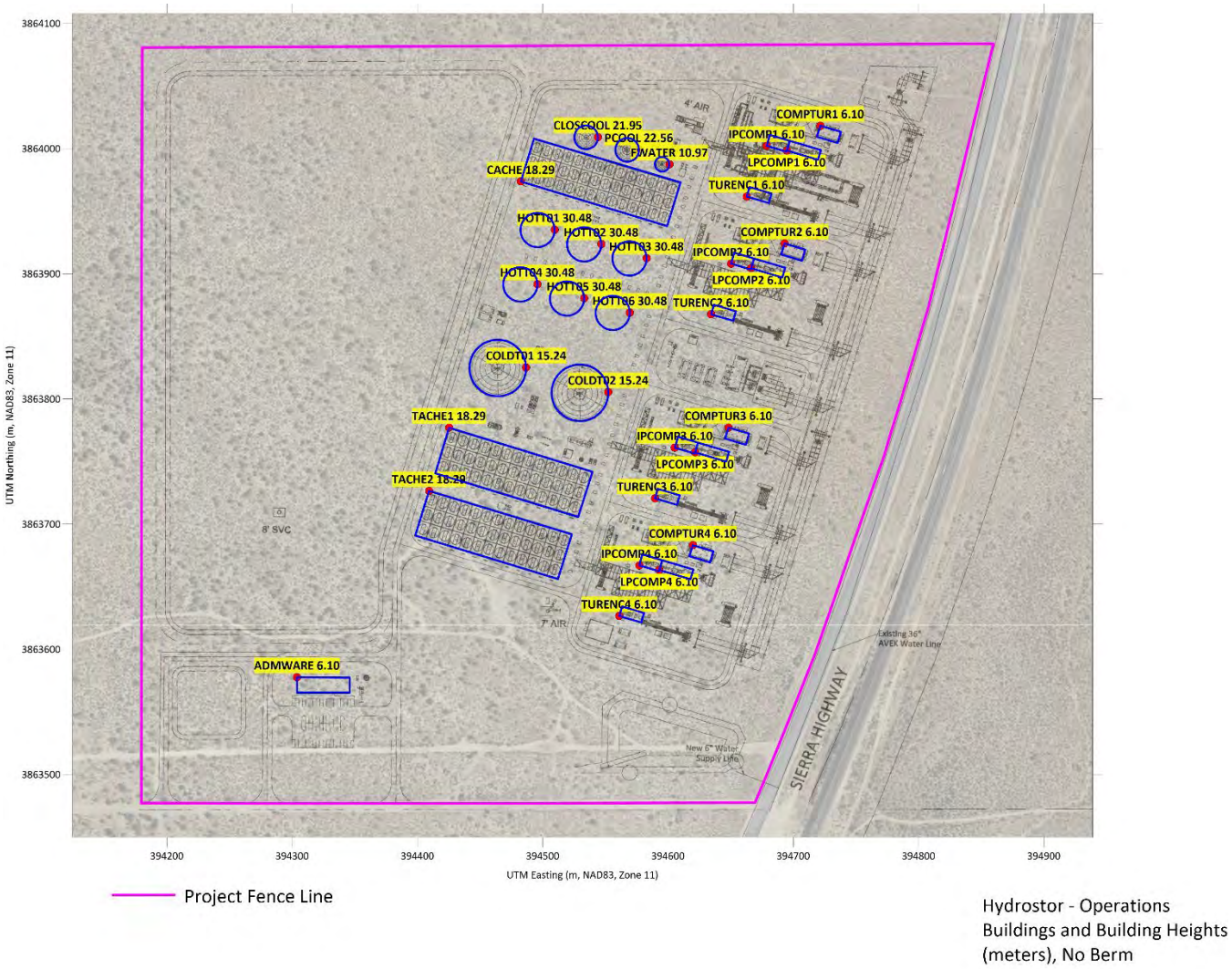
BPIP-PRIME was used to generate wind-direction-specific building dimensions for input into AERMOD. **Figure 5.1-2** shows the structures and source locations included in the BPIP-PRIME downwash analysis. As noted, both architectural berm and no-architectural berm options have the operational sources and structures in the same location, so only the no-architectural berm option is shown in **Figure 5.1-2**.

5.1.6.5 Receptor Grid Selection and Coverage

Receptor and source base elevations were determined from U.S. Geological Survey National Elevation Dataset (NED) data. The NED data was processed with the U.S. EPA model AERMAP for the receptor locations selected. All coordinates (both sources and receptors) are referenced to UTM NAD83, Zone 11. AERMAP (version 18081) can interpolate the elevation data in the NED data for both receptor elevations and hill height scales.

The latest version of AERMAP (version 18081) was used to determine receptor elevations and hill-slope factors utilizing the U.S. Geological Survey's 1-degree square NED (U.S. EPA 2018). NED spacings were 1/3 inch (approximately 10 meters) for the fence line, 20-, 50-, and 100-meter spaced receptor grids and 1 inch (approximately 30 meters) for 200- and 500-meter spaced receptor grids and sensitive receptors. Electronic copies of the BPIP-PRIME and AERMAP input and output files, including the NED data, included with the application will be submitted to staff electronically.

Figure 5.1-2: Structure and Emission Sources Used in Building Profile Input Program (No-Architectural Berm Option)



Cartesian coordinate receptor grids were used to provide adequate spatial coverage at the fence line for assessing ground-level pollution concentrations, identifying the extent of significant impacts, and identifying maximum impact locations. For the full impact analyses, a nested grid was developed to fully represent the initial location and extent of significance area(s) and maximum impact area(s). The nested grid was composed of the following:

Receptors were placed along the proposed WRESC ambient boundary fence lines (both the architectural berm and no-architectural berm options) with 20-meter spacing.

- Receptors extending outwards from the ambient boundary in all directions at least 500 meters with 20-meter receptor spacing.
- Receptors extending from 500 meters to 1,000 meters with 50-meter spacing.
- Receptors extending from 1 km to 5 km with 200-meter spacing.
- Receptors extending from 5 km out to 10 km with 500-meter spacing.
- Additional 20-meter resolution receptors were placed if the maximum impact location occurred beyond 20-meter grid locations.

Ambient concentrations within the facility fence lines were not calculated. **Figures 5.1D-6** through **5.1D-9**, which are provided in Appendix 5.1D, depict the receptor grids based on the two different fence line locations (architectural berm and no-architectural berm options) for both construction and operations. While the fence line locations are different for the construction (architectural berm and no architectural berm) and operations (architectural berm and no architectural berm), the receptor grid resolutions are identical for all four scenarios.

5.1.6.6 Background Air Quality

In 1970, the U.S. Congress instructed the U.S. EPA to establish standards for air pollutants, which were of nationwide concern. This directive resulted from the concern of the impacts of air pollutants on the health and welfare of the public. The resulting Clear Air Act set forth air quality standards to protect the health and welfare of the public. Two levels of standards were promulgated, primary standards and secondary standards. Primary NAAQS are “those which, in the judgment of the administrator U.S. EPA, based on air quality criteria and allowing an adequate margin of safety, are requisite to protect the public health (state of general health of community or population).” The secondary NAAQS are “those which in the judgment of the administrator [U.S. EPA], based on air quality criteria, are requisite to protect the public welfare and ecosystems associated with the presence of air pollutants in the ambient air.” To date, the NAAQS have been established for seven criteria pollutants as follows: SO_2, CO, ozone, NO_2, PM10, PM2.5, and lead.

Criteria pollutants are those that have been demonstrated historically to be widespread and have a potential to cause adverse health effects. The U.S. EPA developed comprehensive documents detailing the basis of, or criteria for, the standards that limit the ambient concentrations of these pollutants. The state of California has also established Ambient Air Quality Standards that further limit the allowable concentrations of certain criteria pollutants. Review of the established air quality standards is undertaken by both U.S. EPA and the state of California on a periodic basis. As a result of the periodic reviews, the standards have been updated and amended over the years following adoption.

Each NAAQS or CAAQS is composed of two basic elements: a numerical limit expressed as an allowable concentration and an averaging time that specifies the period over which the concentration value is to be measured. **Table 5.1-8** presents the current standards.

Table 5.1-8: California and National Ambient Air Quality Standards

Pollutant	Averaging Time	CAAQS (form)	NAAQS (form)
Ozone	1 hour	0.09 ppm	N/A
Ozone	8 hours	0.07 ppm	0.07 ppm
PM10	24 hours	50 µg/m^3 (H1H)	150 µg/m^3 (H6H)
PM10	Annual	20 µg/m^3	N/A
PM2.5	24 hours	N/A	35 µg/m^3 (98th percentile)
PM2.5*	Annual	50 µg/m^3	9 µg/m^3 (3-year average)
CO	1 hour	20 ppm (H1H)	35 ppm (H2H)
CO	8 hours	9.0 ppm (H1H)	9 ppm (H2H)
NO_2	1 hour	180 ppb (H1H)	100 ppb (98th percentile)
NO_2	Annual	30 ppb	53 ppb (3-year average)
SO_2	1 hour	250 ppb (H1H)	75 ppb (99th percentile)
SO_2	3 hours	N/A	500 ppb (H2H)
SO_2	24 hours	40 ppb (H1H)	N/A
SO_2	Annual	N/A	0.03 ppm
Lead	30 days	1.5 µg/m^3	N/A
Lead	3 months	N/A	0.15 µg/m^3

Pollutant	Averaging Time	CAAQS (form)	NAAQS (form)
Sulfates	24 hours	25 µg/m^3	N/A
Hydrogen Sulfide	1 hour	0.03 ppm	N/A
Vinyl Chloride	24 hours	0.01 ppm	N/A

Source: Ambient Air Quality Standards (CARB 2016)
CAAQS = California Ambient Air Quality Standards; CO = carbon monoxide; H1H = highest first high; H2H = highest second high; H6H = highest sixth high; N/A = not applicable; NAAQS = National Ambient Air Quality Standards; NO_2 = nitrogen dioxide; PM10 = particulate matter less than 10 microns; µg/m^3 = micrograms per cubic meter; PM2.5 = particulate matter less than 2.5 microns; ppb = parts per billion; ppm = parts per million.SO_2 = sulfur dioxide
*The annual PM2.5 standard has been revised to 9.0 µg/m^3 and will be effective 60 days from the February 7, 2024 promulgation date, as published in the Federal Register.

Brief descriptions of health effects for the main criteria pollutants are as follows.

Ozone (O_3): Ozone is a reactive pollutant that is not emitted directly into the atmosphere, but rather is a secondary air pollutant produced in the atmosphere through a complex series of photochemical reactions involving VOCs and NO_X. VOC and NO_X are, therefore, known as precursor compounds for ozone. Significant ozone production generally requires ozone precursors to be present in a stable atmosphere with strong sunlight for approximately 3 hours. Ozone is a regional air pollutant because it is not emitted directly by sources but is formed downwind of sources of VOCs and NO_X under the influence of wind and sunlight. Short-term exposure to ozone can irritate the eyes and cause constriction of the airways. In addition to causing shortness of breath, ozone can aggravate existing respiratory diseases, such as asthma, bronchitis, and emphysema.

Carbon Monoxide (CO): CO is a non-reactive pollutant that is a product of incomplete combustion. Ambient CO concentrations generally follow the spatial and temporal distributions of vehicular traffic and are also influenced by meteorological factors, such as wind speed and atmospheric mixing. Under inversion conditions, CO concentrations may be distributed more uniformly over an area out to some distance from vehicular sources. When inhaled at high concentrations, CO combines with hemoglobin in the blood and reduces the oxygen-carrying capacity of the blood. This results in reduced oxygen reaching the brain, heart, and other body tissues. This condition is especially critical for people with cardiovascular diseases, chronic lung disease, or anemia, as well as fetuses.

Particulate Matter (PM10 and PM2.5): Both PM10 and PM2.5 represent fractions of particulate matter, which can be inhaled into the air passages and the lungs and can cause adverse health effects. Particulate matter in the atmosphere results from many kinds of dust- and fume-producing industrial and agricultural operations, combustion, and atmospheric photochemical reactions. Some of these operations, such as demolition and construction activities, contribute to increases in local PM10 concentrations, while others, such as vehicular traffic, affect regional PM10 concentrations.

The U.S. EPA acknowledges that particulate matter can potentially cause the following health effects: premature death in people with heart or lung disease, nonfatal heart attacks, irregular heartbeat, aggravated asthma, decreased lung function, and increased respiratory symptoms.

Nitrogen Dioxide and Sulfur Dioxide (NO_2 and SO_2): NO_2 and SO_2 are two gaseous compounds within a larger group of compounds, NO_X, and SO_X, which are products of the combustion of fuel. NO_X and SO_X emission sources can elevate local NO_2 and SO_2 concentrations, and both are regional precursor compounds to particulate matter. As described above, NO_X is also an ozone precursor compound and can affect regional visibility. (NO_2 is the “whiskey brown-colored” gas readily visible during periods of heavy air pollution.) Elevated concentrations of these compounds are associated with increased risk of acute and chronic respiratory disease.

SO_2 and NO_2 emissions can be oxidized in the atmosphere to eventually form sulfates and nitrates, which contribute to acid rain. Large power facilities with high emissions of these substances from the use of coal or oil are subject to emissions reductions under the Phase I Acid Rain Program of Title IV of the 1990 Clean Air Act Amendments. Power facilities, with individual equipment capacity of 25 MW or greater that use natural gas or other fuels with low sulfur content, are subject to the Phase II Program of Title IV. The WRESC will not require an

acid rain permit because the only power generation units, i.e., the proposed emergency generator engines, that emit regulated air pollutants are less than 25 MW.

Lead: Gasoline-powered automobile engines used to be the major source of airborne lead in urban areas. Excessive exposure to lead concentrations can result in gastrointestinal disturbances, anemia, kidney disease, and, in severe cases, neuromuscular and neurological dysfunction. The use of lead additives in motor vehicle fuel has been eliminated in California and lead concentrations have declined substantially as a result.

CARB has established and maintains a network of sampling stations, called State and Local Air Monitoring Stations (SLAMS) network, that work in conjunction with local air pollution control districts and air quality management districts to monitor ambient pollutant levels. The SLAMS network in Kern County consists of eight stations that monitor various pollutant concentrations. EKAPCD is responsible for monitoring air quality in the Kern County portion of the Mojave Desert Air Basin to determine whether pollutant concentrations meet CAAQS and NAAQS.

Kern Route 58 Business (Kern County), Lancaster (Los Angeles County), and Victorville Park Avenue (San Bernardino County) monitoring stations are the closest stations and have the most representative and complete monitoring data to the WRESC site. Note the three stations belong to the Mojave Desert Air Basin. The identified monitoring stations were used to represent the following background air quality data for use in the modeling analyses:

- Kern Route 58 Business: O_3, PM10, and PM2.5
- Lancaster Division Street: NO_2 and CO
- Victorville Park Avenue: SO_2

Due to its proximity to the WRESC, the Kern Route 58 Business station data was used to summarize ambient concentrations of O_3, PM10, and PM2.5 near the WRESC Site. The Lancaster station was used to summarize CO and NO_2 concentrations, and the Victorville station was used to summarize SO_2 concentrations as the previous two stations do not monitor this pollutant. Appendix 5.1E provides a summary of measured ambient air quality concentrations by year and site for the period 2019 to 2023 (the actual years are dependent upon the monitoring station chosen for this analysis).

Based on the form of the standard, the highest background concentrations for the most recent 3-year period (2019 to 2023) were used to establish background air quality values for modeling. Some of the standards are based on the average across three years (annual PM2.5 and SO_2). These values have been updated and are summarized in **Table 5.1-9** based upon the following caveats:

Data from these sites are a reasonable representation of background air quality for the Project area. The background values represent the highest values reported for the most representative air quality monitoring site during any single year of the most recent 3-year period for the CAAQS assessments. These CAAQS maxima are conservatively used for some of the NAAQS modeling assessments (CO and SO_2), while the appropriate values for the NAAQS, according to the format of the standard, are used for the remainder of the NAAQS modeling assessments (NO_2, PM10, and PM2.5).

Table 5.1-9: Measured Ambient Air Quality (Background)

Pollutant	Basis	Averaging Time	Measured Background (µg/m³)	Site	Data Years
O_3	CAAQS-1st High	1-hr	184.5	Kern 58 Business	2020-2022
	CAAQS-1st High	8-hr	164.9	Kern 58 Business	2020-2022
	NAAQS-4th High	8-hr	155.1	Kern 58 Business	2020-2022
NO_2	CAAQS-1st High	1-hr	97.9	Lancaster Division St	2020-2022
	NAAQS-98th percentile	1-hr	75.91	Lancaster Division St	2020-2022
	CAAQS/NAAQS	Annual	15.7	Lancaster Division St	2020-2022

Pollutant	Basis	Averaging Time	Measured Background (µg/m³)	Site	Data Years
CO	CAAQS/NAAQS -1st High	1-hr	1832	Lancaster Division St	2019-2021
	CAAQS/NAAQS -1st High	8-hr	1260	Lancaster Division St	2019-2021
SO_2	CAAQS/NAAQS -1st High	1-hr	11.2	Victorville Park Ave	2019-2021
	CAAQS/NAAQS -1st High	24-hr	8.9	Victorville Park Ave	2019-2021
	CAAQS/NAAQS	Annual	4.6	Victorville Park Ave	2019-2021
PM10	CAAQS-1st High	24-hr	351	Kern 58 Business	2020-2022
	NAAQS -2nd High	24-hr	112	Kern 58 Business	2020-2022
	CAAQS	Annual	32.7	Kern 58 Business	2020-2022
PM2.5	NAAQS-98th percentile	24-hr	27	Kern 58 Business	2021-2023
	CAAQS/NAAQS	Annual	6.3	Kern 58 Business	2021-2023

µg/m³ = micrograms per cubic meter; O_3 = ozone; CAAQS = California Ambient Air Quality Standards; CO = carbon monoxide; ppm = parts per million; NAAQS = National Ambient Air Quality Standards; NO_2 = nitrogen dioxide; PM10 = particulate matter less than 10 microns; PM2.5 = particulate matter less than 2.5 microns ppb = parts per billion; SO_2 = sulfur dioxide

5.1.6.7 Air Quality Analyses

The following sections present the analyses for determining the impacts to ambient air quality concentrations in the Project region. These analyses are composed of an operational modeling assessment and a construction modeling assessment (both operations and construction included the architectural berm and no-architectural berm options, which also affected fence lines as referenced above). Cumulative multisource modeling assessments, which are used to analyze the proposed Project plus nearby existing sources, is not proposed as the only operational air emission sources are emergency engines that are only intended for emergency use.

Operational characteristics of the engines, such as emission rate, exit velocity, and exit temperature were obtained from manufacturer's specifications. The modeling analyses include the assessment of the Project operational emissions and comparing the calculated concentration to the applicable U.S. EPA Significant Impact Levels (SILs) and CAAQS/NAAQS. For purposes of this analysis, if the SILs are not exceeded, then it is concluded that the Project impacts are insignificant and no further analysis is typically required.

The following averaging times and forms were used to compare to the SILs:

- NO_2 1-hour and PM2.5 24-hour: 5-year average of the 100th percentile (H1H)
- NO_2 and PM2.5 annual: 5-year average of the annual maximum
- CO 1-hour and 8-hour, PM10 24-hour, SO_2 1-hour and 3-hour and 24-hour: highest first high

The following averaging times and forms were used to compare to the CAAQS:

- NO_2 1-hour, CO 1-hour and 8-hour, SO_2 1-hour and 24-hour, and PM10 24-hour: highest first high
- NO_2, PM10, and PM2.5 annual: highest annual value in 5 years

The following averaging times and forms were used to compare to the NAAQS:

- NO_2 1-hour and PM2.5 24-hour: 5-year average of the 98th percentile (H8H)
- SO_2 1-hour: 5-year average of the 99th percentile (H4H)
- NO_2 and PM2.5 annual: 5-year average of the annual maximum
- CO 1-hour and 8-hour, SO2 1-hour (99th percentile) and 24-hour: highest second high
- PM10 24-hour: 6th highest across 5 years

5.1.6.8 Operations and Construction Impact Analyses

Table 5.1-10 shows the stack parameters and emission rates for each emergency engine type (diesel generator or diesel-fueled fire pump). The stationary diesel equipment were all modeled as individual point sources. Detailed emission calculations are included in Appendix 5.1A. Other than the emergency diesel generator and emergency diesel-fueled fire pump, no other combustion sources are proposed for this project.

Table 5.1-10: Stack Parameters and Emission Rates for Each Engine Type

Source	Stack Height (feet)	Exhaust Gas Temperature (ºF)	Exhaust Velocity (ft/s)	Stack Inside Diameter (feet)	Emission Rates (g/s) Short-term Annual			
					PM10/PM2.5	NO_X	SO_2	CO
Each Emergency Diesel Generator 2.5MW	22.93	914	193.5	1.033	0.0201 4.6E-04 (Annual)	0.503 0.0115 (Annual)	0.005 1.15E-04 (Annual)	2.616
Fire Pump	15	1025	245	0.5	0.019 4.37E-04 (Annual)	0.364 8.31E-03 (Annual)	0.00063 1.4E-05 (Annual)	0.332

Source: Appendices 5.1A and 5.1C.
24-hour PM10/2.5 and SO_2 uses maximum hourly emissions spread over 24 hours (1/24). The 8-hour CO uses maximum hourly emissions spread over 8 hours (1/8). Annual emissions represent 200 hours spread over 8,760 hours.
ºF = degrees Fahrenheit; CO = carbon monoxide; ft/s = feet per second; g/s = grams per second; MW = megawatts; NO_x = nitrogen dioxides; PM10 = particulate matter less than 10 microns; PM2.5 = particulate matter less than 2.5 microns; SO_2 = sulfur dioxide

Both the architectural berm and no-architectural berm options were modeled for operational impacts. Because the only difference between the two operational scenarios is the location of the western and northern fence lines, with the no-architectural berm option having the shorter distance to the receptors along the western and northern fence, the no-architectural berm option produced the higher modeled concentrations. For annual averaging periods, each engine was assumed to be capable of operating up to its assumed 200-hour-per-year limit. For shorter averaging periods, i.e., maintenance and readiness testing, only one engine is assumed to be operating in any 1 hour, while up to four engines may be tested in any one day. The use of 200 hours of operation per year results in very conservative criteria pollutant impact assessments since it assumes that up to 150 hours per year will be emergency operation.

Maximum concentrations of pollutants expected to result from the WRESC are compared to the CAAQS and NAAQS in **Table 5.1-11**. Maximum combined concentrations (modeled + background) are less than all the CAAQS and NAAQS except for the PM10 CAAQS (24-hour and annual) and NAAQS (24-hour). For PM10, the background concentrations already exceed the standards. When background exceeds the standards, the Project must demonstrate that it does not contribute to the exceedance of the standard(s). For PM10, the Project's 24-hour and annual modeled concentrations are less than the applicable U.S. EPA SILs of 5 and 1 $\mu g/m^3$ for PM10. Being less than the SIL means that the modeled concentration is not contributing to any violation of the ambient standard as the concentration is considered to be immeasurable; therefore, Project PM10 emissions are less than significant.

The modeling input/output files for both the architectural berm and no-architectural berm options will be provided to the CEC.

Table 5.1-11: Operations Air Quality Impact Results – No-Architectural Berm Option

Pollutant	Averaging Time	Maximum Concentration (µg/m³)	Background (µg/m³)	Total (µg/m³)	U.S. EPA SIL (µg/m³)	Ambient Air Quality Standards (µg/m³)	
						CAAQS	NAAQS
NO_2	1-hour (highest)	121.2	97.9	219.1	NA	339	-
	1-hour (98th percentile) [a]	3.1	75.91	79.0	7.5	-	188
	Annual Maximum	0.3	15.7	16.0	1	57	100
CO	1-hour (highest)	501.6	1,832	2,333.6	2,000	23,000	40,000
	8-hour (highest)	59.3	1,260	1,319.3	500	10,000	10,000
SO_2	1-hour (highest)	1.0	11.2	12.2	NA	655	--
	1-hour (99th percentile)	.04	10.5	10.5	7.5	--	196
	24-hour (highest)	.03	8.9	8.9	5	105	--
	Annual	.003	4.6	4.6	1	105	--
PM10	24-hour (highest)	0.1	351	351.1	5	50	--
	24-hour (6th highest)	0.1	112	112.1	NA	-	150
	Annual maximum	0.02	32.7	32.7	1	20	-
PM2.5	24-hour (98th percentile)	0.08	27.0	27.1	1.2	-	35
	5-year average annual	0.01	6.3	6.3	0.3	9.0*	9.0*

Source: Appendix 5.1E.

[a] Modeling for 1-hour NO_2 NAAQS utilized the annual emissions to assess the 98th percentile concentrations as these units are emergency generators and are, therefore, classified as "intermittent," U.S. EPA Memorandum, March 1, 2011.

µg/m³ = micrograms per cubic meter; CAAQS = California Ambient Air Quality Standards; CO = carbon monoxide; NO_2 = nitrogen dioxide; NAAQS = National Ambient Air Quality Standards; PM10 = particulate matter less than 10 microns; PM2.5 = particulate matter less than 2.5 microns SO_2 = sulfur dioxide, - = not applicable, *U.S. EPA has recently lowered the annual PM2.5 standard from 12 *u*g/m³ down to 9 *u*g/m³: * = the current form of the annual PM2.5 standard is 12.0 *u*g/m³ but is expected to decrease to 9.0 *u*g/m³ within the next 90 days (approximately). To account for this anticipated rulemaking, the new standard was used for this analysis.

Construction equipment and associated heavy-duty truck traffic also generate criteria pollutants through combustion of fuels, as well as the generation of particulate matter through onsite travel and wind erosion of surface and storage piles. As temporary impacts, these construction-related air pollutant emissions would not be considered to contribute substantially to existing or projected air quality violations. However, they were assessed for this project.

For modeling the construction emissions, based upon both the architectural berm and no-architectural berm options, the emission sources for the construction site were grouped into two distinct categories: exhaust emissions and dust emissions. Further, the emissions were, dependent upon the type of activity, modeled as volume line sources (active road sources with a release height of 3.4 meters), as area sources (general site activities related to fugitive dust from equipment usage and wind erosion), and as point sources (stationary diesel combustion sources providing power to the rock crusher and the three cavern vents that expelled emissions from the underground cavern construction). Note that the cement batch was not included in the modeling since operation of this source would occur after the time period of the maximum annual emission scenarios that were assessed. Construction fugitive dust emissions were modeled as area sources covering the 199-acre (with architectural berm) and the 143-acre (no-architectural berm) construction area with a near ground effective

release height of 2 meters. Combustion point, area, and volume source emissions were assumed to occur for 7 days a week, 10 hours per day (7 a.m. to 5 p.m.) while wind-based fugitive dust emissions (wind erosion) were assumed to be continuous (24 hours per day). The construction modeling analysis used the same modeling options, receptor locations, and meteorological data as used for the Project operating impact analysis. In Appendix 5.1D, **Figure 5.1D-10** presents the source type (area, line, and point) and the source location(s) for the no-architectural berm construction option while **Figure 5.1D-11** presents the architectural berm option. The cavern vents were modeled as point sources with a 3-meter release height and with an exit temperature set to ambient. The exit velocity was calculated based on the total incoming air flow rates into the caverns and then adjusted for each cavern vent based on the exit diameter.

To determine the construction impacts on short-term ambient standards (24 hours and less), the calculated worst-case year was used to derive the daily onsite construction emission levels shown in **Table 5.1-6** (architectural berm option) and **Table 5.1-7** (no-architectural berm). The hourly emissions were adjusted to reflect either the 10-hour day operations or were based on a 24-hour day, dependent upon activity and source type. For the pollutants with annual average ambient standards, the annual onsite emission levels shown in **Table 5.1-6** (architectural berm option) or **Table 5.1-7** (no-architectural berm option) were used. Modeled onsite vehicular traffic was based on the CalEEMod default 2025 fleet mix which is composed of Tier 1 through Tier 4 engine categories.

Based on the modeling results in **Table 5.1-12** (architectural berm option), the combined modeled plus background concentrations that are greater than the CAAQS are for the 24-hour and annual PM10 averaging periods, due solely to the monitored background concentrations, which already exceed the CAAQS. The maximum modeled impacts for PM10 are primarily related to the construction fugitive dust emissions. However, reviewing the modeling output identifies that the combustion based construction source concentrations for PM10 are less than the applicable U.S. EPA SILs for both 24-hour and annual averaging periods, the Project modeled impacts are not significant. In addition, application of the CEC construction requirements will further reduce the construction emissions to a level of insignificance.

The modeling results also show the Federal 1-hour NO_2 standard would be exceeded. The Project impacts, by themselves without background, do not exceed any ambient air quality standard. Further, CEC mitigation requiring the application of Tier 4 emission standards and the use of Tier 4 vehicle fleets would also mitigate the 1-hour NO_2 impacts to a level of insignificance. Based on the application of CEC construction requirements, the Project will comply with the ambient air quality standards.

Table 5.1-13 presents the modeling results for the no-architectural berm option. Using the default CalEEMod vehicular fleet mix, exceedances were calculated for the 1-hour NO_2 standard (both California and the Federal Standard). As with the architectural berm option, the total Project impacts (modeled plus background) for 24-hour and annual PM10 exceeded the California and Federal ambient air quality standards, solely due to the background data which already exceeds the applicable standard(s). Modeled impacts without background, with the exception of the 1-hour NO_2 standard are all below the applicable ambient air quality standards. All other modeled impacts are below the applicable ambient air quality standards.

To assess how the application of CEC mitigation measures through the use of Tier 4 engine specifications would reduce the no-architectural berm Project modeled concentrations on 1-hour NO_2 standard the truck fleet used to transport the construction spoils offsite were remodeled as all with Tier 4 emission standards. The dispersion modeling results for 1-hour NO_2 after the application of mitigation are as follows:

- California 1-hour NO_2 modeled + background: 213.57 ug/m^3 + 97.9 ug/m^3 = 311.5 ug/m^3
- Federal 1-hour NO_2 modeled + background: 128.91 ug/m^3 + 75.91 ug/m^3 = 204.8 ug/m^3

Table 5.1-12: Construction Air Quality Impact Results – Architectural Berm Option

Pollutant	Averaging Time	Maximum Concentration (µg/m³)	Background (µg/m³)	Total (µg/m³)	Ambient Air Quality Standards (µg/m³)	
					CAAQS	NAAQS
NO_2	1-hr (highest)	237.51	97.9	335.4	339	-
	1-hr (98_{th} percentile)	131.16	75.91	207.1	-	188
	Annual Maximum	13.77	15.7	29.47	57	100
CO	1-hr (highest)	511.04	1,832	2,343.04	23,000	40,000
	8-hr (highest)	120.22	1,260	1,380.2	10,000	10,000
SO_2	1-hr (highest)	0.94	11.2	12.14	655	--
	1-hr (99_{th} percentile)	0.80	10.5	11.3	--	196
	24-hr (highest)	0.13	8.9	9.03	105	--
	Annual	0.036	4.6	4.64	105	--
PM10	24-hr (highest)	23.94	351	374.9	50	--
	24-hr (6_{th} highest)	19.37	112	131.4	-	150
	Annual maximum	5.99	32.7	38.5	20	-
PM2.5	24-hr (98_{th} percentile)	6.18	27.0	33.2	-	35
	3-year average annual	2.52	6.3	8.82	9*	9*

Source: Appendix 5.1D
µg/m³ = micrograms per cubic meter; CO = carbon monoxide; NAAQS = National Ambient Air Quality Standards; NO_2 = nitrogen dioxide; PM10 = particulate matter less than 10 microns; PM2.5 = particulate matter less than 2.5 microns; SO_2 = sulfur dioxide; - = Not Applicable; * = the current form of the annual PM2.5 standard is 12.0 ug/m³ but is expected to decrease to 9.0 ug/m³ within the next 90 days. The new standard was used for this analysis.

Table 5.1-13: Construction Air Quality Impact Results – No-Architectural berm Option

Pollutant	Averaging Time	Maximum Concentration (µg/m³)	Background (µg/m³)	Total (µg/m³)	Ambient Air Quality Standards (µg/m³)	
					CAAQS	NAAQS
NO_2	1-hr (highest)	469.21	97.9	567.1	339	-
	1-hr (98^{th} percentile)	190.38	75.91	266.3	-	188
	Annual Maximum	7.54	15.7	23.2	57	100
CO	1-hr (highest)	1,285.86	1,832	3,117.9	23,000	40,000
	8-hr (highest)	263.74	1,260	1,523.7	10,000	10,000
SO_2	1-hr (highest)	4.32	11.2	15.5	655	--
	1-hr (99^{th} percentile)	2.28	10.5	12.8	--	196
	24-hr (highest)	0.43	8.9	9.3	105	--
	Annual	0.038	4.6	4.6	105	--
PM10	24-hr (highest)	28.97	351	380.0	50	--
	24-hr (6^{th} highest)	20.63	112	132.6	-	150
	Annual maximum	5.21	32.7	37.9	20	-

Pollutant	Averaging Time	Maximum Concentration (µg/m³)	Background (µg/m³)	Total (µg/m³)	Ambient Air Quality Standards (µg/m³)	
					CAAQS	NAAQS
PM2.5	24-hr (98th percentile)	3.77	27.0	30.8	-	35
	3-year average annual	1.44	6.3	7.74	9*	9*

Source: Appendix 5.1D.
µg/m³ = micrograms per cubic meter; CO = carbon monoxide; NAAQS = National Ambient Air Quality Standards; NO_2 = nitrogen dioxide; SO_2 = sulfur dioxide; PM10 = particulate matter less than 10 microns; PM2.5 = particulate matter less than 2.5 microns; - = Not Applicable: * = the current form of the annual PM2.5 standard is 12.0 ug/m³ but is expected to decrease to 9.0 ug/m³ within the next 90 days. The new standard was used for this analysis.

The additional mitigation will show compliance with the California 1-hour standard. While the Federal standard with background still exceeds the ambient air quality standard for the no-architectural berm option, the modeled concentration was below the standard (without background) at 128.91 ug/m3. Application of additional use of Tier 4 equipment in the emission inventory would further reduce the Project impacts for both berm options. Thus, the application of the standard CEC conditions of certification construction mitigation relating to the requirements for an onsite Air Quality Construction Mitigation Manager, preparation of an Air Quality Construction Mitigation Plan, implementation of Construction Fugitive Dust Control, implementation of a Dust Plume Response Requirement, and implementation of Diesel-Fueled Engine Control (see for example, Conditions AQ-SC1 through AQ-SC5 for the Stanton Energy Center decision – 16-AFC-01, docket number TN 225870, pages Appendix A-1 to A-6) would result in the no-architectural berm Project impacts being reduced to a level of insignificance.

The air quality modeling support data, including the input/output and meteorological data sets, will be submitted to staff electronically (Appendix 5.1F).

5.1.6.9 Willow Rock Commissioning Impact Analysis

Commissioning of the engines is not anticipated to have any additional impacts beyond what has been considered for operation, so as U.S. EPA rate commissioning impact analysis is not provided.

5.1.6.10 Fumigation Analysis

Inversion break-up fumigation was not assessed. The U.S. EPA Model AERSCREEN, based upon guidance given in "Screening Procedures for Estimating the Air Quality Impact of Stationary Sources, Revised" (USEPA-454/R-92-019) requires that the point source stack heights would need to exceed 10 meters (33 feet) in order for fumigation impacts to occur (U.S. EPA 2021b). As all the point source emission release heights are less than 10 meters feet above ground level, fumigation was not assessed.

5.1.7 Laws, Ordinances, Regulations, and Statutes

The following presents a listing of local, state, and federal air quality LORS deemed applicable to the proposed Project. Conformance and/or compliance for each identified LORS is noted in the sections below.

5.1.7.1 Specific Laws, Ordinances, Regulations, and Statutes Discussion

5.1.7.1.1 Federal LORS

Federal LORS applicability is discussed in the list below. Parts of Title 40 CFR Subchapter C that have no practical applicability to the WRESC are not discussed.

- 40 CFR Part 50 (NAAQS): All stationary sources of emission are required to meet the NAAQS. WRESC modeling discussed in Section 5.1.6.8 demonstrates compliance with the NAAQS.
- 40 CFR Part 52.21 (PSD): The WRESC will not be considered a major source under Prevention of Significant Deterioration.

- 40 CFR Part 60 (NSPS): The following New Source Performance Standard(s) (NSPS) apply to the WRESC:
  - Subpart A (General Provisions) apply to the WRESC if any of the listed subparts apply. Because NSPS Subpart IIII applies, portions of Subpart A apply, which are listed in NSPS Subpart IIII Table 8.
  - Subpart IIII (Standards for Stationary Compression Ignition Internal Combustion Engines) applies to the four diesel engines proposed that will drive emergency generators and the fire pump. Compliance will be demonstrated by purchasing engines that are certified to applicable emission standards and by following applicable operating and BMPs. Operation will be limited to 200 hours per year for emergency operations and maintenance and readiness testing. Fuel must contain no more than 15 ppm sulfur. The air permitting process described in Section 5.1.2 will document compliance with this rule.
  - No other NSPSs apply.
- 40 CFR Part 61 (NESHAP): No Part 61 National Emission Standards for Hazardous Air Pollutants (NESHAP) apply to the WRESC.
- 40 CFR Part 63 (NESHAP for Source Categories): The following Part 60 NESHAPs apply to the WRESC:
  - Subpart A (General Provisions) apply to the WRESC if any of the listed subparts apply. Because NESHAP Subpart ZZZZ applies, portions of Subpart A apply but due to the limited nature of compliance requirements of Subpart ZZZZ, Subpart A has no practical applicability.
  - Subpart ZZZZ (NESHAP for Stationary Reciprocating Internal Combustion Engines) applies to the four diesel engines proposed that will drive emergency generators and fire pump. The only requirement under Subpart ZZZZ is that the units comply with the requirements of NSPS Subpart IIII. The air permitting process described in Section 5.1.2 will document compliance with this rule.
- 40 CFR Part 63 (CAM): Compliance Assurance Monitoring does not apply because no emission unit has an uncontrolled pollutant specific emission rate above Part 70 major source thresholds and no add-on pollution control equipment is proposed.
- 40 CFR Part 68 (RMP): The WRESC will not require a Risk Management Plan.
- 40 CFR Part 70 (Operating Permits): Because the WRESC will not have permitted emissions from stationary sources that exceed Part 70 major source thresholds, a major source operating permit under Part 70 is not required (sometimes referred to as a Title V permit).
- 40 CFR Part 71 (Federal Operating Permits): The EKAPCD has delegated permitting authority over the geographic region where the WRESC is proposed; therefore, Part 71 does not apply.
- 40 CFR Part 72-75 (Acid Rain): The WRESC will not require an acid rain permit.
- 40 CFR Part 82 (Protection of Stratospheric Ozone): The Applicant anticipates having a licensed third party handle any ozone depleting substances, if applicable. Proper documentation will be kept for such activity.
- 40 CFR Part 93 (General Conformity): As discussed in Section 5.1.4.6, this project is not subject to general conformity.
- 40 CFR Part 98 (Mandatory GHG Reporting): The WRESC is not anticipated to have actual GHG emission from operations that exceed 25,000 metric tons per year; therefore, reporting will not be required under Part 98.

5.1.7.1.2 State Laws, Ordinances, Regulations, and Statutes

- California Health and Safety Code Part 6 Sections 44360 to 44366 [Air Toxics “Hot Spots” Information and Assessment]: The WRESC will be subject to Part 6 because it will release substances listed in the rule from the combustion of diesel fuel from the emergency generators and the fire pump. WRESC will participate in the requirement to prepare an inventory and health risk analysis (as applicable). The analysis presented in Section 5.9, Public Health, shows that emissions from the WRESC will be below the significance levels for operation and that the cancer risk and chronic hazard index values are reasonable for risks due to construction activities.
- California Health and Safety Code 41700 [public nuisance]: Prohibits the discharge from a facility of air pollutants that cause injury, detriment, nuisance, or annoyance to the public, or which endanger the comfort, repose, health, or safety of the public, or that damage business or property. The Applicant will acquire

permits from EKAPCD for emergency generators and fire pump that will not operate for more than 200 hours per year. The operations of these generators are not expected to generate a public nuisance.

- California Code of Regulations Title 17 Section 70200 [California Ambient Air Quality Standards]: Emissions from WRESC operations and construction show compliance with the CAAQS using air dispersion models. WRESC modeling discussed in Section 5.1.6.8 demonstrates compliance with the NAAQS.
- California Health and Safety Code 41753 (https://ww2.arb.ca.gov/our-work/programs/portable-equipment-registration-program-perp): This is a program offered by CARB to register portable equipment as an alternative to securing permits or portable registrations from local air pollution control districts. Equipment registered with the Portable Equipment Registration Program, when used according to the conditions on the registration, may operate throughout the state without obtaining permits to operate or portable registrations from any of California's 35 air quality management or air pollution control districts. Generally, portable engines over 50 horsepower (hp) and portable equipment units that emit particulate matter cannot be operated within the jurisdiction of the EKAPCD without an EKAPCD or State Portable Registration.

5.1.7.1.3 Air Pollution Control District LORS

EKAPCD LORS applicability is discussed in the list below.

- EKAPCD Regulation II Rule 201 [permits required]: The reciprocating engines proposed for the operating phase of the WRESC must obtain an air authority to construct and a permit to operate as described in Section 5.1.2.
- EKAPCD Regulation II Rule 201.1 [Title V]: The WRESC will not be considered a major source under Title V and will not be required to obtain a Title V air permit to operate.
- EKAPCD Regulation II Rules 201.2 and 201.3 [synthetic minor and federally enforceable limits on potential to emit]: The WRESC will accept enforceable limits on annual operation in the air permit such that the facility will be considered a synthetic minor source.
- EKAPCD Regulation II Rule 210.1 [minor new source review]: The WRESC emission units will be subject to new source review for minor sources. The process will require application of BACT. Offsets will not be required because the emission units are for emergency use only and will limit operation to no more than 200 hours per year (excluding maintenance and readiness testing). See Sections 5.1.2 and 5.1.5 for compliance measures.
- EKAPCD Regulation II Rule 210.1A [major new source review]: The WRESC emission units will not be subject to prevention of significant deterioration review due to the potential to emit.
- EKAPCD Regulation II Rule 210.4 [prevention of significant deterioration]: The WRESC emission units will not be subject to major new source review due to the potential to emit.
- EKAPCD Regulation II Rule 210.7 [federal general conformity]: As discussed in Section 5.1.4.6, this action will not be subject to federal general conformity.
- EKAPCD Regulation IV Rule 401 [visible emissions]: The reciprocating engines proposed for the operating phase of the WRESC must obtain an air permit, which will contain conditions that require compliance with the visible emission limits.
- EKAPCD Regulation IV Rule 407 [sulfur compounds]: Reciprocating engines in the operating the WRESC will comply by combusting diesel fuel that contains not more than 15 ppm sulfur.
- EKAPCD Regulation IV Rule 409 [fuel burning equipment]: The engines at the WRESC do not meet the definition of fuel burning equipment; therefore, this rule does not apply.
- EKAPCD Regulation IV Rules 411 and 413 [storage of organic liquids and loading]: The WRESC will include diesel fuel storage tanks; however, Rules 411 and 413 only apply to petroleum distillates that have a true vapor pressure greater than 1.5 pounds per square inch absolute. Diesel fuel has a vapor pressure less than this threshold, so Rules 411 and 413 do not apply.
- EKAPCD Regulation IV Rule 419 [nuisance]: The engines at the WRESC are not anticipated to emit quantities of air contaminants that would qualify as a nuisance.
- EKAPCD Regulation IV Rule 422 [NSPS]: The engines at the operational WRESC will comply with applicable NSPS Subpart IIII.

- EKAPCD Regulation IV Rule 423 [NESHAP]: The only requirement under Subpart ZZZZ will be for the engine to comply with NSPS Subpart IIII.
- EKAPCD Regulation IV Rule 427 [piston engines]: The engines for the WRESC will be for emergency use so this rule does not apply.

5.1.7.2 Agency Jurisdiction and Contacts

Table 5.1-14 presents data on the following:

- Air quality agencies that may or will exercise jurisdiction over air quality issues resulting from the power facility
- The most appropriate agency contacts for Willow Rock
- Contact address and phone information
- The agency involvement in required permits or approvals

Table 5.1-14: Agency, Contacts, Jurisdictional Involvement, Required Permits for Air Quality

Regulatory Agency	Regulatory Contact	Jurisdictional Area	Permit Status
CEC	CEC-Lon Payne 1516 Ninth Street Sacramento, CA 95814	Primary reviewing and certification agency.	Will certify the facility under the energy siting regulations and CEQA. Certification will contain a variety of conditions pertaining to emissions and operation.
EKAPCD	Glen Stephens, PE, Air Pollution Control Officer 2700 M Street, Suite 302 Bakersfield, CA 93301 (661) 862-5250	Prepares DOC for CEC, Issues EKAPCD ATC and Permit to Operate, primary air regulatory and enforcement agency.	DOC will be prepared after AFC submittal.
CARB	Mike Tollstrup Chief, Project Assessment Branch 1001 I Street, 6th Floor Sacramento, CA 95814 (916) 322-6026	Oversight of APCD stationary source permitting and enforcement program.	CARB staff will provide comments on applicable AFC sections affecting air quality and public health. CARB staff will also have opportunity to comment on draft ATC.
U.S. EPA Region 9	La Weeda Ward, Permits Section U.S. EPA Region 9 75 Hawthorne Street San Francisco, CA 94105 (213) 244-1812	Oversight of all APCD programs, including permitting and enforcement programs. PSD permitting authority for EKAPCD.	U.S. EPA Region 9 staff will receive a copy of the DOC. U.S. EPA Region 9 staff will have opportunity to comment on draft ATC.

AFC = Application for Certification; ATC = Authority to Construct; CARB = California Air Resources Board; CEC = California Energy Commission; DOC = Determination of Compliance; CEQA = California Environmental Quality Act; APCD = Air Pollution Control District; EKAPCD = Eastern Kern APCD; CARB = California Air Resources Board; PSD = Prevention of Significant Deterioration; TBD = to be determined; U.S. EPA = U.S. Environmental Protection Agency;

5.1.7.3 Permit Requirements and Schedules

A description of the air permitting process is in Section 5.1.2.

5.1.8 References

Auer, August H. Correlation of Land Use and Cover with meteorological Anomalies, Journal of Applied Meteorology 1978.California Air Resources Board (CARB. 2016. Ambient Air Quality Standards. Updated May 4, 2016. Available at: http://www.arb.ca.gov/research/aaqs/aaqs2.pdf. Accessed in February 2024.

Eastern Kern Air Pollution Control District (EKAPCD). 2018. Eastern Kern APCD Attainment Status, 2018. Available at: http://www.kernair.org/Documents/Reports/EKAPCD%20Attainment%20Status%202018.pdf. Accessed in August 2021.

EKAPCD. 2017 Ozone Attainment Plan. July. Available at: http://kernair.org/Documents/Announcements/Attainment/2017%20Ozone%20Plan_EKAPCD_Adopted_7-27-17.pdf. Accessed in August 2021.

EKAPCD. 2006. Guidelines for Preparing an Air Quality Assessment for Use in Environmental Impact Reports, December 2006. Available at: http://kernair.org/Documents/CEQA/AirQualityAssessmentPrUSEPArationGuidelines.pdf. Accessed in August 2021.

EKAPCD. 1999. Guidelines for Implementation of the California Environmental Quality Act (CEQA) of 1970, as Amended July 1. Available at: http://kernair.org/Documents/CEQA/CEQA_Guidelines%20&%20Charts.pdf. Accessed online August 2021.

U.S. Environmental Protection Agency (USEPA). 2021a. AERMOD Modeling System (Version 21112). Available at: https://www.USEPA.gov/scram/air-quality-dispersion-modeling-preferred-and-recommended-models#aermod. Accessed in August 2021.

U.S. EPA. 2021b. AERSCREEN Users Guide, April 2021, United States Environmental Protection Agency.

U.S. EPA. 2018. AERMAP (version 18081). Available at: https://www.USEPA.gov/scram/air-quality-dispersion-modeling-related-model-support-programs. Accessed in August 2021.

U.S. EPA. 1985. Guideline for Determination of Good Engineering Stack Height (Technical Support Document for the Stack Height Regulation) (Revised), USEPA-450/4-80-023R. Office of Air Quality Planning and Standards, Research Triangle Park, NC. June.

5.2 Biological Resources

GEM A-CAES LLC's (GEM, the Applicant) Willow Rock Energy Storage Center (WRESC, or Willow Rock) will be located on approximately 88.6 acres of private land immediately north of Dawn Road and between State Route (SR) 14 and Sierra Highway within unincorporated, southeastern Kern County, California. The WRESC will be a nominal 520-megawatt (MW) gross (500 MW net) and 4,160 megawatt-hour (MWh) gross (4,000 MWh net) facility using Hydrostor, Inc.'s (Hydrostor's) proprietary, advanced compressed air energy storage (A-CAES) technology. Energy stored at the WRESC Site will be delivered to Southern California Edison's (SCE's) Whirlwind Substation located southwest of the WRESC Site at the intersection of 170th Street W and Rosamond Boulevard, via a new approximately 19-mile 230-kilovolt (kV) generation-tie (gen-tie) line. The WRESC Site will be capable of operating on a 24-hour basis, 365 days a year with an approximately 50-year lifespan.

The Project or Project Area encompasses the WRESC Site, the parcels within the Project Boundary, and the right-of-way (ROW) associated with the WRESC's gen-tie line. The Project Boundary encompasses the WRESC Site and the parcels of land (an additional 133 acres of private land surrounding the WRESC) that will be allocated for potential temporary staging and laydown area (referred to herein as the Staging Area) during construction, or the construction of a permanent architectural berm constructed from the material excavated during cavern construction. The Staging Area consists of groups of assessor's parcels referred to as P1, P2N, P2S, and VH.

This section discusses the biological resources and regulatory setting and includes an analysis of potential impacts associated with the WRESC proposed by the Applicant. The WRESC will be located in unincorporated Kern County, California, between Rosamond Dry Lake to the southeast and the Tehachapi Mountains to the northwest. There are several gen-tie route options to the SCE Whirlwind Substation, in addition to the Preferred Gen-Tie Route. Section 5.2.1 discusses the affected environment, including an overview of the region (10-mile radius), habitat and vegetation communities (1-mile radius), and special-status species (10-mile radius).

- Section 5.2.1.5 presents the results of biological surveys in and near the Project Area.
- Section 5.2.2 presents an environmental analysis of the Project, including standards of significance, potential impacts of construction and operation of the WRESC, and impacts to special-status species.
- Section 5.2.3 evaluates any potential cumulative effects on biological resources in the vicinity of the Project Area.
- Section 5.2.4 addresses mitigation measures that will avoid, minimize, or compensate for adverse impacts.
- Section 5.2.5 describes the laws, ordinances, regulations, and standards (LORS) that apply to the WRESC.
- Section 5.2.6 presents permit requirements.
- Section 5.2.7 presents the regulatory agency contacts.
- Section 5.2.8 contains the references used to prepare this section.

The Applicant contracted WSP USA Environment and Infrastructure Inc. (WSP) to perform the biological resources evaluation for the WRESC California Energy Commission (CEC) Application for Certification (AFC). WSP's findings were presented to GEM in the Biological Resources Assessment Report for the Project, dated January 25, 2024 (WSP 2024a). This section includes several figures that are attached at the end of the section. Appendix 5.2A includes the resume of the study's lead biologist.

5.2.1 Affected Environment

This section discusses the affected environment and provides an overview of the region, significant habitats, and special-status plant and wildlife species. The affected environment consists of the Project Area. Collectively, the Project Boundary, VH, and the gen-tie line alignment is referred to in this document as the Project Area. The Project Boundary includes the WRESC Site and additional workspaces in P1 and P2 (both north and south). The WRESC Site consists of Assessor's Parcel Number (APN) 431-022-013. The P1 additional workspace area includes APNs 431-122-03, 431-122-07, 431-122-08, 431-122-14, 431-122-15, 431-122-16, 431-122-17, 431-122-18, 431-022-12, and 431-022-11. The P2 additional workspace includes APNs 471-061-05, 471-061-06, 471-

061-07, and 471-061-08 to the south and 431-111-30, 431-112-24, 431-112-25, 431-112-26, 431-112-27, 431-122-01, 431-122-02 and 431-122—04 to the north. An optional non-contiguous workspace area, VH, (APNs 431-022-08) is located west of SR 14. Figure 5.0-1 shows the Project Boundary, WRESC Site, P1, P2, and VH.

The Project Area ranges in elevation from 2,335 feet above mean sea level at the central portion of the gen-tie line to 2,752 feet at the Whirlwind Substation. The average elevation of the Project Area is 2,556 feet. The WRESC Site is located at the intersection of Dawn Road and State Route (SR)14, in the unincorporated community of Ansel, approximately halfway between the cities of California City and Lancaster, California. To begin the biological resources assessment, a literature review of previously recorded sensitive biological resource occurrences was completed within a 10-mile radius of the Project Area (Rarefind 5, 5 2024 data, last accessed on February 5, 2024). The California Natural Diversity Database (CNDDB) search included the following topo quads:

- Cummings Mountain
- Tehachapi South
- Monolith
- Mojave
- Sanborn
- Liebre Twins
- TylerHorse Canyon
- Willow Springs
- Soledad Mountain
- Bissell
- Neenach School
- Fairmont Butte
- Little Buttes
- Rosamond
- Rosamond Lake
- Burnt Peak
- Lake Hughes
- Del Sur
- Lancaster West
- Lancaster East

There are a number of species known to occur in the higher-elevation mountainous areas surrounding the Project Area (San Gabriel Mountains and Tehachapi Mountains) that would not support the same sensitive species as those found within the lower-elevation Antelope Valley.

The WRESC Site will be located on the 7.5-minute Soledad Mountain, California, U.S. Geological Survey (USGS) topographic quadrangle (topo quad). The gen-tie line route and options are located on the Soledad Mountain, Rosamond, Fairmont Butte, and Little Buttes topo quads.

To assess the affected environment, a buffer area was placed around the Project Area to identify direct and indirect project effects. This buffer area included a 1,000-foot radius around the WRESC and a 500-foot buffer around the gen-tie line alignment, hereafter referred to as the Study Area. In addition, protocol-level survey areas refer to the specific survey area identified under protocol-level requirements (see Section 5.2.1.5.2).

5.2.1.1 Regional Overview

The U.S. Geological Survey has separated southern California into nine distinct natural provinces. The Study Area is located within the western portion of the Mojave Desert Province. Regionally, it is located south of the Sierra Nevada Province and north of the Transverse Range Province (Sharp 1975). The Mojave Desert Province originates just east of the unincorporated community of Gorman, California, at the intersection of the Tehachapi Mountains and the San Gabriel Mountains. More specifically, the Project Area is located in an area of the Mojave Desert known as the Rosamond Playa. Withing that area, the WRESC Site is located north of the Rosamond Hills and south of Soledad Mountain.

Significant earthquake faults are present near the Project Area. The largest fault near the Project Area is the San Andreas Fault, which runs in a northwest-to-southeast direction along the base of the San Gabriel Mountains (approximately 12 miles south of the WRESC Site). The next major earthquake fault near the Project Area is the Garlock Fault, which runs in a southwest-to-northeast direction along the base of the Tehachapi Mountains (approximately 12 miles north of the WRESC Site).

The region experiences four distinct seasons with large diurnal fluctuations in temperature. Winter storms from the northern Pacific Ocean can bring rain into the region; however, the Tehachapi Mountains, the San Gabriel

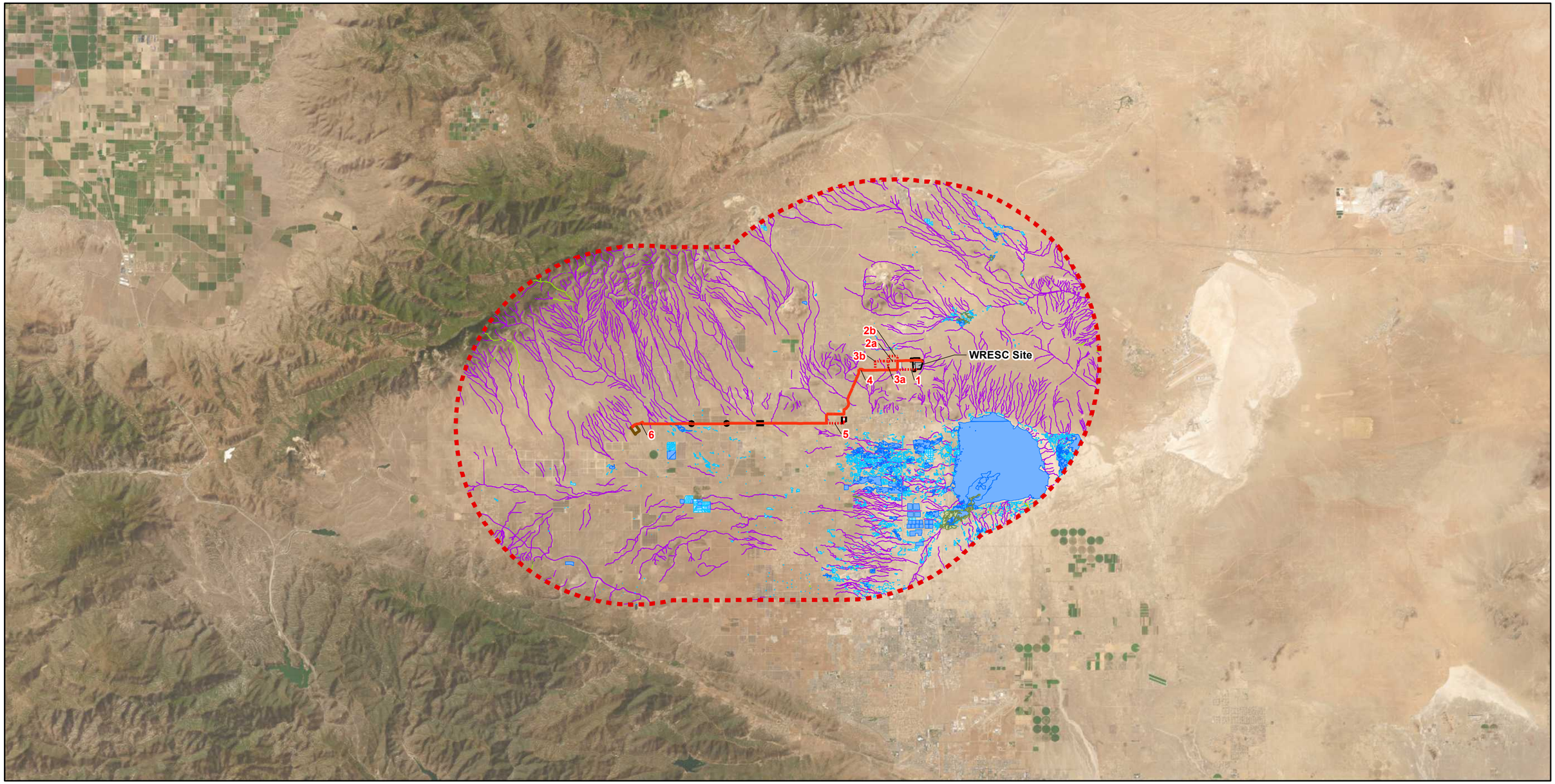
Mountains, and, to a lesser extent, the Sierra Nevada act as a boundary that prevents west coast moisture and storms from moving east. The rain shadow that these mountain ranges create causes this region to be the hottest and driest portion of the Mojave Desert. In some of the driest sites, average rainfall can be less than 2 inches. During the 2023 surveys performed for the WRESC, rainfall exceeded the annual average, and 9.75 inches of rain occurred during the 2022/2023 rain season (November to August). Winter temperatures have been recorded to drop to 20 degrees Fahrenheit (°F) in the valleys (Bunn et al. 2007). Over the course of the year, the temperature in this area typically ranges from 33°F to 98°F and is rarely below 23°F or above 105°F.

Despite the arid climate, the region supports a large variety of flora and fauna, many of which have evolved specifically for the region. Common habitats found typically include creosote bush scrub, desert saltbush, Joshua tree scrub, desert wash, alkali scrub, and juniper-pinyon woodlands. Some of the mid-elevation areas in this region can support up to 70 species of shrubs per hectare (Randall et. al 2010).

Current land use within close proximity of the WRESC Site is mixed, with undeveloped land, rural residential properties, and unauthorized off-road vehicle use. The gen-tie line alignment lies within close proximity of residential development, commercial development, historic mining operations, electrical substations, agricultural lands, and solar farms. Several wind turbine farms are located throughout the 10-mile radius surrounding the WRESC Site.

5.2.1.2 Significant Regional Wetlands and Protected Areas

The National Wetland Inventory (NWI) and National Hydrography Dataset (NHD) were reviewed to identify wetland or hydrographic features (USFWS 2021; USGS 2021). **Figure 5.2-1a** presents bodies of water found within a 10-mile radius of the WRESC Site, and **Figure 5.2-1b** presents water features observed within a 1,000-foot buffer of the Project Area.



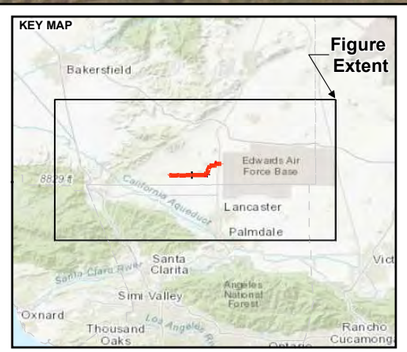
LEGEND

Wetland Type
- Freshwater Emergent Wetland
- Freshwater Forested/Shrub Wetland
- Freshwater Pond
- Lake
- Riverine

Proposed Transmission Line
- Preferred Route, Aboveground
- Preferred Route, Underground
- Route Options 1-6, Aboveground
- Route Options 1-6, Underground

Project Components
- WRESC Site
- Other Project Parcels
- Project Boundary
- SCE Whirlwind Substation
- 10 Mile Buffer Around Transmission Line

KEY MAP



0 5 10
1:350,000 MILES

REFERENCE(S)
1. COORDINATE SYSTEM: NAD 1983 STATEPLANE CALIFORNIA V FIPS 0405 FEET
2. MAP SERVICE LAYER CREDITS: SOURCES: ESRI, HERE, GARMIN, INTERMAP, INCREMENT P CORP., GEBCO, USGS, FAO, NPS, NRCAN, GEOBASE, IGN, KADASTER NL, ORDNANCE SURVEY, ESRI JAPAN, METI, ESRI CHINA (HONG KONG), (C) OPENSTREETMAP CONTRIBUTORS, AND THE GIS USER COMMUNITY
SOURCE: ESRI, MAXAR, EARTHSTAR GEOGRAPHICS, AND THE GIS USER COMMUNITY

CLIENT
GEM A-CAES LLC

CONSULTANT
wsp

PROJECT
WILLOW ROCK ENERGY STORAGE CENTER
SUPPLEMENTAL AFC

YYYY-MM-DD	2024-02-26
DESIGNED	MK
PREPARED	MK
REVIEWED	SC
APPROVED	SH

TITLE
NATIONAL WETLANDS INVENTORY - 10 MILE BUFFER AROUND TRANSMISSION LINE

PROJECT NO.	PHASE	REV.	FIGURE
31406639.003	HY.04	0	5.2-1a

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B

PATH: G:\Hydrostor\Ansel\99_PROJECTS\31406639.003_HydrostorAnselBlvdAFC\HY.04 Bio-LBR_Biology\02_PRODUCTION\MXD\FIGURES\AFC_Draft_Biology\Rev0\31406639.000_01_C01_F5.2-1a_C_Rev0_NWI_Map.mxd PRINTED ON: 2024-02-26 AT: 11:46:59 PM

LEGEND

- Jurisdictional Drainages

Proposed Transmission Line

- Preferred Route, Aboveground
- Preferred Route, Underground
- Route Options 1-6, Aboveground
- Route Options 1-6, Underground

Project Components

- WRESC Site
- Other Project Parcels
- Project Boundary
- SCE Whirlwind Substation
- 125 ft Buffer Around Transmission Line
- Portions of the Survey Area Not Surveyed

0 5 10
1:350,000 MILES

NOTE(S)
1. SURVEY AREA IS BASED OFF OF A 1000 FT BUFFER AROUND PROJECT PARCELS AND 500 FT BUFFER AROUND TRANSMISSION LINES.

REFERENCE(S)
1. COORDINATE SYSTEM: NAD 1983 STATEPLANE CALIFORNIA V FIPS 0405 FEET
2. MAP SERVICE LAYER CREDITS: SOURCES: ESRI, HERE, GARMIN, INTERMAP, INCREMENT P CORP., GEBCO, USGS, FAO, NPS, NRCAN, GEOBASE, IGN, KADASTER NL, ORDNANCE SURVEY, ESRI JAPAN, METI, ESRI CHINA (HONG KONG), (C) OPENSTREETMAP CONTRIBUTORS, AND THE GIS USER COMMUNITY
SOURCE: ESRI, MAXAR, EARTHSTAR GEOGRAPHICS, AND THE GIS USER COMMUNITY

CLIENT
GEM A-CAES LLC

PROJECT
WILLOW ROCK ENERGY STORAGE CENTER
SUPPLEMENTAL AFC

CONSULTANT
wsp

YYYY-MM-DD	2024-02-28
DESIGNED	MK
PREPARED	MK
REVIEWED	SC
APPROVED	VG/LL

TITLE
JURISDICTIONAL WATERS DELINEATION

PROJECT NO.	PHASE	REV.	FIGURE
31406639.000	HY.04	0	5.2-1b

Protected areas were determined by the California Protected Area Database (CPAD) and California Conservation Easement Database (CCED) mapping tools (CPAD 2018). **Figure 5.2-2** presents protected and conserved lands identified within a 10-mile radius of the Project Area.

Hydrologic Features

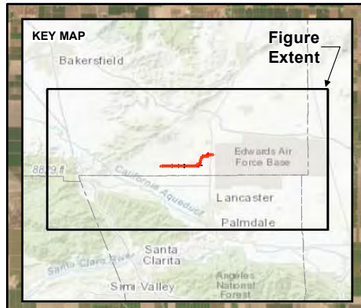
Review of the NWI and NHD indicated that numerous water bodies, including riverine features, a lake, and freshwater ponds, may occur within 500 feet of the gen-tie line centerline. The Applicant's biologists conducted a preliminary field-based delineation to determine the current accuracy of the NWI/NHD data and the presence/absence of potentially jurisdictional resources throughout the Project Area. The preliminary field-based delineation was performed in accordance with the following guidance and regulations:

- **U.S. Army Corps of Engineers (USACE) Wetland Delineation Manual**. According to the USACE, wetlands are areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances, do support a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands are delineated using three parameters: hydrophytic vegetation, wetland hydrology, and hydric soils. According to the USACE, indicators for all three parameters must normally be present to qualify as a wetland (USACE 1987).
- **Waters of the United States (WOTUS).** Includes all waters identified in the Clean Water Act Section 404.
- **Non-Wetland WOTUS.** As defined by the USACE in 33 Code of Federal Regulations (CFR) Part 328.3, these waters must have strong hydrologic indicators, such as the presence of seasonal flows and an ordinary high-water mark (OHWM). According to the Navigable Waters Protection Rule of 2020, ephemeral drainages are no longer considered jurisdictional under the USACE. Drainage features must have at least intermittent flow to be considered jurisdictional under the USACE (U.S. EPA and Department of Army 2020). Based on the results of the preliminary field-based delineation, the Applicant's biologists concluded that the Project Area does not contain any drainage features under USACE jurisdiction.

Although the preliminary field survey did not reveal any wetlands or WOTUS, the Applicant's biologists identified 12 drainage features that were identified in the literature review based on the NWI and NHD. Seven of the twelve drainage were considered to have some jurisdiction by state agencies. The five features that were not identified as jurisdictional drainage features lacked any defined bed and bank features. Many of these features were isolated by natural water diversions and no longer convey sufficient flows to create any flow indicators. All seven drainage features are similar in character, vary between 1 and 16 feet in width, and typically flow northwest to southeast. The drainage features had observable hydrologic indicators such as shelving, sedimentation, and cracked soil surfaces with drainage patterns. However, none of the drainage features identified contained water at the time of the survey, even though 2023 was recorded as an above-average rain year. The Applicant's biologists determined that many of the drainage features originated from upland swales, and many dissipated into uplands with no observable downstream connection. This observation is consistent with the NWI/NHD dataset.

The Applicant's biologist delineated the seven drainage features for their OHWM limits for Regional Water Quality Control Board (RWQCB) jurisdiction, as well as top-of-bank or OHWM limits, as applicable on a case-by-case basis, for California Department of Fish and Wildlife (CDFW) streambed jurisdiction. Since the drainage features within the Project Area did not contain any adjacent riparian habitat (microphyll woodland), the CDFW and RWQCB jurisdictional limits will be the same. The following summarizes the findings of the preliminary jurisdictional determination:

- All seven drainage features within the Project Area were identified by the Applicant's biologist as ephemeral; therefore, there is no USACE jurisdiction on the Project Area, per the 2020 Rule (U.S. EPA and Department of Army 2020).
- All seven mapped drainage features fall under the jurisdiction of two state agencies, the RWQCB and the CDFW. **Table 5.2-1** summarizes the total acreage and linear feet under the jurisdiction of RWQCB and CDFW, and **Figure 5.2-1b** maps all ephemeral drainages observed.
- The total RWQCB jurisdiction within the Project Area includes 0.85 acres (8,945 linear feet)
- The total CDFW jurisdiction includes 0.85 acres (8,945 linear feet)



LEGEND

California Conservation Easement - Site Name
- Mojave Desert Land Trust Conservation Easement

California Protected Areas - Owner
- California Department of Fish and Wildlife
- California Department of Parks and Recreation
- City
- County
- Non Governmental Organization
- Other State
- Special District
- US Bureau of Land Management
- US Forest Service

California Protected Area - Access
- No Public Access
- Open Access
- Restricted Access
- Unknown Access

Proposed Transmission Line
- Preferred Route, Aboveground
- Preferred Route, Underground
- Route Options 1-6, Aboveground
- Route Options 1-6, Underground

Project Components
- WRESC Site
- Other Project Parcels
- Project Boundary
- SCE Whirlwind Substation

0 5 10
1:350,000 MILES

NOTE(S)
1. THE PROJECT BOUNDARY IS CALCULATED BASED ON A 125 FT BUFFER AROUND TRANSMISSION LINES AND PROJECT PARCELS.

REFERENCE(S)
1. CRITICAL HABITAT FROM THE US FISH & WILDLIFE SERVICE DATA PORTAL, 2023
2. COORDINATE SYSTEM: NAD 1983 STATEPLANE CALIFORNIA V FIPS 0405 FEET
3. MAP SERVICE LAYER CREDITS: SOURCES: ESRI, HERE, GARMIN, INTERMAP, INCREMENT P CORP., GEBCO, USGS, FAO, NPS, NRCAN, GEOBASE, IGN, KADASTER NL, ORDNANCE SURVEY, ESRI JAPAN, METI, ESRI CHINA (HONG KONG), (C) OPENSTREETMAP CONTRIBUTORS, AND THE GIS USER COMMUNITY

CLIENT
GEM A-CAES LLC

CONSULTANT
wsp

YYYY-MM-DD	2024-02-28
DESIGNED	MK
PREPARED	MK
REVIEWED	SC
APPROVED	VG/LL

PROJECT
WILLOW ROCK ENERGY STORAGE CENTER SUPPLEMENTAL AFC

TITLE
PROTECTED/CONSERVED LANDS

PROJECT NO.	PHASE	REV.	FIGURE
31406639.000	01.LBR	0	5.2-2

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Based on the Project's design, a single drainage feature was identified as potentially impacted by the Project within the P2 south Staging Area. The Applicant has agreed to avoid this drainage feature. In addition, the Applicant has also agreed to avoid drainage features potentially impacted by the gen-tie poles. Therefore, no impacts to jurisdictional drainage features are anticipated.

Table 5.2-1: Jurisdictional Waters within the Project Area

	RWQCB Non-wetland Waters of the State		CDFW Streambed	
Ephemeral Drainage Feature	Acres	Linear Feet	Acres	Linear Feet
A	0.19	1,037	0.19	1,037
B	0.06	897	0.06	897
C	0.05	287	0.05	287
D	0.05	128	0.05	128
E	0.3	155	0.3	155
F	0.01	344	0.01	344
G	0.19	2,094	0.19	2,094
Total	0.85	8,945	0.85	8,945

CDFW = California Department of Fish and Wildlife; RWQCB = Regional Water Quality Control Board

Protected Areas

A review of the CPAD and CCED confirmed that there are 15 protected areas within a 10-mile radius of the Project Area. These areas are mapped in **Figure 5.2-2**.

California Protected Area Database

The CPAD is a database that includes lands that are owned and protected for open-space purposes by more than 1,000 public agencies or nonprofit organizations. The CPAD includes national, state, and regional parks, forests, preserves, and wildlife areas. It also includes large and small urban parks, land trust preserves, and special district open-space lands (CPAD 2021). The CPAD-identified areas that occur within the 10-mile buffer of the Project Area are described below.

- **California Department of Parks and Recreation:** The California Department of Parks and Recreation has more than 280 state park units that protect and preserve beaches, ghost towns, historic monuments, parks, lakes and reservoirs, museums, natural and cultural preserves, recreational areas, and visitor centers (CDPR 2021a). The Antelope Valley California Poppy Reserve and Arthur B. Ripley Desert Woodland State Park were identified within 10 miles of the WRESC Site. The Antelope Valley California Poppy Reserve encompasses 8 miles of trails along gentle rolling hills. In the spring, the Mojave grassland habitat blooms with a variety of wildflowers along the trails. Wildlife common in this area includes meadow larks, lizards and gopher snakes, kangaroo rats, beetles, and scorpions (CDPR 2021b). Arthur B. Ripely Desert Woodland State Park was established to protect and preserve native Joshua trees and junipers and features two hiking trails (CDPR 2021c). In Antelope Valley, the Joshua tree was a vital natural resource for the Native Americans that once inhabited the region. These parks are over 9 miles south of the Project Area, and no portion of the proposed Project will pass through any portion of the parks. Therefore, the Project will not affect these parks.
- **California State Lands Commission.** The California State Lands Commission was established in 1938 and includes 4 million acres of submerged lands, natural navigable bodies of water, and protected lands. The commission also manages sovereign land granted in trust by the California Legislature to approximately 70 jurisdictions (CSLC 2021). Eight land units of the California State Land Commission were identified within the Project Area's 10-mile buffer area, seven of which are north of the Project Area and no portion of the Project Area. There is a 236-acre parcel (APN 431-022-06) located immediately west of the optional Staging Area. Although construction of the WRESC will not impact this area, there is one gen-tie alignment variant

that crosses through the northern half of the parcel, so impacts are expected to be minor and less than significant and would be associated with the construction of transmission poles and a new access road.

- **Desert and Mountain Conservation Authority (DMCA).** The DMCA was established in July 2006. The DMCA is a public entity through a Joint Powers Authority Agreement between the Antelope Valley Resource Conservation District and Santa Monica Mountains Conservancy. The DMCA was established to identify and acquire open-space lands within the boundaries of the two founding agencies (DMCA 2006). One land unit was identified southwest of the WRESC Site and is approximately 480.9 acres. This land unit is over 6 miles south of the Project Area, and no portion of the proposed Project will pass through any portion of the land unit. Therefore, the Project will not affect this land unit.
- **City of Lancaster, Parks, Arts, Recreation and Community Services, Mariposa Park**. Mariposa Park is an approximately 5.5-acre park that offers open areas, a baseball field, walking trails, and restroom facilities (Lancaster 2021). This park is over 13 miles south of the Project Area, and no portion of the proposed Project will pass through any portion of the park. Therefore, the Project will not affect this park.
- **Los Angeles County, Parks and Recreation (LACPR).** There are three areas of interest currently managed and overseen by the LACPR: Apollo Community Regional Park, Neenach Wildlife Preserve, and the George R. Bones Wildlife Sanctuary. Apollo Community Regional Park is an approximately 55-acre urban park that features open areas, fishing lakes, running trails, and restroom facilities (LACPR 2021a). The Neenach Wildlife Preserve is a 40-acre natural open area with Joshua trees, junipers, and rabbit brush, located 20 miles west of the Lancaster city center. This open area provides suitable habitat for a number of native wildlife species that commonly occur in the area (LACPR 2021b). The George R. Bones Wildlife Sanctuary is a 99-acre reserve located at the edge of the Mojave Desert, adjacent to the north of the Liebre Mountains. It protects gray pines and Joshua trees, as well as other native species (LACPR 2021c). Both the Neenach Wildlife Preserve and George R. Bones Wildlife Sanctuary offer plant walks and hiking trails. The Apollo Community Regional Park is over 11 miles from the Project Area, The Neenach Wildlife Preserve is 16 miles south of the Project. The George R Bones Wildlife Sanctuary is 9 miles southwest of the Project Area. Therefore, the Project will not affect these parks.
- **Mountains Recreation and Conservation Authority (MRCA)**. The MRCA is a local government public entity that was established in 1985 pursuant to the Joint Powers Act and has a partnership with the Santa Monica Mountains Conservancy, Conejo Recreation and Park District, and Rancho Simi Recreation and Park District. The MRCA manages parklands and provides operations, ranger services, fire prevention, and community-based planning (MRCA 2021). The closest MRCA land is Ritter Ranch Park, which is over 20 miles south of the Project Area. Therefore, the Project will not affect any areas managed by the MRCA.
- **Mojave Desert Land Trust (MDLT).** The MDLT is headquartered in Joshua Tree and has been responsible for acquiring and protecting over 100,000 acres of desert habitat within the Colorado and Mojave Deserts. The MDLT received accreditation with the Land Trust Alliance in 2018. The MRCA acquires desert lands, but also grows native flora in local nurseries and collects native seeds. The closest MDLT land is located immediately west of Mojave Tropico Road and is associated with APN 252-014-35, The gen-tie alignment may be completely contained within the existing road easement associated with Mohave Tropico Road. Impacts are expected to be minor and less than significant and would be associated with the construction of transmission poles.
- **Rosamond Community Services District (RCDS).** The RCDS was formed to provide domestic water, sewage, and waste services; stormwater management; and maintenance for recreational facilities. The RCDS Park System Master Plan includes two parks identified by the CPAD as protected areas: Rosamond Park and United Street Park. Rosamond Park is an approximately 9.7-acre cooperative use park that has developed recreational centers, basketball courts, and baseball fields. This park is approximately 2.6 miles south of the Project Area. United Street Park is a neighborhood park that is approximately 10 acres in size, and 2.8 miles south of the Project Area. Both are used for recreation and feature open areas and restroom facilities (RCDS 2009). Therefore, the Project will not affect these parks.
- **U.S. Bureau of Land Management.** In 1976, 25 million acres of desert lands in southern California were designated as the California Desert Conservation Area (CDCA) through the Federal Land Policy and Management Act. In 2009, the U.S. Congress passed the Omnibus Public Land Management Act, which directed the Bureau of Land Management to incorporate lands managed for conservation purposes within the CDCA as part of the national conservation lands. The Applicant identifies approximately 44 land

designations, all with varying sizes, within a 10-mile radius of the WRESC Site. There is a 172-acre area managed by the Bureau of Land Management (BLM) that occurs along the gen-tie alignment. Although construction of the WRESC will not impact this area, a portion of the gen-tie alignment crosses the eastern portion of the BLM property, which is designated as open space. The gen-tie alignment may be completely contained within the existing road easement associated with Mohave Tropico Road. Impacts to BLM land are expected to be minor and less than significant.

- **U.S. Forest Service (USFS).** The U.S. Forest Service manages over 193 million acres of public lands in 43 states for multiple uses. The Angeles National Forest, which is managed by the USFS, was established in 1982 and covers 700,000 acres of land (USDA 2021). The Angeles National Forest is identified as a protected area in **Figure 5.2-2;** however, it is not within the 10-mile radius of the WRESC Site. Therefore, the Project Area will not impact any USFS lands.

California Conservation Easement Database

The CCED is a database that defines boundaries of easements and deed-based restrictions on private lands. These lands may be actively farmed, grazed, forested, or held as nature preserves and typically have no public access (CPA 2018). The following easements were discovered and mapped in **Figure 5.2-2**: Bi-Centennial, Pacific Crest Trail, Portal Ridge Conservation Easement, Sequoia Riverlands Trust Conservation Easement, TMV-A, and Tri-Centennial. The Project Area does not cross any of these easements, and therefore impacts to these easements are not anticipated.

5.2.1.3 Sensitive Habitat Types and Critical Habitat

Sensitive habitat types and critical habitats within a 10-mile radius of the WRESC Site are shown in **Figure 5.2-3** and are described below.

Sensitive Habitat Types

The CDFW defines sensitive habitats as plant communities that have limited distributions, high wildlife value, include sensitive species, or are particularly susceptible to disturbance (CNDDB 2024). The CDFW ranks sensitive communities as “threatened” or “very threatened” and keeps records of their occurrences in the CNDDB. Currently, the CDFW publishes the California Sensitive Natural Communities List online (CDFW 2023a). Vegetation rarity ranking is based on a rank calculator developed by NatureServe. Vegetation maps were taken from the CDFW Vegetation Classification Reports (CDFW 2021b). The CDFW’s Vegetation Program considers vegetation alliances with state ranks of S1-S3 as sensitive vegetative habitats. The CDFW considers species or natural communities with one of the following NatureServe rankings as sensitive:

Global(G)/State(S)

X = Presumed Extinct

G/S H = Possibly Extinct

G/S 1 = Critically Imperiled

G/S 2 = Imperiled

G/S 3 = Vulnerable

The Applicant’s biologist identified the following sensitive habitat types within a 10-mile radius of the Project Area.

Southern Cottonwood Willow Riparian Forest occurs on floodplains, low-gradient rivers, perennial or seasonally intermittent streams, springs, lower canyons of desert mountains, on alluvial fans, and in valleys with adequate subsurface water. The closest recorded occurrence of this community is over 11 miles southwest of the Project Area. This vegetation community is dominated by Fremont’s cottonwood (*Populus fremontii*) and various willow species (*Salix* sp.) and is listed as an S3.2 under the CDFW sensitivity ranking system.

Southern Mixed Riparian Forest is comprised of winter-deciduous trees that require water near the soil surface. Fremont cottonwood and western sycamore (*Platanus racemosa*) form a dense medium height woodland or forest in moist canyons and drainage bottoms. The closest recorded occurrence of this community is over 18 miles southwest of the Project Area. This vegetation community is listed as an S2.1 under the CDFW sensitivity ranking system.

Southern Riparian Forest is essentially a more generalized version of the previous community. Can include various oak tree species in some cases. The closest recorded occurrence of this community is over 13 miles southwest of the Project Area. This vegetation community is listed as an S4 under the CDFW sensitivity ranking system.

Southern Riparian Scrub is an early seral type of riparian woodland on loose, sandy, or fine gravelly alluvium deposited near stream channels during flood flows. May be dominated by several shrub-sized willow species, coyote bush (*Ambrosia psylostachia*), and mule fat (*Baccharis salisifolia*) with some emergent cottonwoods or sycamores. The closest recorded occurrence of this community is over 10 miles southwest of the Project Area. This vegetation community is listed as an S3.2 under the CDFW sensitivity ranking system.

Southern Sycamore Alder Riparian Woodland often grows along very rocky streambeds subject to seasonally high intensity flooding. Alders increase in abundance on more perennial streams, while sycamores favor more intermittent hydrographs. A tall, open, broadleafed, winter-deciduous streamside woodland dominated by Platanus racemosa (and often also *Alnus rhombifolia*). These stands seldom form closed canopy forests, and even may appear as trees scattered in a shrubby thicket of sclerophyllous and deciduous species. The closest recorded occurrence of this community is over 14 miles southwest of the Project Area. This vegetation community is listed as an S4 under the CDFW sensitivity ranking system.

Southern Willow Scrub is essentially very similar to Southern Riparian Scrub (discussed above), although may require repeated flooding to prevent succession to Southern Cottonwood-Sycamore Riparian Forest. The closest recorded occurrence of this community is over 10 miles south of the Project Area. This vegetation community is listed as an S2.1 under the CDFW sensitivity ranking system.

Valley Needlegrass Grassland was formerly extensive around the Sacramento, San Joaquin, and Salinas Valleys, as well as the Los Angeles Basin, but is now much reduced. Valley needlegrass grassland usually occurs on fine-textured (often clay) soils that are moist or waterlogged during winter, but very dry in summer (Oberbauer et al. 2008). Valley needlegrass grassland is a mid-height (to 2 feet) grassland dominated by perennial, tussock-forming purple needlegrass (*Nasella pulchra*) with native and introduced annuals occurring between the perennials, such as salt spring checkerbloom (*Sidalcea neomexican*), blue-eyed grass (*Sisyrinchium bellum*), California poppy (*Eschscholzia eschscholzia*), or California goldfields (*Lasthenia californica*). The closest recorded occurrence of this community is over 8 miles south of the Project Area. This vegetation community is listed as a S3.1 under the CDFW sensitivity ranking system.

Valley Oak Woodland is an open, grassy-understoried savanna rather than a closed woodland. *Quercus lobata* is usually the only tree present. On deep, well-drained alluvial soils, usually in valley bottoms, apparently with more moisture in summer than in Blue Oak Woodland. The closest recorded occurrence of this community is over 13 miles southwest of the Project Area. This vegetation community is listed as an S2.1 under the CDFW sensitivity ranking system.

Wildflower Field is a highly diverse field habitat of mostly native annuals and forbs. This vegetation community consists of herb-dominated conspicuous annual wildflower displays. Dominance varies from site to site and from year to year at a particular site. This vegetation community typically occurs on fairly poor-quality sites (droughty, low in nutrients) associated with grasslands or on oak woodlands on surrounding, more productive sites, and is mostly associated with sandy soils. Plant species commonly found in wildflower fields include California poppy, gilia bicolor (*Gilia leptalea* ssp. *bicolor*), coastal tidy-tips (*Layia platvglossa*), miniature lupine (*Lupinus bicolor*), narrowleaf owl's-clover (*Orthocarpus attenuatus*), and purple owl's clover (*Orthocarpus purpuresens*). This habitat type is commonly found in valleys and foothills of the Californian Floristic Province except the north coast, which is too wet. It is typically found below 2,000 feet in elevation in the northern portion of its range and between 4,000 and 5,000 feet in the southern portion. The closest recorded occurrence of this community is over 8 miles south of the Project Area. This vegetation community is listed as an S2.2 under the CDFW sensitivity ranking system.

Critical Habitat

Critical habitats are designated areas identified as crucial for long-term conservation of sensitive species. A critical habitat may not be occupied by a specific sensitive species at the time of its listing, but it has been

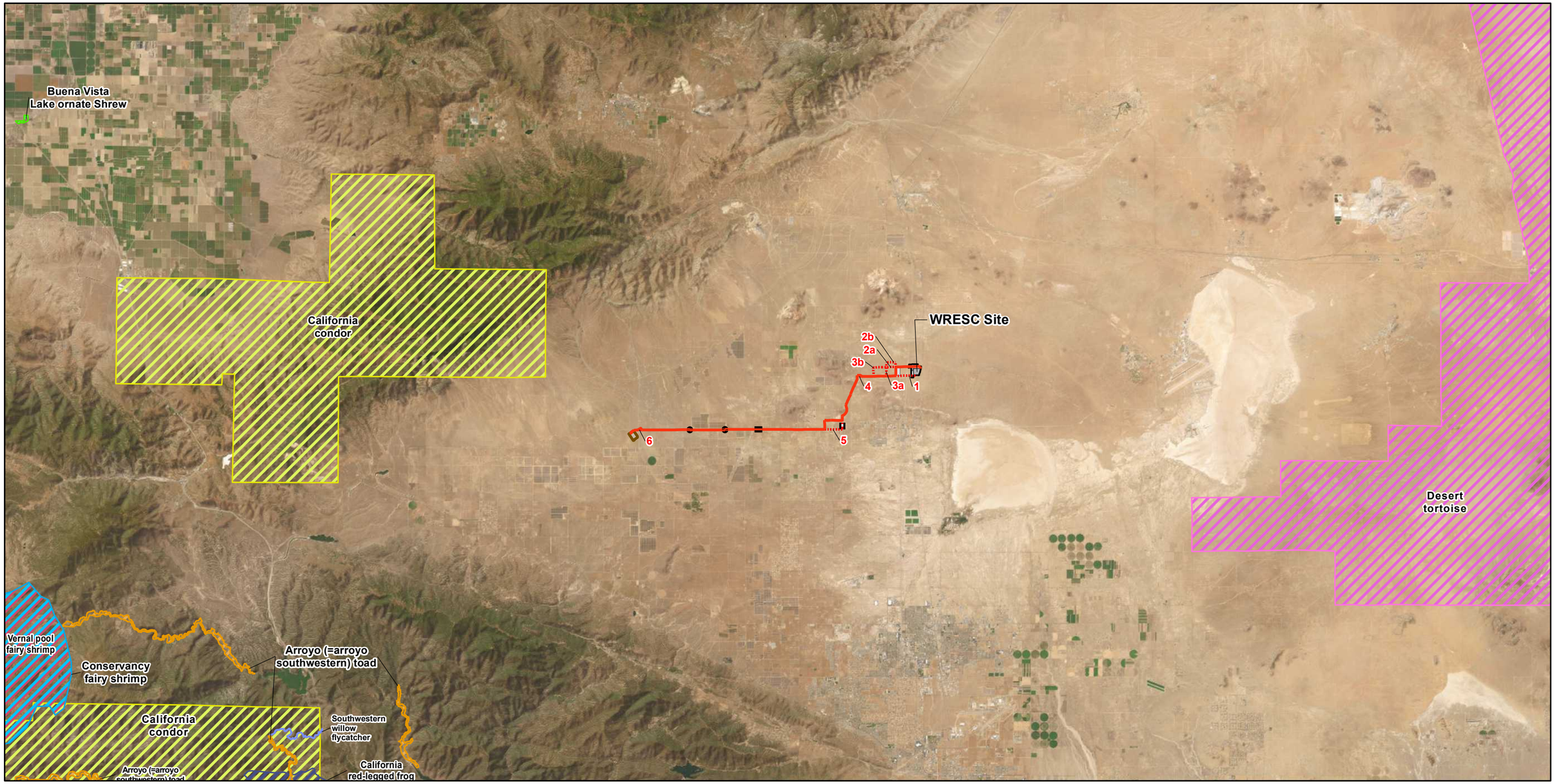
identified as containing key elements that are essential to the conservation of one or more endangered and threatened species. Habitat is designated as "critical" if it features the following:

> *Space for individual and population growth, and for normal behavior; nutritional or physiological requirements; cover or shelter; sites for breeding, reproduction, or rearing offspring; and, generally, and habitats that are protected from disturbance or are representative of the historic geographical and ecological distributions of this species.* (USFWS 2017)

The critical habitats described below were identified within 10 miles of the Project Area.

Desert Tortoise Conservation Unit. The desert tortoise (*Gopherus agassizii*) was listed as threatened in April of 1990. Because desert tortoises occur in a variety of habitats and elevations, the Desert Tortoise Conservation Unit is a general region that contains a variety of vegetation communities, including saltbush scrub, black bush scrub, cheesebush scrub, iodine bush-alkali scrub complex, and desert needlegrass scrub steppe, with tortoises typically occurring in valleys, alluvial fans, bajadas and rolling hills. The habitat areas are also characterized as being friable enough for tortoises to dig burrows but firm enough so that burrows do not collapse (USFWS 2011). The designated desert tortoise conservation unit is located within the Project Area; however, the Project Area is not within a designated desert tortoise critical habitat area. The closest desert tortoise critical habitat is located 12 miles southeast of the Project Area (WSP 2024c).

California Condor Critical Habitat. It is estimated that 350,000 acres of eastern and southern Kern County are used regularly by the endangered California condor (*Gymnogyps californianus*). A small population of condors occupy rangeland in the western part of the county. Condor populations fluctuate in this region depending on the time of year. Habitat throughout eastern portions of Kern County provides roosting and feeding areas in the fall and winter months. However, in the summer, nonbreeding populations of condors typically move south to the Ventura and Los Angeles Counties. Habitat for condors varies, with roosting areas including rock cliffs or dead conifer snags located in isolated or semi-secluded areas (Wilbur et al. 1979). The southeast corner of this critical habitat is located approximately 5.3 miles northwest of the Project Area and is associated with the Transverse Ranges and Tehachapi Mountains (Figure 5.2-3).



LEGEND

Critical Habitat Type

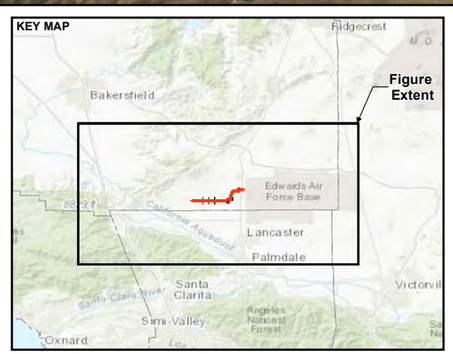
- Arroyo (=arroyo southwestern) toad
- Buena Vista Lake ornate Shrew
- California condor
- California red-legged frog
- Conservancy fairy shrimp
- Desert tortoise
- Southwestern willow flycatcher
- Vernal pool fairy shrimp

Proposed Transmission Line

- Preferred Route, Aboveground
- Preferred Route, Underground
- Route Options 1-6, Aboveground
- Route Options 1-6, Underground

Project Components

- WRESC Site
- Other Project Parcels
- Project Boundary
- SCE Whirlwind Substation



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REFERENCE(S)

1. CRITICAL HABITAT FROM THE US FISH & WILDLIFE SERVICE DATA PORTAL, 2023
2. COORDINATE SYSTEM: NAD 1983 STATEPLANE CALIFORNIA V FIPS 0405 FEET
3. MAP SERVICE LAYER CREDITS: SOURCES: ESRI, HERE, GARMIN, INTERMAP, INCREMENT P

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wsp

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PREPARED	MK
REVIEWED	SC
APPROVED	VG/LL

PROJECT
WILLOW ROCK ENERGY STORAGE CENTER
SUPPLEMENTAL AFC

TITLE
CRITICAL HABITAT

PROJECT NO.	PHASE	REV.	FIGURE
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5.2.1.4 Regional Sensitive or Special-status Species

Appendix 5.2A provides a list of special-status species found within a 10-mile radius of the Project Area during literature review. This appendix includes the status designation for each species, habitat types that may support these species in the regional vicinity, a determination of potential for these species to occur within the Project Area, and a rationale for the occurrence determination. Additionally, **Figures 5.3-4a and 5.3.4b** illustrate the potential known locations of special-status species within a 10-mile range of the WRESC Site. Sensitive or special-status species meet at least one of more of the following criteria:

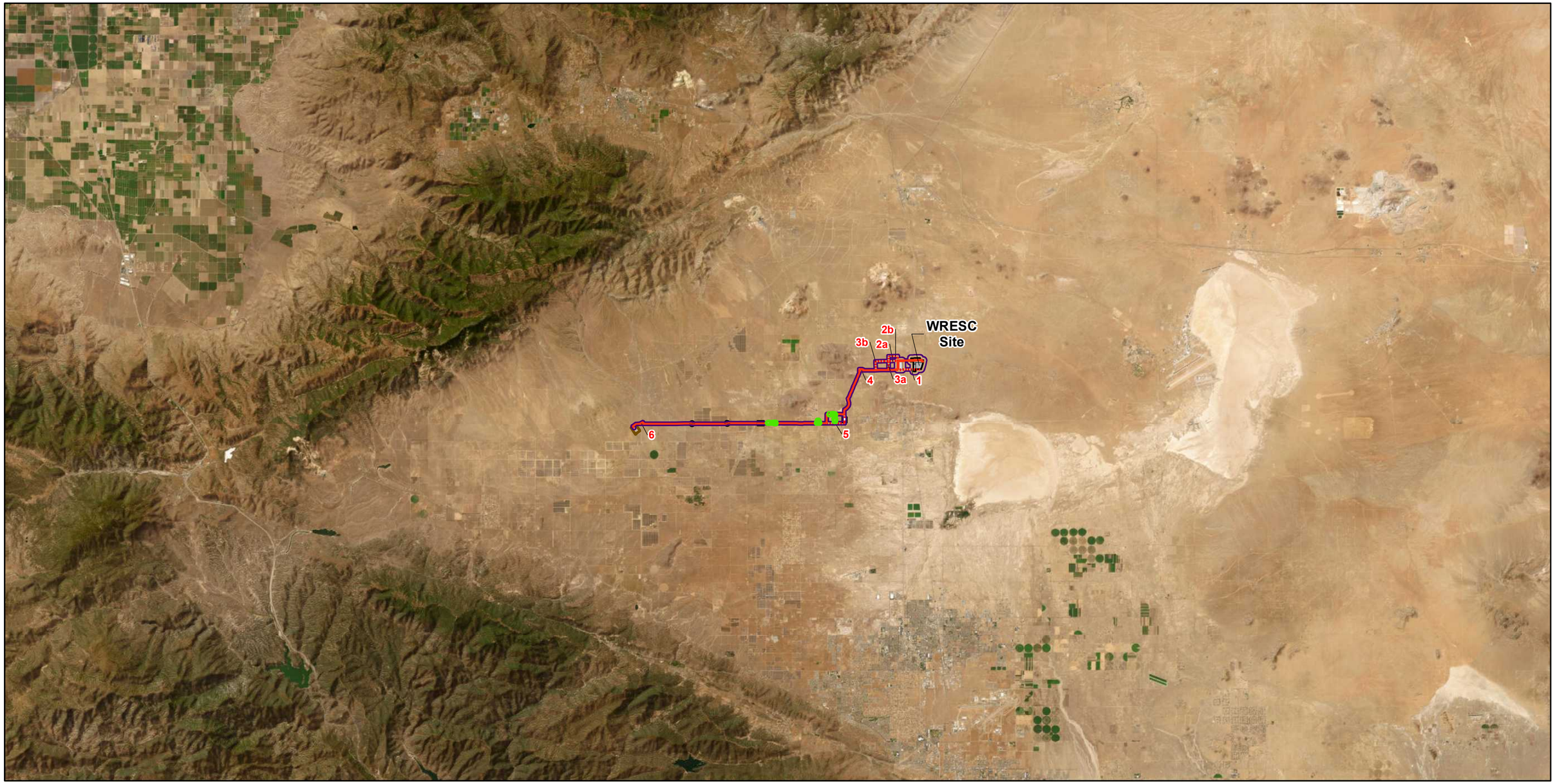
- Regional species listed as threatened or endangered that have special requirements under the federal Endangered Species Act (ESA).
- Regional species listed as threatened or endangered that have special requirements under the California Endangered Species Act (CESA) (California Fish and Game Code, Section 2050 et seq.).
- Other non-listed sensitive and special-status species, including California Native Plant Society (CNPS) Rare Plant Ranks 1 through 4, CDFW Species of Special Concern (SSC), CDFW Fully Protected (FP) Species, and other CDFW Special Animals.

The CNDDB and CNPS Electronic Inventory were used in preparing Appendix 5.2A. The results of the special-status species identified during the biological reconnaissance and rare plant surveys are discussed in Section 5.2.1.7.

Sensitive species naming was referenced based on the CDFW Special Animals List (CDFW 2024).

5.2.1.5 Biological Surveys

To understand the biological resources present within the WRESC, the Applicant's biologist performed a habitat assessment within the WRESC Site and gen-tie line alignment, as well as a 1,000-foot buffer around the WRESC Site and a 500-foot buffer on either side of the gen-tie line alignment. This area is hereafter referred to as the Study Area. During these surveys, suitable habitat areas were identified for future protocol-level surveys for Swainson's hawk (*Buteo swainsoni*), desert tortoise, burrowing owl (*Athene cunicularia*), Mohave ground squirrel (*Xerospermophilus mohavensis*), Crotch's bumble bee (*Bombus crotchii*), and sensitive plants (including western Joshua tree [*Yucca brevifolia*] and various cactus species). The habitat assessment was also conducted to document the different vegetation communities and identify potentially jurisdictional WOTUS and Waters of the State. All biological surveys and resource assessments were performed according to the latest protocols and guidelines for biological surveys and reporting. **Table 5.2-2** defines the characteristics of the biological surveys conducted. The results of each survey are described below.



LEGEND

CNDDB Sensitive-Species Common Name
- Alkali mariposa-lily

Proposed Transmission Line
- Preferred Route, Aboveground
- Preferred Route, Underground
- Route Options 1-6, Aboveground
- Route Options 1-6, Underground

Project Components
- WRESC Site
- Other Project Parcels
- Project Boundary
- Project Survey Area
- SCE Whirlwind Substation

KEY MAP

0 5 10
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NOTE(S)
1. THE SURVEY AREA IS CALCULATED BASED ON A 500 FT BUFFER AROUND TRANSMISSION LINES AND A 1000 FT BUFFER AROUND PROJECT PARCELS.

REFERENCE(S)
1. CA DEPT OF CONSERVATION, 2023 - CNDDB SPECIAL STATUS PLANTS
2. COORDINATE SYSTEM: NAD 1983 STATEPLANE CALIFORNIA V FIPS 0405 FEET
3. MAP SERVICE LAYER CREDITS: SOURCES: ESRI, HERE, GARMIN, INTERMAP, INCREMENT P CORP., GEBCO, USGS, FAO, NPS, NRCAN, GEOBASE, IGN, KADASTER NL, ORDNANCE SURVEY, ESRI JAPAN, METI, ESRI CHINA (HONG KONG), (C) OPENSTREETMAP CONTRIBUTORS, AND THE GIS USER COMMUNITY

CLIENT
GEM A-CAES LLC

PROJECT
WILLOW ROCK ENERGY STORAGE CENTER
SUPPLEMENTAL AFC

CONSULTANT
wsp

YYYY-MM-DD	2024-02-28
DESIGNED	MK
PREPARED	MK
REVIEWED	SC
APPROVED	VG/LL

TITLE
POTENTIALLY OCCURING SPECIAL-STATUS SPECIES - PLANTS

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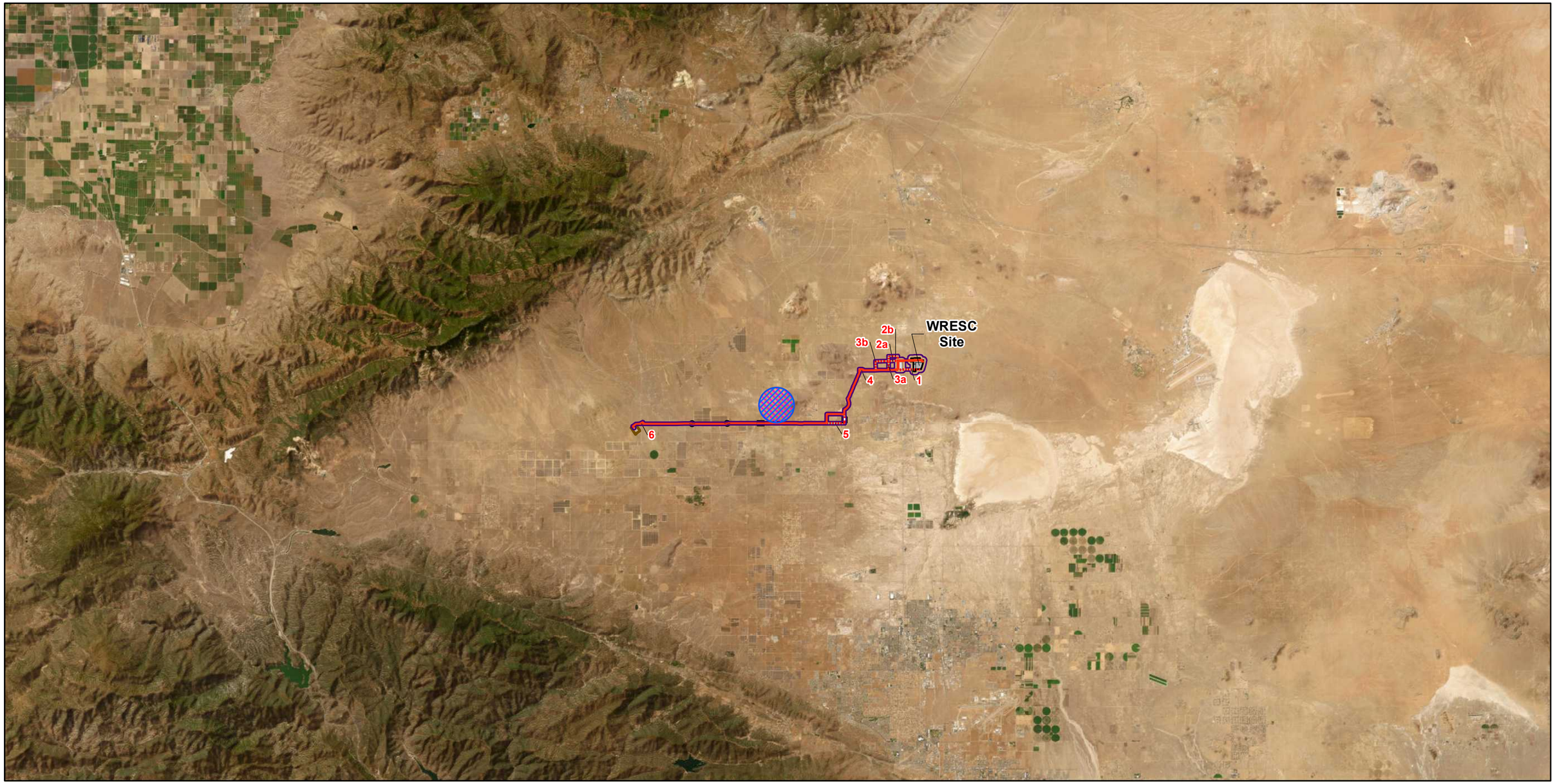

LEGEND

Sensitive Wildlife Common Name
- American badger
- Horn's milk-vetch

Proposed Transmission Line
- Preferred Route, Aboveground
- Preferred Route, Underground
- Route Options 1-6, Aboveground
- Route Options 1-6, Underground

Project Components
- WRESC Site
- Other Project Parcels
- Project Boundary
- Project Survey Area
- SCE Whirlwind Substation

KEY MAP

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1:3,000,000 MILES

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2. COORDINATE SYSTEM: NAD 1983 STATEPLANE CALIFORNIA V FIPS 0405 FEET
3. MAP SERVICE LAYER CREDITS: SOURCES: ESRI, HERE, GARMIN, INTERMAP, INCREMENT P CORP., GEBCO, USGS, FAO, NPS, NRCAN, GEOBASE, IGN, KADASTER NL, ORDNANCE SURVEY, ESRI JAPAN, METI, ESRI CHINA (HONG KONG), (C) OPENSTREETMAP CONTRIBUTORS, AND THE GIS USER COMMUNITY

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TITLE
POTENTIALLY OCCURING SPECIAL-STATUS SPECIES - PLANTS

PROJECT NO.	PHASE	REV.	FIGURE
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Table 5.2-2: Biological Surveys Conducted

Survey	Survey Target or Purpose	Date	Biologists	Project Parameters [a]	Gen-Tie Line Study Area [b] Parameters
Reconnaissance Survey	Biological Survey	March 28, 2023, through October 6, 2023	Scott Crawford, Nathan Moorhatch, Marshall Paymard	Project Boundary, VH, and 1,000-foot buffer	Gen-Tie Line alignment and 500-foot buffer
Reconnaissance Survey	Vegetation Mapping	March 28, 2023, through October 6, 2023	Scott Crawford, Nathan Moorhatch, Marshall Paymard	Project Boundary, VH, and 1,000-foot buffer	Gen-Tie Line alignment and 500-foot buffer
Protocol-Level Survey	Swainson's Hawk	March 28, 30, 31, 2023 April 3, 5, 19, 24, 26, 2023 May 9, 10, 12, 22, 23, 2023 June 8, 2023	Nathan Moorhatch, Dale Hameister, Melanie Bukovac, Phil Clevinger, Scott Crawford, Emily Urquidi, and Alegria Garcia	Project Boundary, VH, and 0.5-mile buffer	Gen-Tie Line alignment and a 0.5-mile buffer
Protocol-Level Survey	Burrowing Owls and Burrows	April 18, 19, 25, 26, 27, 2023 May 10, 11, 23, 2023 June 7, 21, 22, 23, 2023 July 5, 26, 2023	Nathan Moorhatch, Melanie Bukovac, Phil Clevinger, Scott Crawford, Emily Urquidi, Tim Chumley, John Green, Ciara Shirey, Alex Kerr, Kyralai Duppel, and Liz Diaz	Project Boundary, VH, and 500-foot buffer	Gen-Tie Line alignment and 500-foot buffer
Protocol-Level Survey	Rare Plant Survey	April 18, 19, 25, 26, 27, 2023 May 10, 11, 23, 2023 June 7, 21, 22, 23, 2023 July 5, 26, 2023	Nathan Moorhatch, Melanie Bukovac, Phil Clevinger, Scott Crawford, Emily Urquidi, Tim Chumley, John Green, Ciara Shirey, Alex Kerr, Kyralai Duppel, and Liz Diaz	Project Boundary, VH, and 500-foot buffer	Gen-Tie Line alignment and 500-foot buffer
Protocol-Level Survey	Desert Tortoise Habitat	April 18, 19, 25, 26, 27, 2023 May 10, 11, 23, 2023 June 7, 21, 22, 23, 2023 and July 5, 26 2023	Nathan Moorhatch, Melanie Bukovac, Phil Clevinger, Scott Crawford, Emily Urquidi, Tim Chumley, John Green, Ciara Shirey, Alex Kerr, Kyralai Duppel, and Liz Diaz	Project Boundary, VH, and 500-foot buffer	Gen-Tie Line alignment and 500-foot buffer
Protocol-Level Survey	Crotch's Bumble Bee	April 25, 26, 2023 May 10, 2023 June 8, 2023	Nathan Moorhatch, Melanie Bukovac, Phil Clevinger, Scott Crawford, Emily Urquidi	Project Boundary and VH	Gen-Tie Line alignment
Protocol-Level Survey	Mohave Ground Squirrel	Between March 15 and July 15, 2023	Steven Chen, Corey Chan, Dalton Stanfield, and Kyle Tabor	Project Boundary and VH	Gen-Tie Line alignment
Preliminary Hydrological Delineation	Jurisdictional Waters	October 3, 4, 5, and 6, 2023	Scott Crawford, Marshall Paymard	Project Boundary and VH	Gen-Tie Line alignment

Notes: All biological surveys were conducted by WSP and Aardvark Biological Services, LLC.
a Project Boundary includes the WRESC Site, P1, and P2
b Gen-tie line alignment includes the Preferred Gen-Tie Route and options

Reconnaissance Survey

Vegetation Mapping. Vegetation mapping was conducted to determine the vegetation communities and habitat suitability for special-status and listed species within the Study Area. Mapping was completed following the *National Vegetation Classification System per the Manual of California Vegetation (MCV), Second Edition* (Sawyer et al. 2009). Biologists drove throughout the entire Study Area, where accessible, and accessed areas as needed on foot. Esri ArcGIS Collector software was used to map various vegetation communities and all relevant data, including dominant and subdominant plant species. For any community that could not be easily classified under the MCV, *Holland's Preliminary Descriptions of the Terrestrial Natural Communities of California* was used (Holland 1986). Onsite and adjacent areas were characterized for their existing conditions and current land uses. A total of 100 plant species were observed during the field surveys, of which 91 were native species and 11 non-natives. The vegetation observed and land cover types are discussed in Section 5.2.1.6. A comprehensive list of all plant species observed is provided in Appendix 5.2B.

Potential for Occurrence. The potential for occurrences of special-status plant and wildlife species, as determined from the literature review, was assessed in relation to the Study Area. A total of 45 wildlife species and 63 plants were observed either on or in the vicinity of the Project Area. Among the vertebrate species, the total includes seven reptilian, 23 avian, and 12 mammalian species. Many of these species are common to the region and would be expected in the terrestrial habitats within the Study Area. A list of special-status plant and wildlife species can be found in the Biological Resources Assessment Report (WSP 2024a). Special-status species on this list that are threatened, endangered, or protected are discussed in detail in Section 5.2.1.7. A comprehensive list of all plant wildlife species observed is available in Appendix 5.2B.

Protocol-Level Surveys

Swainson's Hawk Survey. Swainson's hawk (*Buteo swainsoni*) is a state-listed threatened species and is also protected under the federal Migratory Bird Treaty Act (MBTA). This species occurs in open desert, grasslands, agricultural land, and open riparian habitat that contains scattered, large trees or small groves. Swainson's hawks construct nests using sticks, bark, and leaves, typically placed in trees or large bushes; it may also utilize old stick nests built by common ravens and other raptors. Swainson's hawks in Antelope Valley have also been documented to nest in Joshua trees.

Previously recorded observations in the literature review records included 13 total recorded occurrences within a 10-mile radius of the WRESC including the CNDDB (10 records) and iNaturalist (three records), Since Swainson's hawks were previously identified within a 10-mile radius of the WRESC Site, protocol surveys are restricted to a 0.5-mile radius around the WRESC Site (as per protocol guidelines and verified by the CDFW staff). Following CDFW protocols, 10 focused surveys were conducted that would include the identification of all trees with potential Swainson's hawk nests, documentation of nest competitors, a CDFW-protocol-level Swainson's hawk survey focused specifically on the Antelope Valley region and all Swainson's hawk observations within the Study Area. **Table 5.2-3** presents the Swainson's hawk survey period dates. Survey Periods II, III, and IV required three separate surveys for each period. Based on the number of biologists and area covered, the Study Area was able to be covered in 1 to 2 days. These individual survey days are represented by a different gray shaded area below.

Table 5.2-3: Swainson's Hawk Survey Dates and Personnel for the Project Area

Survey Date	Survey Period I	Survey Period II	Survey Period III	Survey Period IV
March 28, 2021	X	--	--	--
March 30, 2023	X	--	--	--
March 31, 2023	X	--	--	--
April 3, 2023	--	X	--	--
April 5, 2023	--	X	--	--
April 19, 2023	--	X	--	--
April 24, 2023	--	X	--	--
April 26, 2023	--	X	--	--
May 9, 2023	--	--	X	
May 10, 2023	--	--	X	
May 12, 2023	--	--	X	
May 22, 2023	--	--	X	
May 23, 2023	--	--	X	
June 8, 2023	--	--		X
June 20, 2023	--	--		X
June 26, 2023	--	--		X

Source: WSP 2024b
-- = survey not performed; X = survey performed

The survey methods generally followed the latest accepted CDFW Swainson's hawk protocol specifically referencing Kern County (CEC and CDFW 2010). This protocol designates 10 surveys to be conducted over four survey periods, with the intent of capturing progressive nesting behaviors and activity.

- Survey Period I: Preliminary survey of potential nest locations (optional)
- Survey Period II: Surveys targeting initial occupancy of traditional nest territories and nesting behaviors
- Survey Period III: Direct monitoring of known/identified active nests to confirm incubation
- Survey Period IV: Direct monitoring of known/identified active nests to confirm young rearing

Results of the burrowing owl protocol surveys are discussed in Section 5.2.1.7.2.

Burrowing Owl Survey. Since suitable burrowing owl habitat was observed onsite and the species is known to occur in the area, a focused burrowing owl survey was required per CDFW guidelines. No surveys were conducted within 5 days following a rain event. **Table 5.2-4** presents the survey dates and the personnel who performed the surveys.

Table 5.2-4: Burrowing Owl Survey Dates and Personnel for the Project Area

Dates	Pass	Field Personnel
April 18, 2023	1	Scott Crawford, Melanie Bukovac
April 19, 2023	1	Scott Crawford, Melanie Bukovac, Emily Urquidi, Phil Clevinger
April 25, 2023	1	Nathan Moorhatch, Scott Crawford, Liz Diaz, and Kyralai Duppel
April 26, 2023	1	Nathan Moorhatch, Scott Crawford, Melanie Bukovac, Liz Diaz, and Kyralai Duppel, Alexa Kerr
April 27, 2023	1	Nathan Moorhatch, Scott Crawford, Melanie Bukovac, Liz Diaz, and Kyralai Duppel, Alexa Kerr
May 10, 2023	2	Melanie Bukovac, Scott Crawford, Nathan Moorhatch, Ciarra Shirey, and Phil Clevinger
May 11, 2023	2	Melanie Bukovac, Scott Crawford, Nathan Moorhatch, Ciara Shirey
May 23, 2023	2	Melanie Bukovac, Nathan Moorhatch
June 7, 2023	3	Nathan Moorhatch
June 21, 2023	3	Nathan Moorhatch, John Green,
June 22, 2023	3	Nathan Moorhatch, John Green, Melanie Bukovac, Scott Crawford
June 23, 2023	3	Nathan Moorhatch, John Green, Melanie Bukovac, Scott Crawford
July 5, 2023	4	Nathan Moorhatch, Tim Chumley
July 27, 2023	4	Nathan Moorhatch

Source: WSP 2024d

The survey methods followed the latest accepted CDFW burrowing owl protocols, with a few exceptions. The applied methods were in alignment with the CDFW (2012) staff report.

CDFW protocol stipulates that focused burrowing owl surveys must include four visits to the site in question, (survey pass 1 through 4), with the first occurring between February 15 and April 15 and the remaining three to occur at least 3 weeks apart so that the last occurs between June 15 and July 15. However, during the 2023 protocol surveys for the WRESC, there was a prolonged winter rain season. This required the protocol surveys to be altered from the standard protocol. The first survey was conducted after the April 15 deadline for survey pass 1. The first day available to complete the first pass of the protocol survey was April 18, which was 3 days after the survey window (February 15 to April 15). Second, the spacing of some of the surveys was within the 3-week minimum spacing. This was discussed with and approved by the CDFW before the surveys were conducted. The four surveys were conducted within the peak breeding season, based on weather conditions. Therefore, the confidence level that these surveys accurately captured burrowing owl presence/absence is high.

The Applicant's biologists walked 10-meter-wide belt transects within the Study Area to provide 100 percent visual coverage within the Study Area. While walking the transects, the biologists specifically searched for burrowing owls; burrowing owl sign (i.e., cough pellets, whitewash, feathers, tracks, nest decorations); and burrows and burrow complexes suitable for use by burrowing owls. Burrow complexes are composed of a cluster or suitable burrows and burrow surrogates. The biologists paused at least every 100 meters, as appropriate, to scan for burrowing owls using binoculars and/or the naked eye. In addition, they listened for burrowing owl calls. For habitat that the biologists could not safely survey or gain permission to access, such as private property, surveys were conducted by meticulously scanning the area using binoculars. If burrowing owls were not directly observed at a suitable burrow with burrowing owl sign, sign was cleared from around the burrow entrance to facilitate detection of fresh sign that would indicate recent occupation in subsequent survey passes. Survey pass 1 included a full sweep of the entire Study Area as part of the initial burrow study, while subsequent survey passes focused only on areas known to have suitable burrows that resulted from survey pass 1. Results of the burrowing owl protocol surveys are discussed in Section 5.2.1.7.2.

Rare Plant Survey. The methods used for rare plant surveys in the Project Area were based on the following resources: 1) *Protocols for Surveying and Evaluating Impacts to Special-status Native Plant Populations and Natural Communities* (CDFW 2009); 2) *Guidelines for Conducting and Reporting Botanical Inventories for Federally Listed, Proposed and Candidate Plants* (USFWS 1996); and 3) *General Rare Plant Survey Guidelines* (Cypher 2002). Surveys were conducted by walking 10-meter parallel transects throughout the entire Project Area, where accessible. Due to the relatively flat nature of the WRESC Site and the gen-tie alignment, nearly all parts of the Project Area were observed directly. Surveys were not conducted in inaccessible areas. Biologists meandered through the higher-quality habitat areas to obtain as much coverage as possible in areas with a greater potential for occurrence. **Table 5.2-5** presents the survey dates and personnel who conducted the rare plant survey. Surveys were conducted during the appropriate blooming period for targeted species. Two independent surveys were conducted, one to cover those sensitive plant species that are considered early blooming (April–May) and one to cover late blooming sensitive plant species (June to July).

Table 5.2-5: Rare Plant Survey Dates and Personnel for the Project Area

Date	Field Personnel
April 18, 2023	Scott Crawford, Melanie Bukovac
April 25, 2023	Nathan Moorhatch, Scott Crawford, Liz Diaz, Kyralai Duppel
April 26, 2023	Nathan Moorhatch, Scott Crawford, Liz Diaz, Kyralai Duppel, Alexa Kerr, Melanie Bukovac
April 27, 2023	Nathan Moorhatch, Scott Crawford, Liz Diaz, Kyralai Duppel, Alexa Kerr, Melanie Bukovac
May 9,.2023	Nathan Moorhatch
May 10, 2023	Melanie Bukovac, Scott Crawford, Nathan Moorhatch, Ciara Shirey, Phil Clevinger
May 11, 2023	Melanie Bukovac, Scott Crawford, Nathan Moorhatch, Ciara Shirey
May 12, 2023	Nathan Moorhatch
May 23, 2023	Melanie Bukovac, Nathan Moorhatch
June 20, 2023	Nathan Moorhatch
June 21, 2023	Nathan Moorhatch, John Green
June 22, 2023	Nathan Moorhatch, John Green, Melanie Bukovac, Scott Crawford
June 23, 2023	Nathan Moorhatch, John Green, Melanie Bukovac, Scott Crawford
June 27, 2023	Nathan Moorhatch

Source: WSP 2024e

Plants were identified to species or sub-species level and recorded in the biologists' field notes. For species that were not easily identifiable, a sample was collected and identified at an offsite location. Species that were not identified offsite were taken to Dr. Andy Sanders, a botanist at the University of California, Riverside, for further identification/confirmation. Taxonomy of plant species identified within the Study Area was based on The Jepson Manual, 1st Addition (Hickman) and The Jepson Manual, 2nd Edition (Baldwin et al. 2012). In addition to documenting plant species, biologists recorded all incidental wildlife occurrences by sight, sound, and/or sign (e.g., tracks, burrows, scat, etc.). Results of common plants and vegetation communities are discussed in Section 5.2.1.6, and special-status plant species are discussed in Section 5.2.1.7.1.

Western Joshua Tree Census. Western Joshua tree is a state candidate species that occurs in well-drained soils within hot, dry sites on flats, mesas, bajadas, and gentle slopes. This species persists in areas with cold winters, hot summers, and nominal precipitation. Joshua trees provide cover for a variety of wildlife and nesting substrate for numerous avian species, including special-status species such as loggerhead shrike (*Lanius ludovicianus*) and Swainson's hawk. Primary threats to Joshua trees include climate change and habitat loss due to development. This species was found throughout the Project Area, primarily associated with creosote-white bursage scrub and California matchweed-rubber rabbitbrush vegetation communities within the Project Area. The western Joshua tree census followed the instructions described by CDFW (CDFW 2024). Results of the western Joshua tree census are discussed in Section 5.2.1.7.1.

Desert Tortoise Survey. This species is a federal and state-listed threatened species. The initial literature review indicated that the Project Area is located within the Western Mojave Desert Tortoise Recovery Unit (USFWS 2011), and the CNDDB search identified eleven records of desert tortoise observations within 10 miles of the Project Area. However, only one recorded occurrence was identified within a 5-mile radius of the Project site and is located 1.2 miles northwest of the Whirlwind Substation (CNDDB 2024). Although the Project Area is located in the western-most portion of the range for desert tortoise, suitable desert scrub habitat, topography, and soils within the majority of the Project Area are suitable for desert tortoise. For this reason, focused surveys were conducted following the protocol set forth in Preparing for Any Action That May Occur within the Range of the Mojave Desert Tortoise (USFWS 2019).

Desert tortoise surveys were conducted in concert with sensitive plant surveys and burrowing owl surveys, since both require 10-meter transects, which include 100 percent cover of the Study Area, and are terrestrial in nature. Surveys were walked at a much slower pace than standard desert tortoise protocol surveys (0.5 mph vs. 2 mph). Biologists stopped periodically to examine burrows for suitability and checked under every shrub. With respect to desert tortoises and their sign, the Applicant's biologist documented and classified any observed burrows, dens, scats, and shell remains associated with desert tortoise, if present.

Developed areas within the Project Area were excluded from the survey as unsuitable habitat. For habitat that biologists could not safely survey or gain permission to access, such as private property, surveys were conducted by meticulously scanning the Project Area using binoculars. All data relevant to desert tortoise surveys, were recorded using the Esri ArcGIS Collector application, if present. Results of the desert tortoise protocol surveys are discussed in Section 5.2.1.7.2.

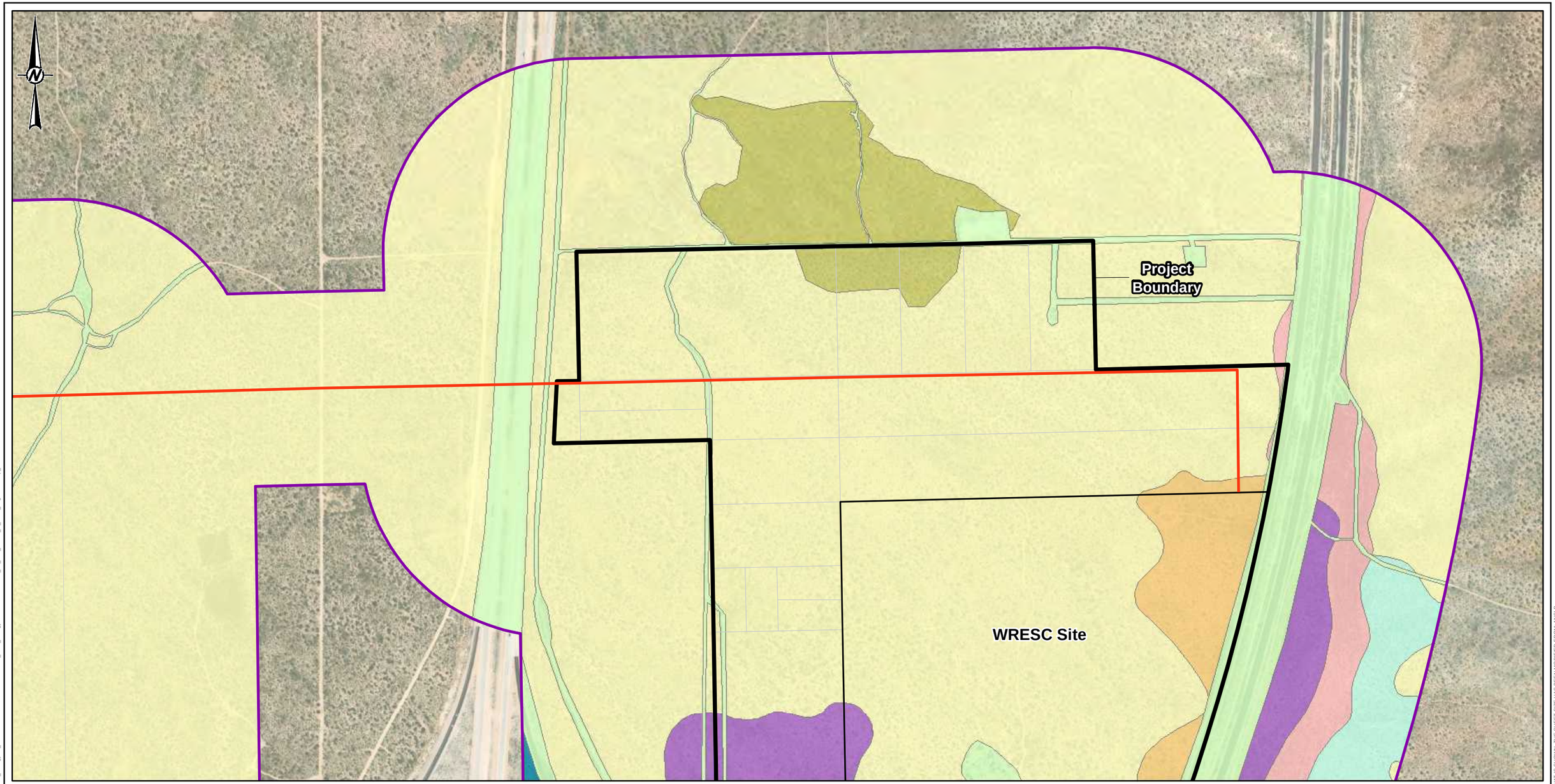
Mohave Ground Squirrel. The Mohave ground squirrel is state-listed as threatened. Suitable habitat includes desert scrub in sandy and gravelly soils. Burrows are typically found at the base of shrubs. Even though the Project Area is at the western limits of this species' range, suitable habitat is present within the Project Area. The closest recorded occurrences of this species are 3 miles south to the south and 5.5 miles to the east. Therefore, protocol-level surveys were completed within the Project Area. Results of the Mohave ground squirrel protocol surveys are discussed in Section 5.2.1.**7**.2.

Crotch's Bumble Bee. Crotch's bumble bee is native to California, where it nests in various cavities and forages on a number of annual flowers. It inhabits grasslands and shrublands and requires a hotter and drier environment than other bumble bee species. This species nests underground and overwinters in soil or under leaf litter/debris. Crotch's bumblebee is a short-tongued species and prefers certain flowering plant species as a food source, particularly milkweeds, dusty maidens, lupines, medics, phacelias, sages, clarkias, poppies, and wild buckwheat. Nectar sources for this species also include plants from the following floristic families: Fabaceae, Apocynaceae, Asteraceae, Lamiaceae, Boraginaceae, and Hydrophyllaceae. Genera include Antirrhinum, Asclepias, Chaenactis, Clarkia, Dendromecon, Eschscholzia, Eriogonum, Lupinus, Medicago, Phacelia, and Salvia. The queen flight period for this species occurs from February to March. Once the queen selects the hive location, the active colony is detectable between April and August. These bees require flowering plants for the entire activity period to be considered suitable for an active hive.

The species occurs in California and is found in the Mediterranean ecoregion, Pacific coast, western desert, and adjacent foothills throughout most of the southwestern region of the state. The Central Valley historically served as the primary population center for the species. Today, Crotch's bumble bee is absent from much of its historic range, with a relative species abundance decline of approximately 98 percent over the last decade. Due to the rapid decline of this species, limited knowledge of this species in the area surrounding the Project Area, and the presence of suitable nectar sources, protocol-level surveys are recommended. Protocol-level surveys methods were based on a protocol developed for the High-Speed Rail project, which was reviewed approved by CDFW. This protocol is very similar to the CDFW protocol released in June 2023 (CDFW 2023). Results of the Crotch's bumble bee protocol surveys are discussed in Section 5.2.1.7.2.

5.2.1.6 Land Cover Types and Vegetation Communities

Land cover types and vegetation communities identified within the Study Area are shown in **Figure 5.2-4**, listed in **Table 5.2-6**, and discussed in the following sections.



LEGEND

Vegetation Class

- Allscale scrub (ASSC)
- Cheesebush Scrub (CHBS)
- Creosote bush - white bursage scrub (CBWS)
- Creosote bush scrub (CBS)
- Disturbed/Developed (DH-DEV)
- Needleleaf rabbitbrush scrub (NRS)
- Rubber rabbitbrush scrub (RRS)
- White Bursage Scrub (WBS)

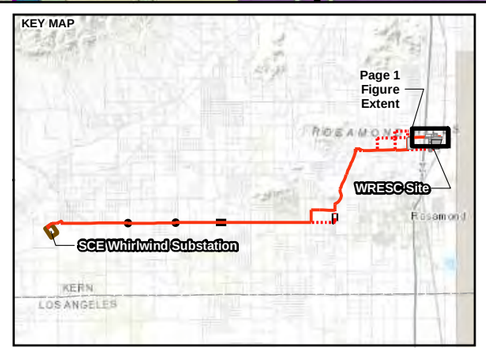
Proposed Transmission Line

- Preferred Route, Aboveground

Project Components

- WRESC Site
- Other Project Parcels
- Project Boundary
- Project Survey Area

KEY MAP



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NOTE(S)

1. STUDY AREA IS CALCULATED BASED ON A 500 FT BUFFER AROUND TRANSMISSION LINES AND A 1000 FT BUFFER AROUND PROJECT PARCELS.

REFERENCE(S)

1. CADFW - VEGETATION CLASSES
2. COORDINATE SYSTEM: NAD 1983 STATEPLANE CALIFORNIA V FIPS 0405 FEET
3. MAP SERVICE LAYER CREDITS: SOURCES: ESRI, HERE, GARMIN, INTERMAP, INCREMENT P CORP., GEBCO, USGS, FAO, NPS, NRCAN, GEOBASE, IGN, KADASTER NL, ORDNANCE SURVEY, ESRI JAPAN, METI, ESRI CHINA (HONG KONG), (C) OPENSTREETMAP CONTRIBUTORS, AND THE GIS USER COMMUNITY

CLIENT
GEM A-CAES LLC

PROJECT
WILLOW ROCK ENERGY STORAGE CENTER
SUPPLEMENTAL AFC

CONSULTANT
wsp

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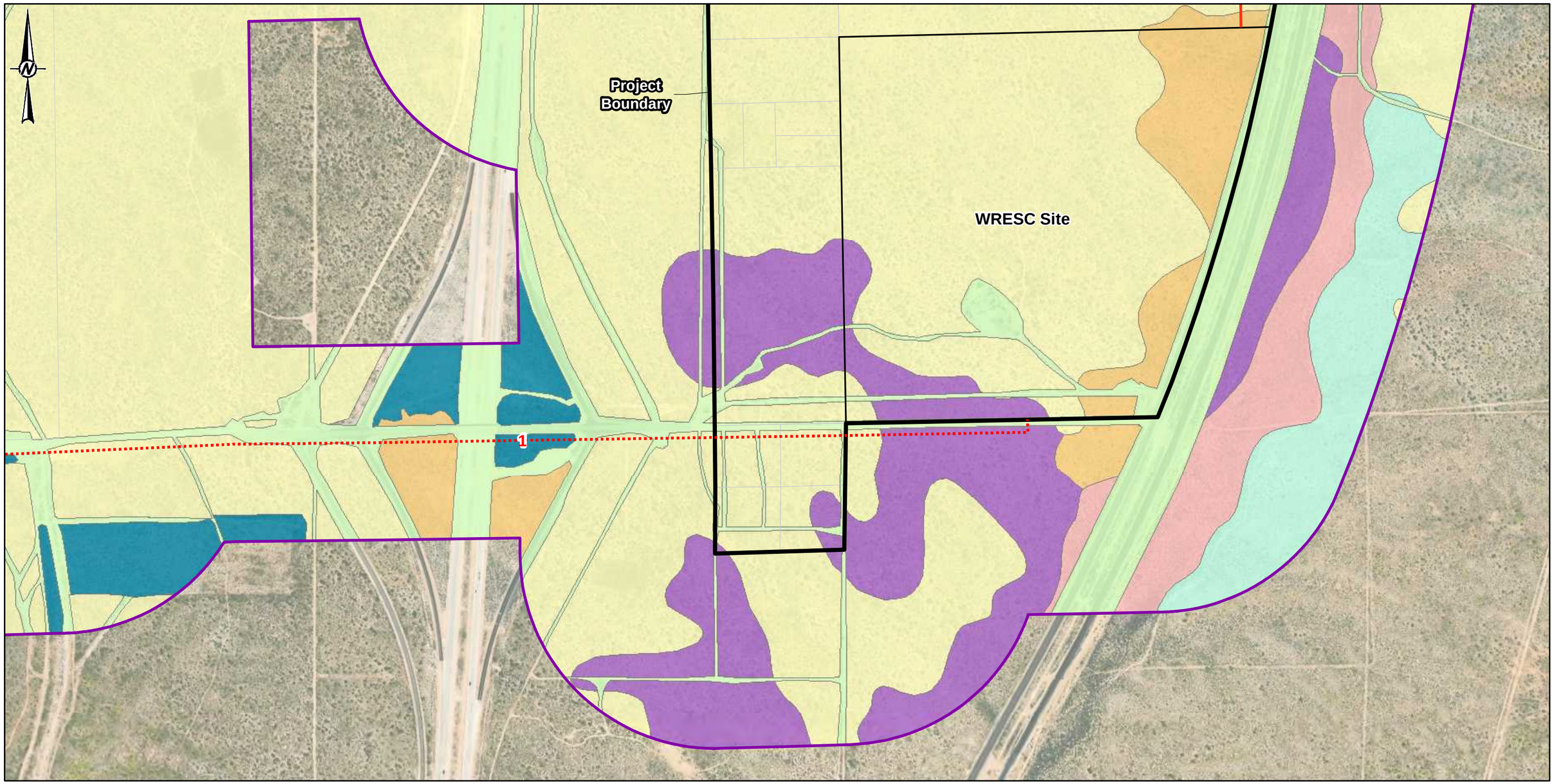


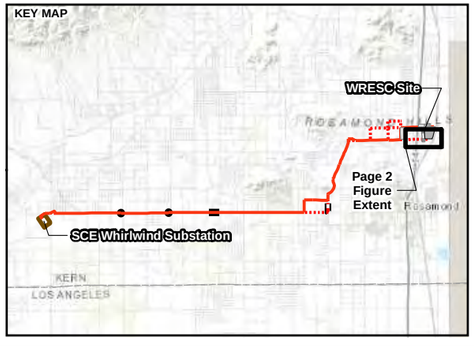
LEGEND

Vegetation Class
- Allscale scrub (ASSC)
- Cheesebush Scrub (CHBS)
- Creosote bush - white bursage scrub (CBWS)
- Disturbed/Developed (DH-DEV)
- Needleleaf rabbitbrush scrub (NRS)
- Rubber rabbitbrush scrub (RRS)
- White Bursage Scrub (WBS)

Proposed Transmission Line
- Preferred Route, Aboveground
- Route Options 1-6, Aboveground

Project Components
- WRESC Site
- Other Project Parcels
- Project Boundary
- Project Survey Area

KEY MAP



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APPROVED	SH

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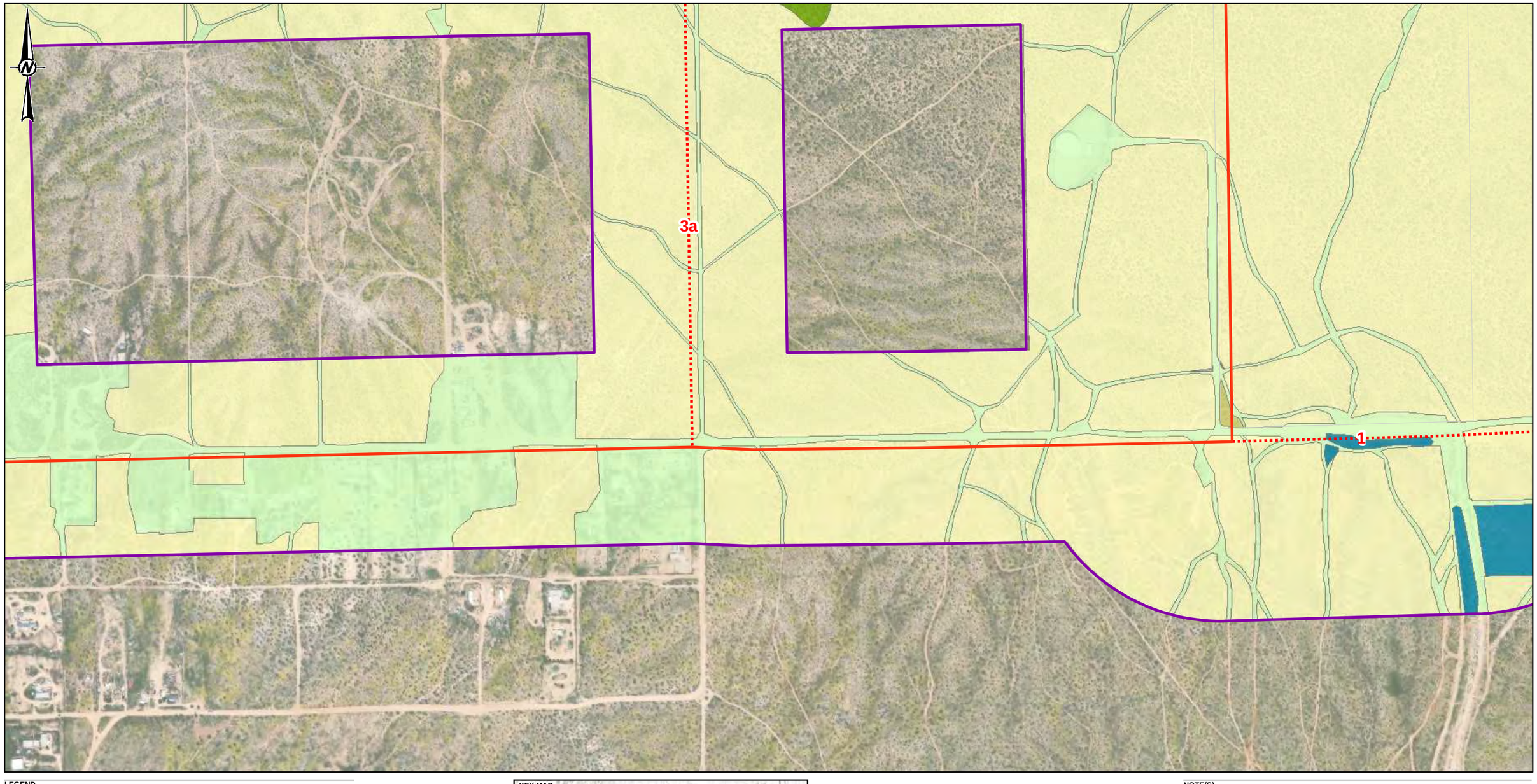


LEGEND

Vegetation Class

- Creosote bush - white bursage scrub (CBWS)
- Creosote bush scrub (CBS)
- Disturbed/Developed (DH-DEV)
- Joshua tree woodland (JTW)
- Rubber rabbitbrush scrub (RRS)

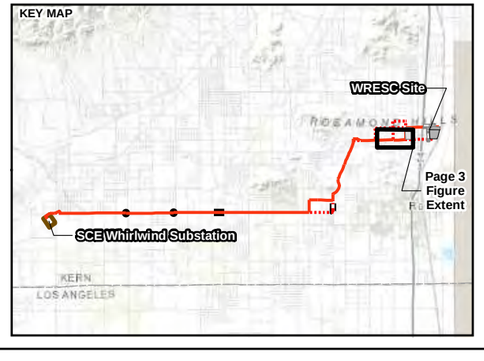
Proposed Transmission Line

- Preferred Route, Aboveground
- Route Options 1-6, Aboveground

Project Components

- Other Project Parcels
- Project Survey Area

KEY MAP



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NOTE(S)

1. STUDY AREA IS CALCULATED BASED ON A 500 FT BUFFER AROUND TRANSMISSION LINES AND A 1000 FT BUFFER AROUND PROJECT PARCELS.

REFERENCE(S)

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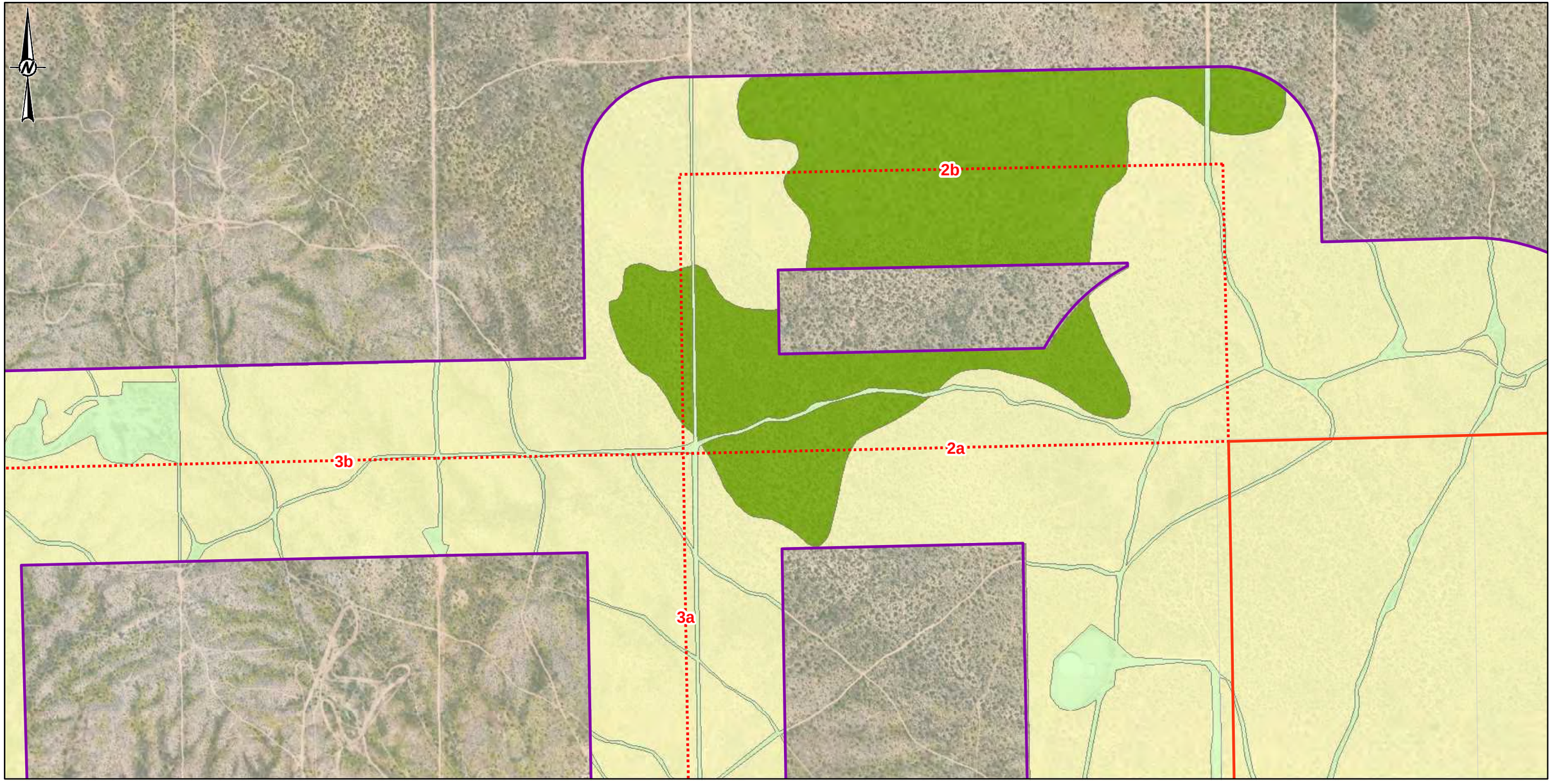


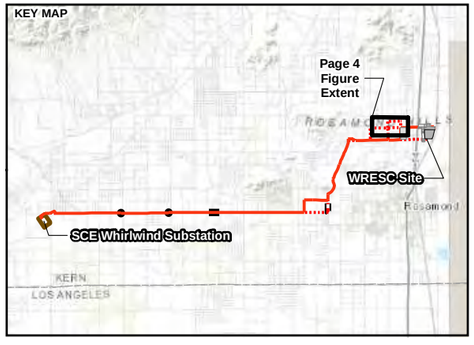
LEGEND

Vegetation Class
- Creosote bush - white bursage scrub (CBWS)
- Disturbed/Developed (DH-DEV)
- Joshua tree woodland (JTW)

Proposed Transmission Line
- Preferred Route, Aboveground
- Route Options 1-6, Aboveground

Project Components
- Other Project Parcels
- Project Survey Area

KEY MAP



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NOTE(S)
1. STUDY AREA IS CALCULATED BASED ON A 500 FT BUFFER AROUND TRANSMISSION LINES AND A 1000 FT BUFFER AROUND PROJECT PARCELS.

REFERENCE(S)
1. CADFW - VEGETATION CLASSES
2. COORDINATE SYSTEM: NAD 1983 STATEPLANE CALIFORNIA V FIPS 0405 FEET
3. MAP SERVICE LAYER CREDITS: SOURCES: ESRI, HERE, GARMIN, INTERMAP, INCREMENT P CORP., GEBCO, USGS, FAO, NPS, NRCAN, GEOBASE, IGN, KADASTER NL, ORDNANCE SURVEY, ESRI JAPAN, METI, ESRI CHINA (HONG KONG), (C) OPENSTREETMAP CONTRIBUTORS, AND THE GIS USER COMMUNITY

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SUPPLEMENTAL AFC

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TITLE
VEGETATION MAP
MAP BOOK PAGE 4 OF 16

PROJECT NO.	PHASE	REV.	FIGURE
31406639.003	01	0	5.2-5-4

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM ANSI B

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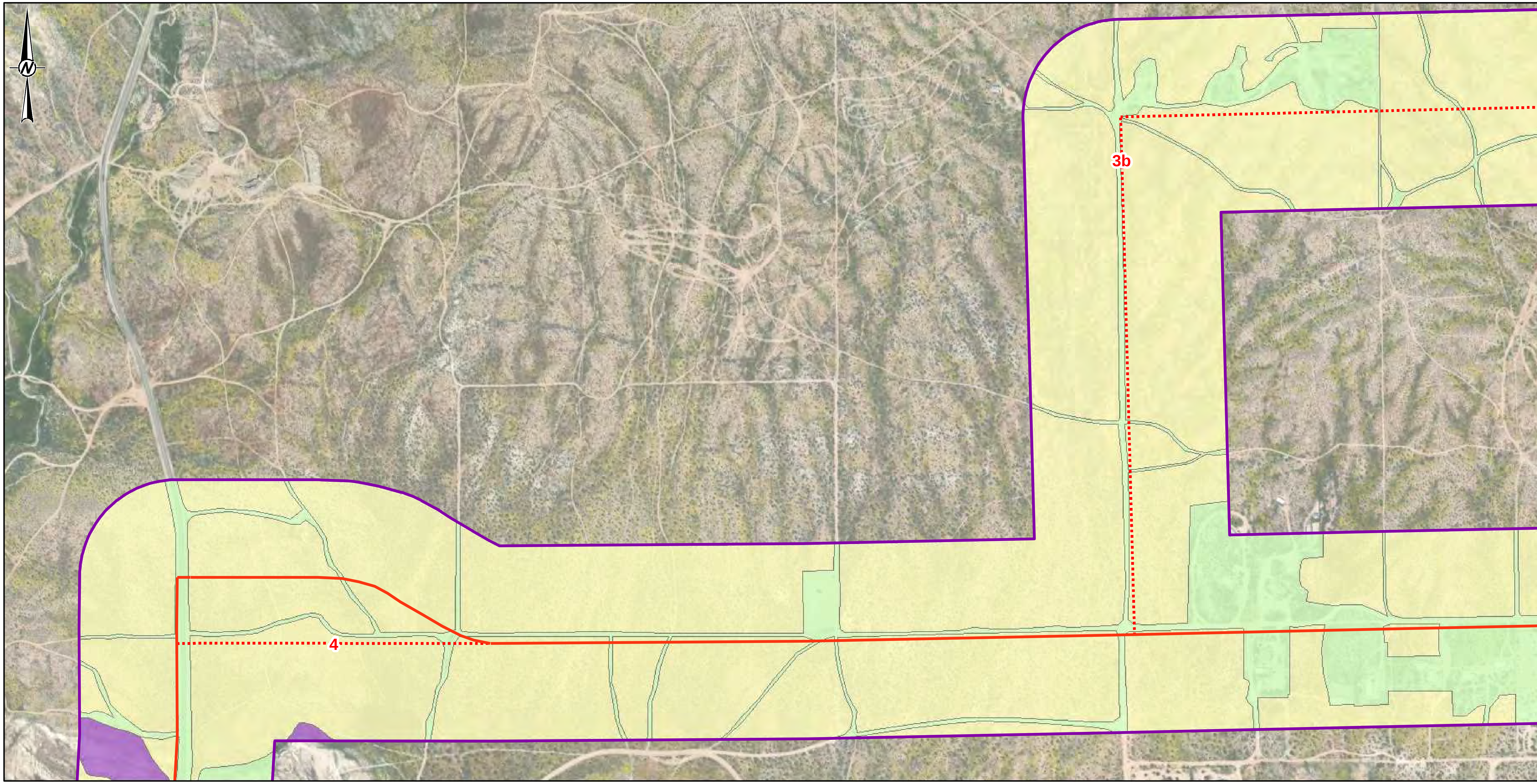


LEGEND

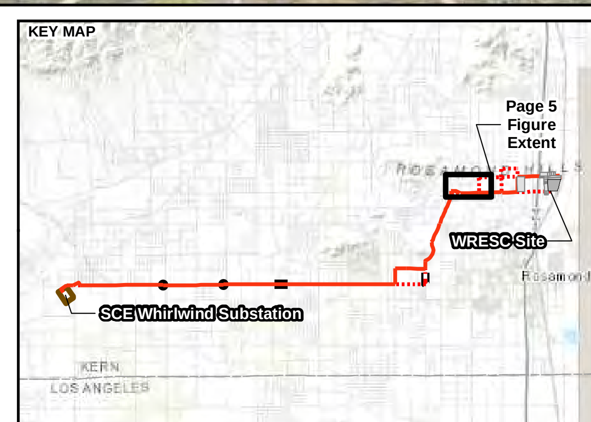
Vegetation Class

- Creosote bush - white bursage scrub (CBWS)
- Disturbed/Developed (DH-DEV)
- White Bursage Scrub (WBS)

Proposed Transmission Line

- Preferred Route, Aboveground
- Route Options 1-6, Aboveground
- Project Survey Area

KEY MAP



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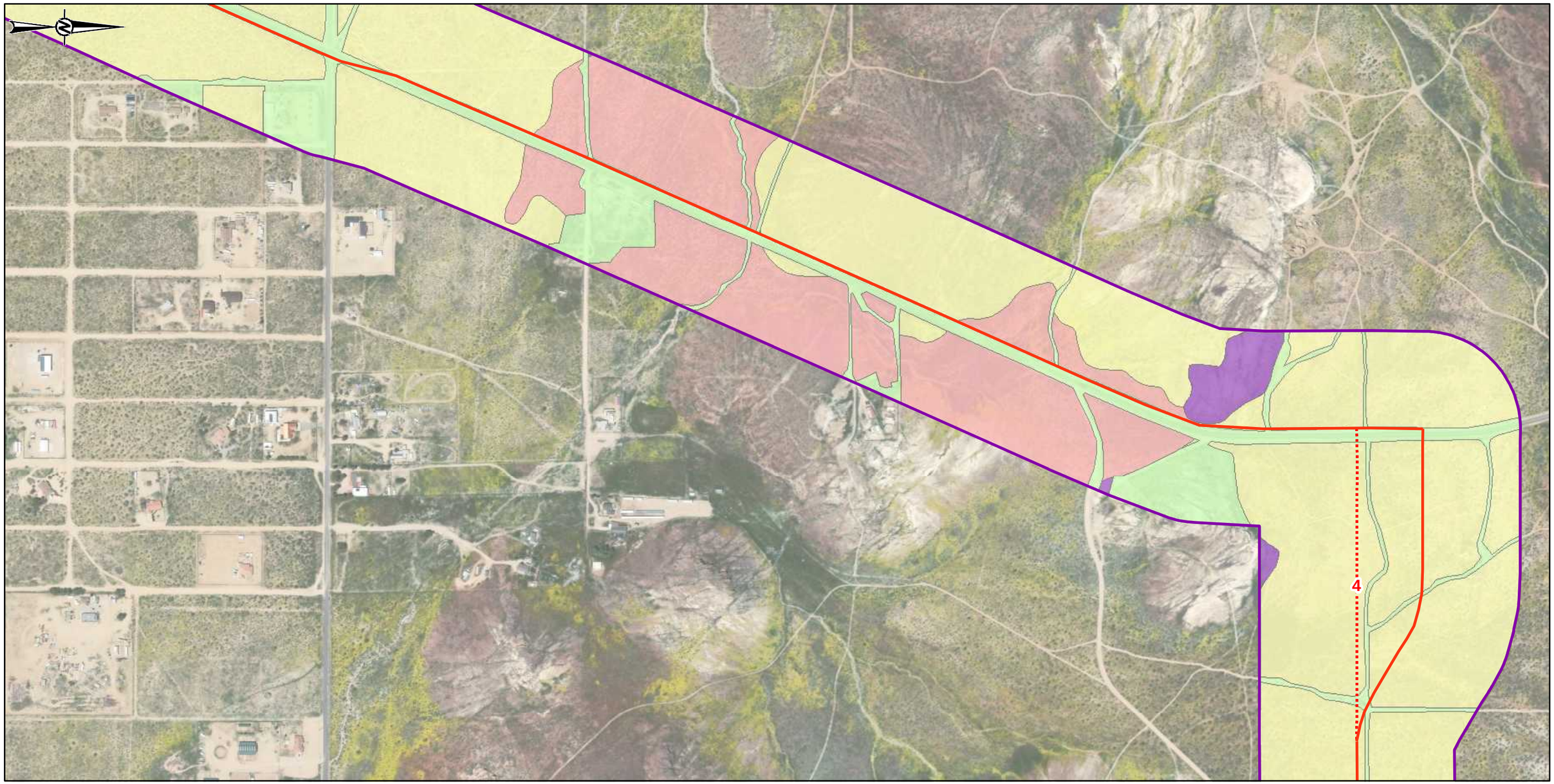
TITLE
VEGETATION MAP
MAP BOOK PAGE 5 OF 16

PROJECT NO.	PHASE	REV.	FIGURE
31406639.003	01	0	5.2-5-5



LEGEND

Vegetation Class

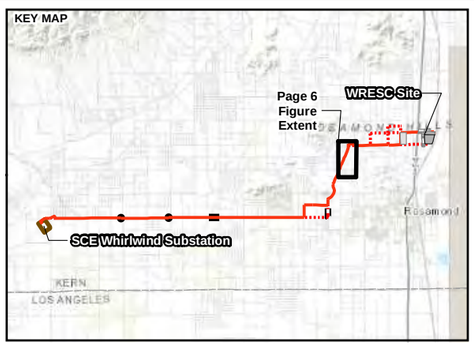
- Allscale scrub (ASSC)
- Creosote bush - white bursage scrub (CBWS)
- Disturbed/Developed (DH-DEV)
- White Bursage Scrub (WBS)

Proposed Transmission Line

- Preferred Route, Aboveground
- Route Options 1-6, Aboveground

- Project Survey Area

KEY MAP



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TITLE
VEGETATION MAP
MAP BOOK PAGE 6 OF 16

PROJECT NO.	PHASE	REV.	FIGURE
31406639.003	01	0	5.2-5-6

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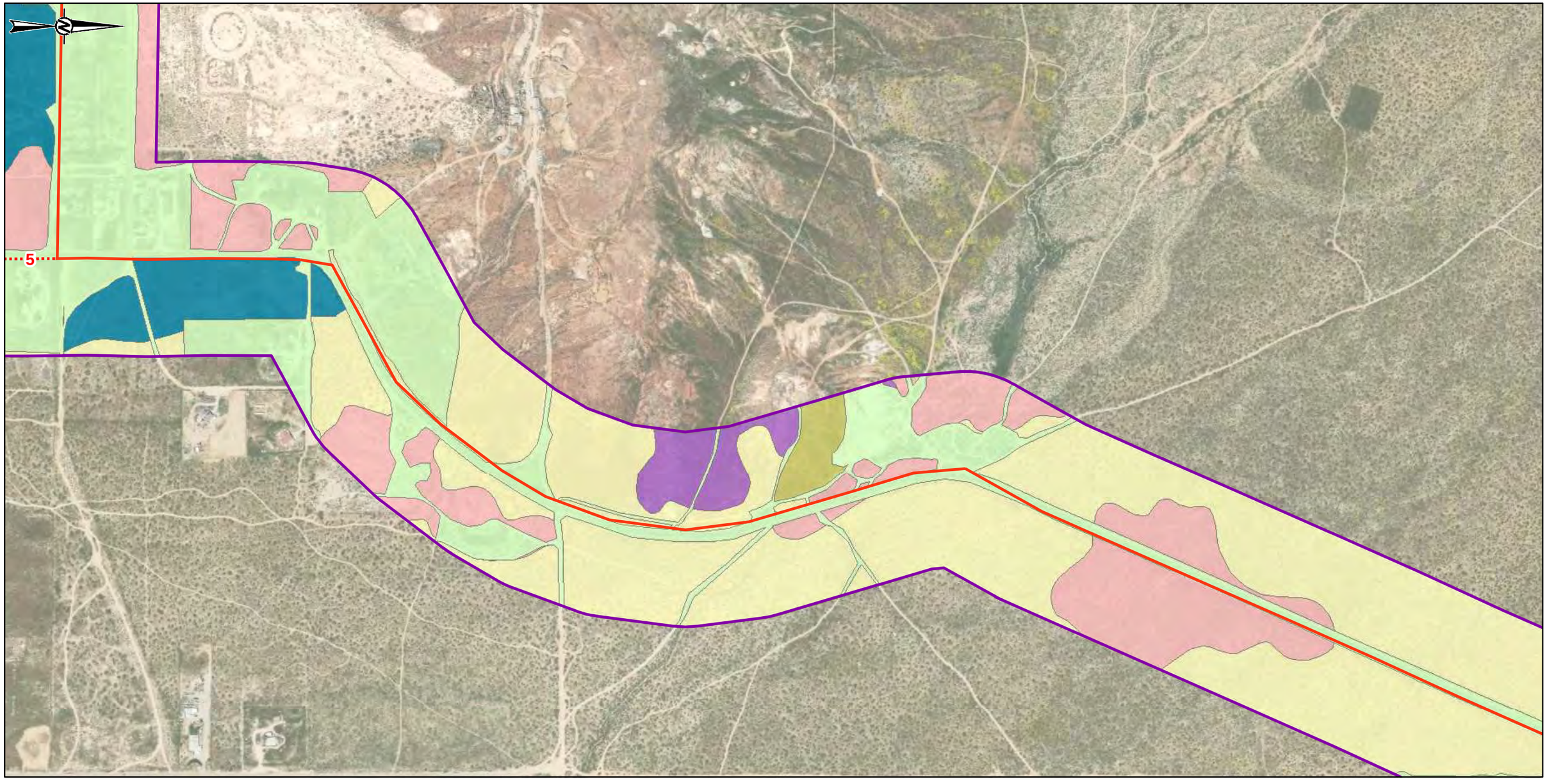


LEGEND

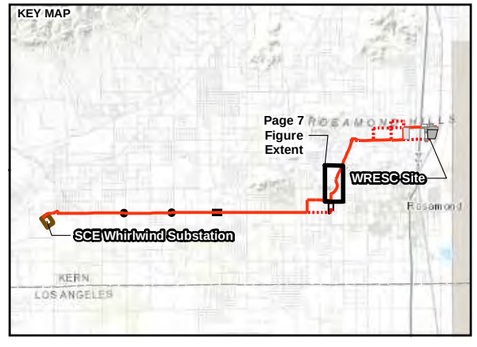
Vegetation Class

- Allscale scrub (ASSC)
- Creosote bush - white bursage scrub (CBWS)
- Creosote bush scrub (CBS)
- Disturbed/Developed (DH-DEV)
- Rubber rabbitbrush scrub (RRS)
- White Bursage Scrub (WBS)

Proposed Transmission Line

- Preferred Route, Aboveground
- Route Options 1-6, Aboveground
- Project Survey Area

KEY MAP



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TITLE
VEGETATION MAP
MAP BOOK PAGE 7 OF 16

PROJECT NO.	PHASE	REV.	FIGURE
31406639.003	01	0	5.2-5-7

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B

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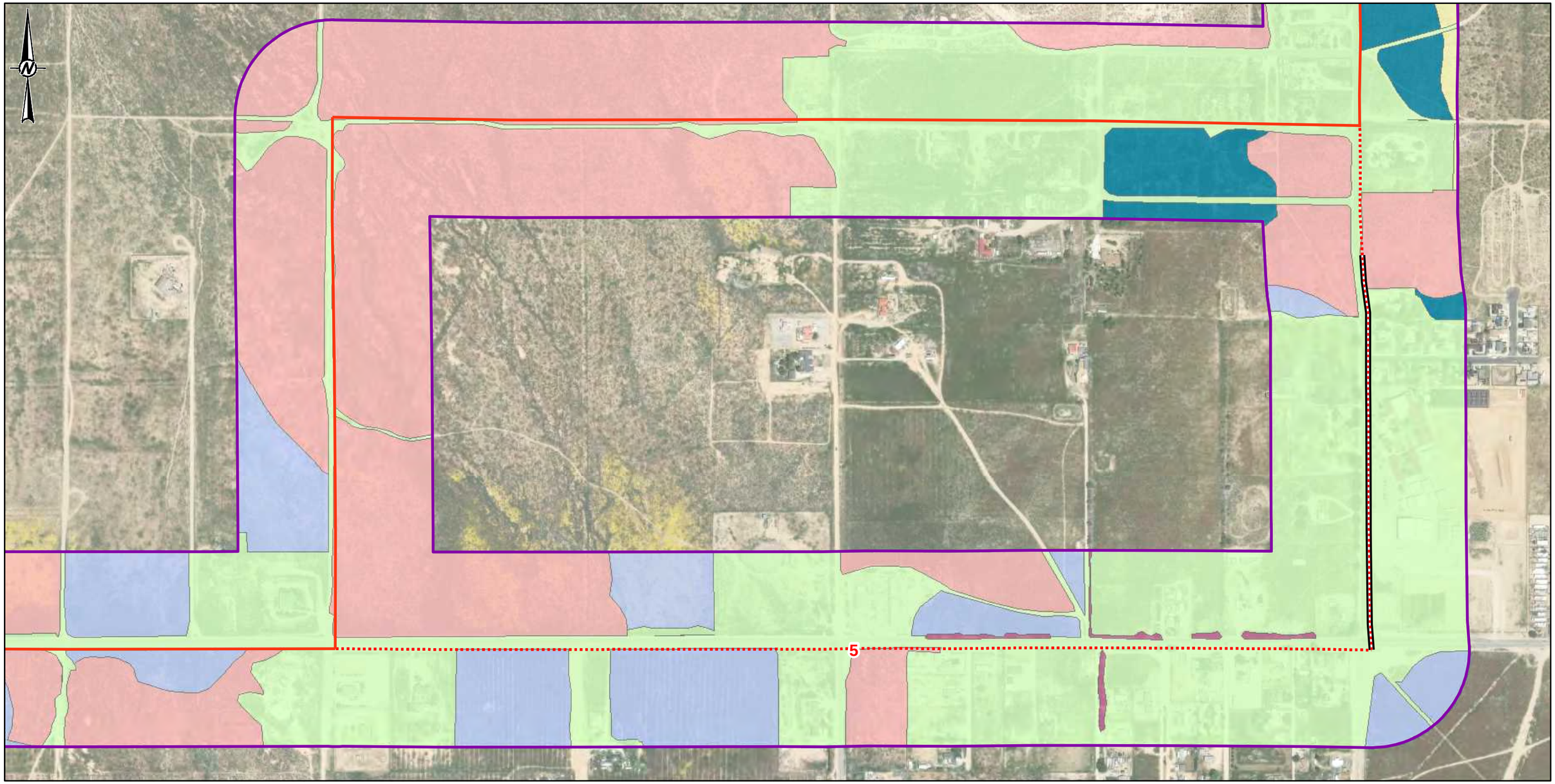


LEGEND

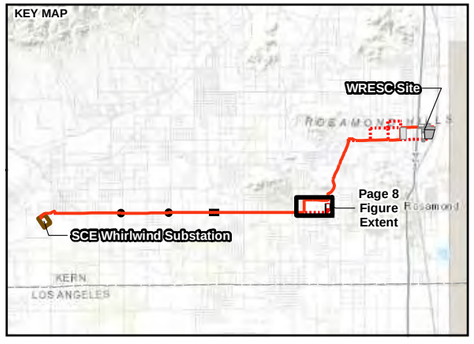
Vegetation Class

- Allscale scrub (ASSC)
- Creosote bush - white bursage scrub (CBWS)
- Disturbed/Developed (DH-DEV)
- Non-Native (NNGF)
- Non-Native Grassland and Forbes (NNGF)
- Rubber rabbitbrush scrub (RRS)
- Tamarisk Thickets (TTH)

Proposed Transmission Line

- Preferred Route, Aboveground
- Route Options 1-6, Aboveground
- Route Options 1-6, Underground
- Project Survey Area

KEY MAP



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NOTE(S)

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CONSULTANT

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TITLE
VEGETATION MAP
MAP BOOK PAGE 8 OF 16

PROJECT NO.	PHASE	REV.	FIGURE
31406639.003	01	0	5.2-5-8

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B

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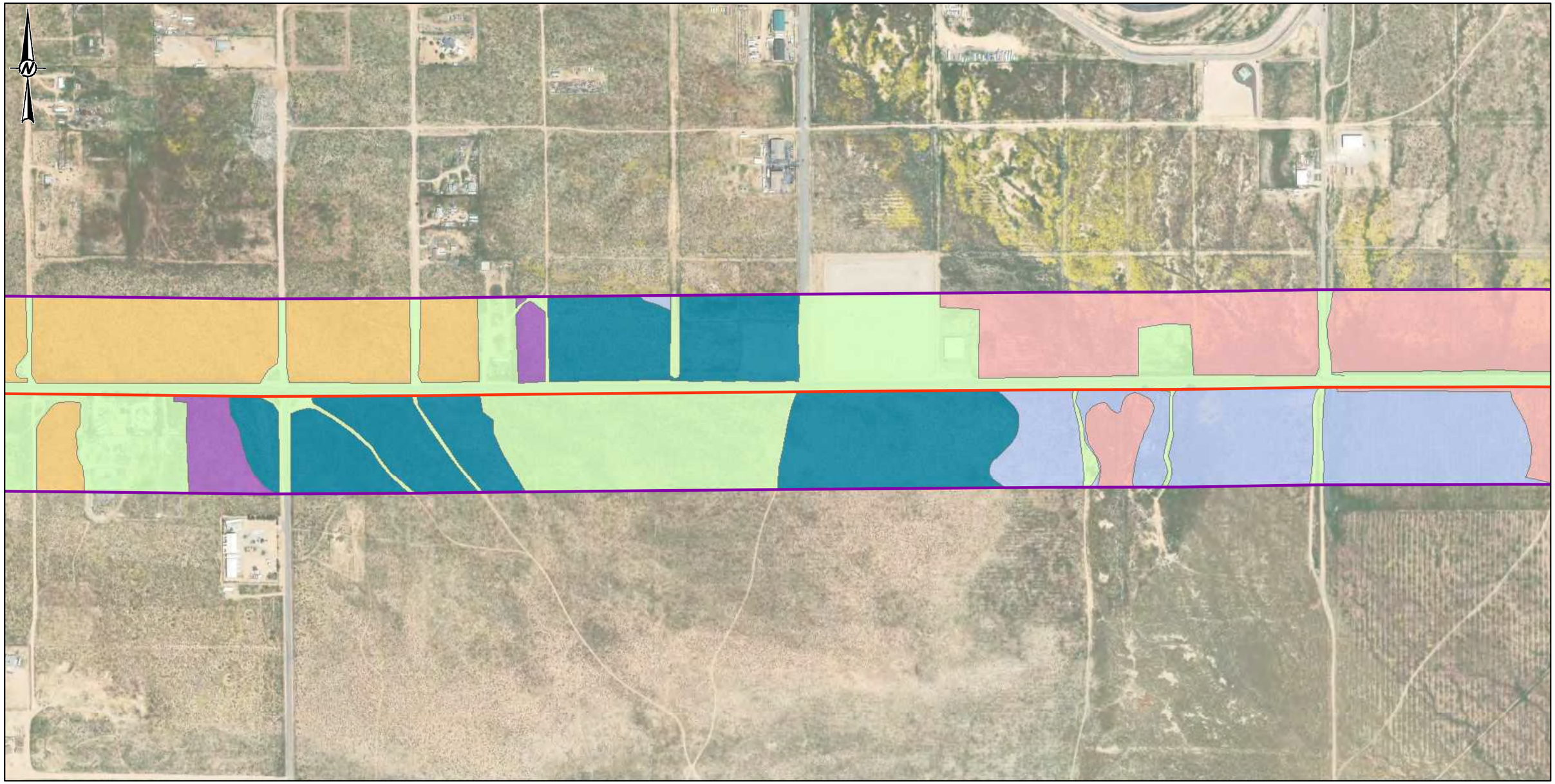


LEGEND

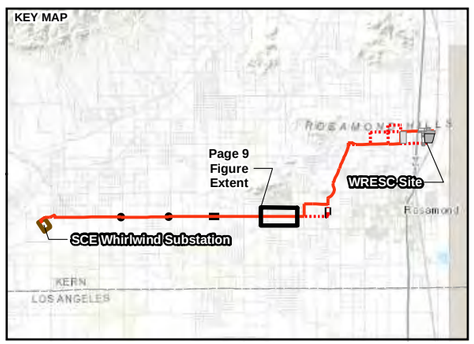
Vegetation Class

- Allscale scrub (ASSC)
- Cheesebush Scrub (CHBS)
- Disturbed/Developed (DH-DEV)
- Non-Native Grassland and Forbes (NNGF)
- Rubber rabbitbrush scrub (RRS)
- White Bursage Scrub (WBS)

Proposed Transmission Line

- Preferred Route, Aboveground
- Project Survey Area

KEY MAP



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REFERENCE(S)
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TITLE
VEGETATION MAP
MAP BOOK PAGE 9 OF 16

PROJECT NO.	PHASE	REV.	FIGURE
31406639.003	01	0	5.2-5-9

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM ANSI B

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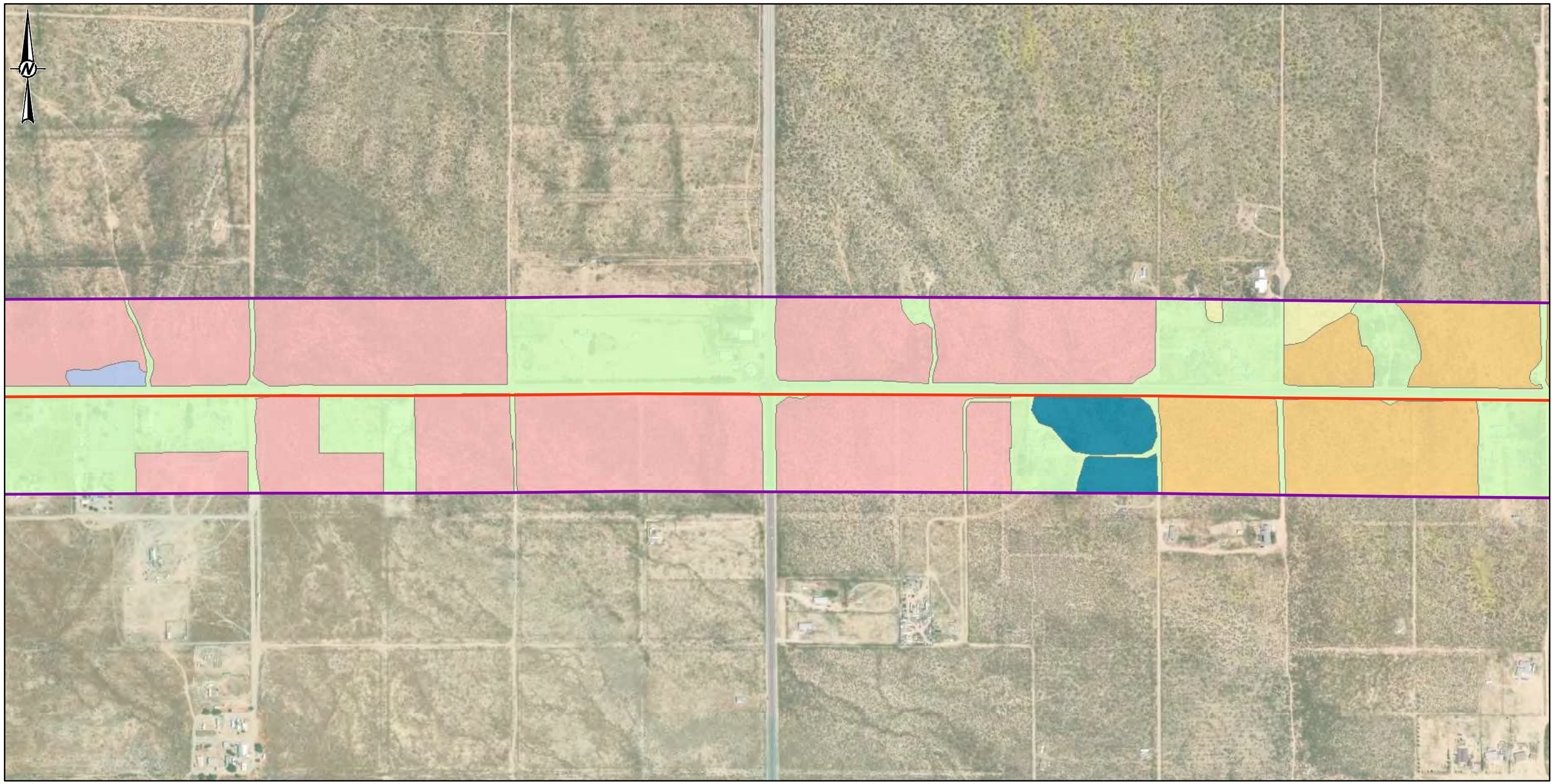


LEGEND

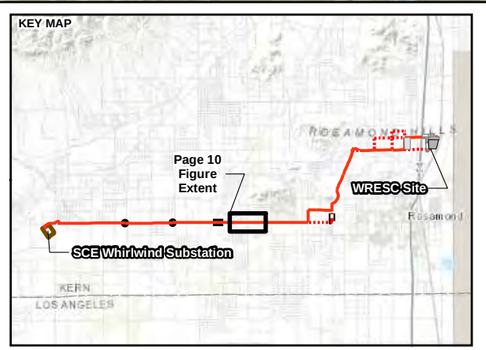
Vegetation Class

- Allscale scrub (ASSC)
- Cheesebush Scrub (CHBS)
- Creosote bush - white bursage scrub (CBWS)
- Disturbed/Developed (DH-DEV)
- Non-Native Grassland and Forbes (NNGF)
- Rubber rabbitbrush scrub (RRS)

Proposed Transmission Line

- Preferred Route, Aboveground
- Project Survey Area

KEY MAP



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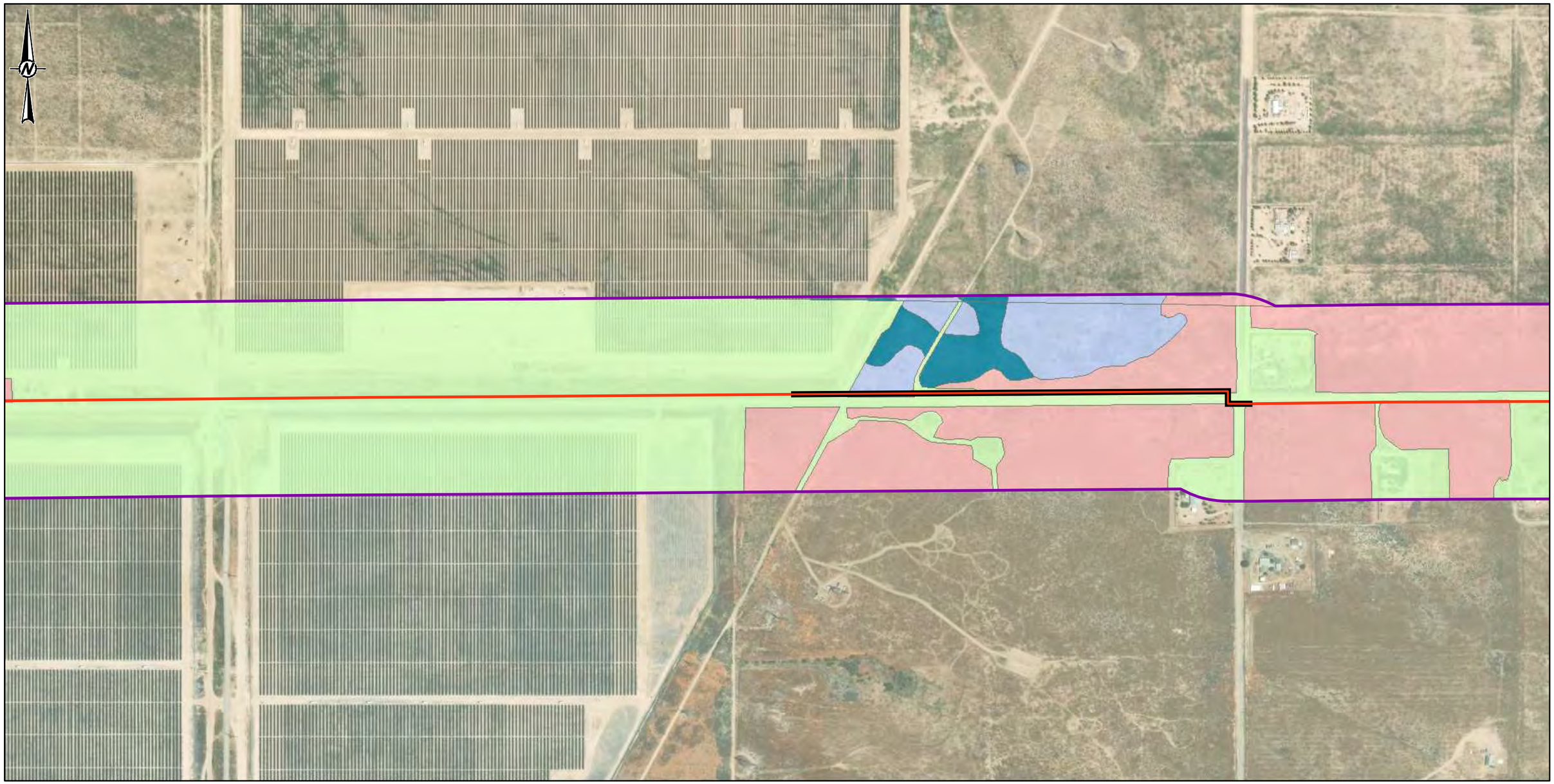
TITLE
VEGETATION MAP
MAP BOOK PAGE 10 OF 16

PROJECT NO.	PHASE	REV.	FIGURE
31406639.003	01	0	5.2-5-10



LEGEND

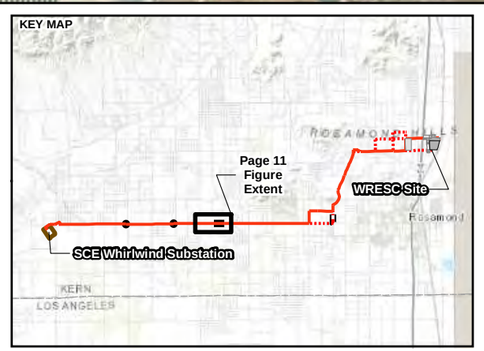
Vegetation Class

- Allscale scrub (ASSC)
- Disturbed/Developed (DH-DEV)
- Non-Native Grassland and Forbes (NNGF)
- Rubber rabbitbrush scrub (RRS)

Proposed Transmission Line

- Preferred Route, Aboveground
- Preferred Route, Underground
- Project Survey Area

KEY MAP



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VEGETATION MAP
MAP BOOK PAGE 11 OF 16

PROJECT NO.	PHASE	REV.	FIGURE
31406639.003	01	0	5.2-5-11

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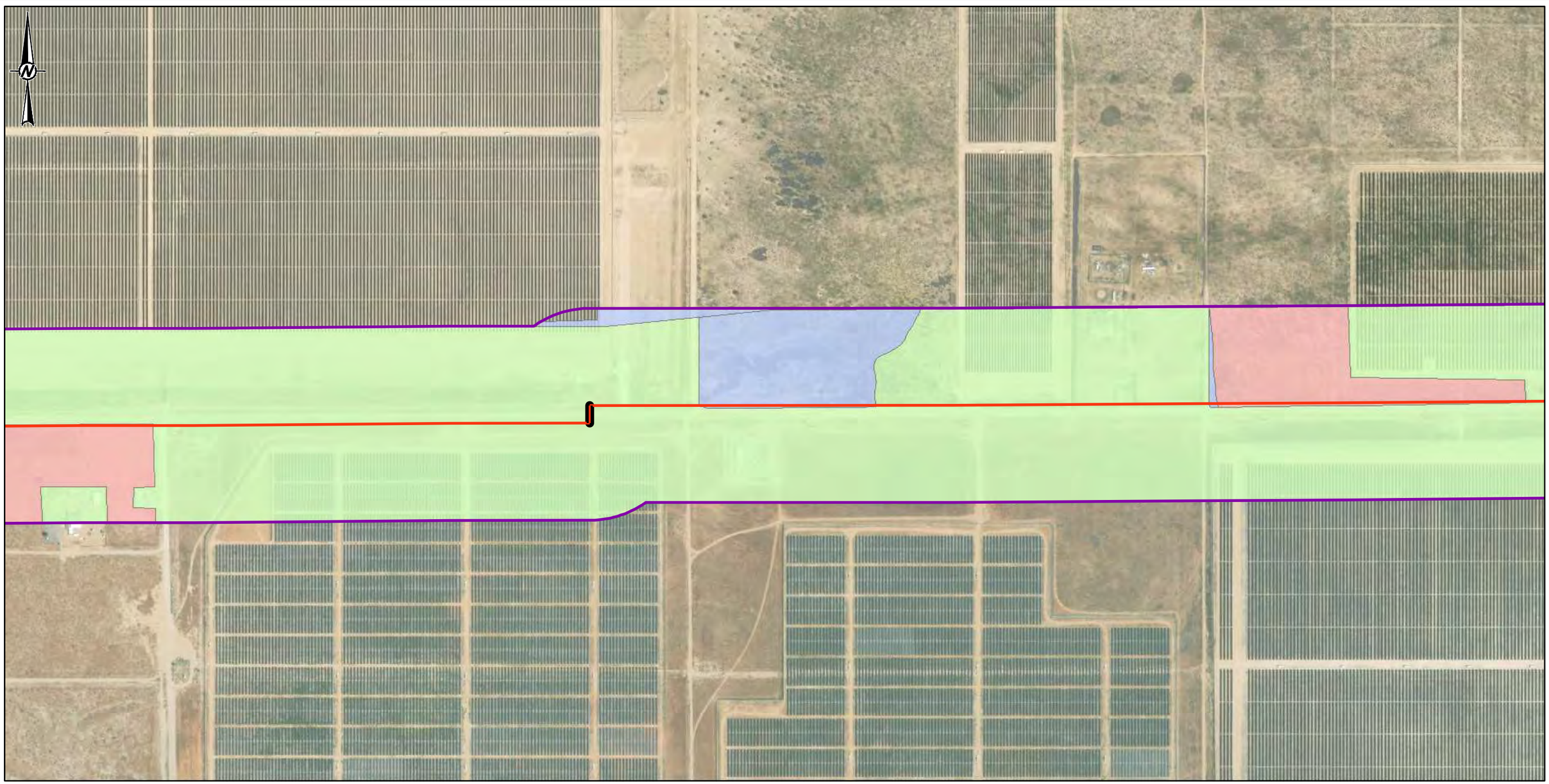


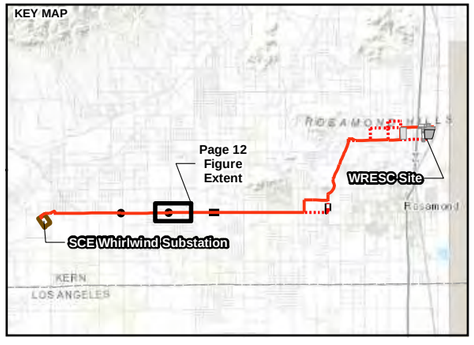
LEGEND

Vegetation Class

- Allscale scrub (ASSC)
- Disturbed/Developed (DH-DEV)
- Non-Native Grassland and Forbes (NNGF)

Proposed Transmission Line

- Preferred Route, Aboveground
- Preferred Route, Underground
- Project Survey Area



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VEGETATION MAP
MAP BOOK PAGE 12 OF 16

PROJECT NO.	PHASE	REV.	FIGURE
31406639.003	01	0	5.2-5-12

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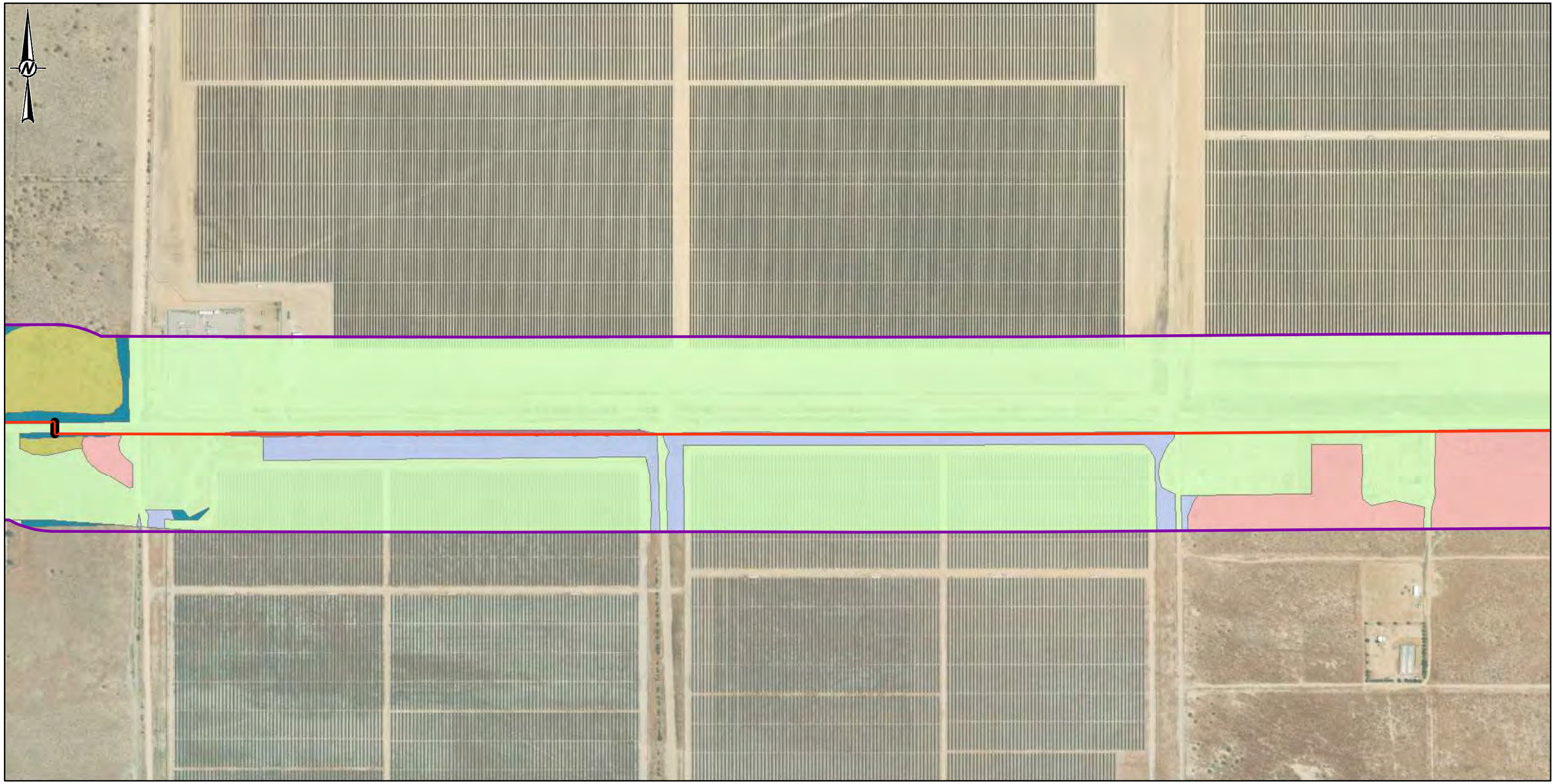


LEGEND

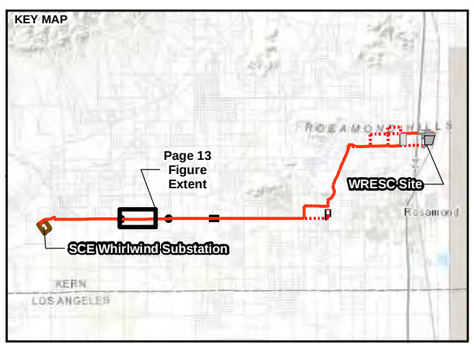
Vegetation Class

- Allscale scrub (ASSC)
- Creosote bush scrub (CBS)
- Disturbed/Developed (DH-DEV)
- Non-Native Grassland and Forbes (NNGF)
- Rubber rabbitbrush scrub (RRS)
- Tamarisk Thickets (TTH)

Proposed Transmission Line

- Preferred Route, Aboveground
- Preferred Route, Underground
- Project Survey Area

KEY MAP



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CONSULTANT
wsp

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VEGETATION MAP
MAP BOOK PAGE 13 OF 16

PROJECT NO.	PHASE	REV.	FIGURE
31406639.003	01	0	5.2-5-13

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B

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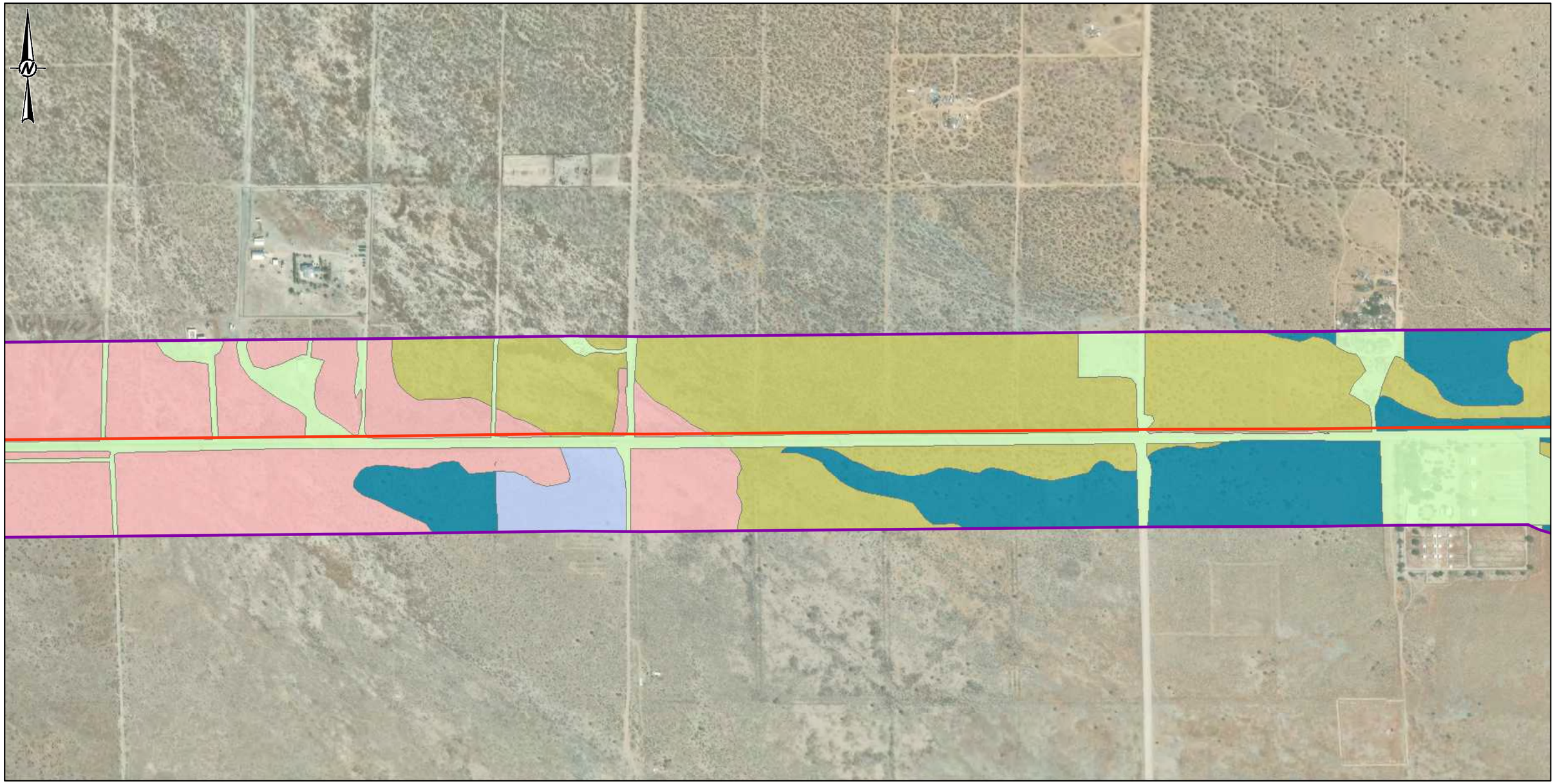


LEGEND

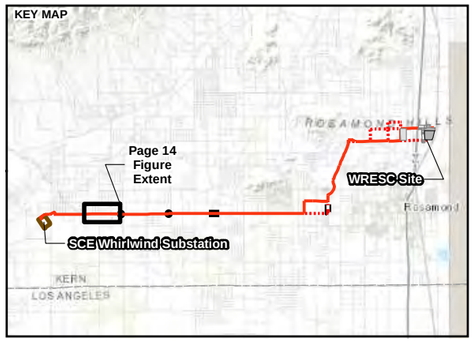
Vegetation Class

- Allscale scrub (ASSC)
- Creosote bush scrub (CBS)
- Disturbed/Developed (DH-DEV)
- Non-Native Grassland and Forbes (NNGF)
- Rubber rabbitbrush scrub (RRS)

Proposed Transmission Line

- Preferred Route, Aboveground
- Project Survey Area

KEY MAP



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NOTE(S)

1. STUDY AREA IS CALCULATED BASED ON A 500 FT BUFFER AROUND TRANSMISSION LINES AND A 1000 FT BUFFER AROUND PROJECT PARCELS.

REFERENCE(S)

1. CADFW - VEGETATION CLASSES
2. COORDINATE SYSTEM: NAD 1983 STATEPLANE CALIFORNIA V FIPS 0405 FEET
3. MAP SERVICE LAYER CREDITS: SOURCES: ESRI, HERE, GARMIN, INTERMAP, INCREMENT P CORP., GEBCO, USGS, FAO, NPS, NRCAN, GEOBASE, IGN, KADASTER NL, ORDNANCE SURVEY, ESRI JAPAN, METI, ESRI CHINA (HONG KONG), (C) OPENSTREETMAP CONTRIBUTORS, AND THE GIS USER COMMUNITY

CLIENT
GEM A-CAES LLC

PROJECT
WILLOW ROCK ENERGY STORAGE CENTER
SUPPLEMENTAL AFC

CONSULTANT

YYYY-MM-DD	2024-02-28
DESIGNED	MK
PREPARED	MK
REVIEWED	SC
APPROVED	SH

TITLE
VEGETATION MAP
MAP BOOK PAGE 14 OF 16

PROJECT NO.	PHASE	REV.	FIGURE
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LEGEND

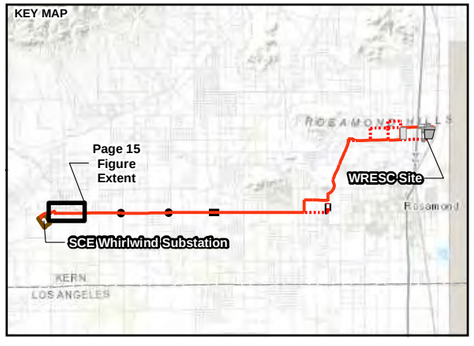
Vegetation Class

- Allscale scrub (ASSC)
- Cheesebush Scrub (CHBS)
- Creosote bush scrub (CBS)
- Disturbed/Developed (DH-DEV)
- Non-Native Grassland and Forbes (NNGF)
- Rubber rabbitbrush scrub (RRS)

Proposed Transmission Line

- Preferred Route, Aboveground
- Route Options 1-6, Aboveground
- SCE Whirlwind Substation
- Project Survey Area

KEY MAP



0 500 1,000

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CLIENT
GEM A-CAES LLC

CONSULTANT
wsp

YYYY-MM-DD	2024-02-28
DESIGNED	MK
PREPARED	MK
REVIEWED	SC
APPROVED	SH

NOTE(S)
1. STUDY AREA IS CALCULATED BASED ON A 500 FT BUFFER AROUND TRANSMISSION LINES AND A 1000 FT BUFFER AROUND PROJECT PARCELS.

REFERENCE(S)
1. CADFW - VEGETATION CLASSES
2. COORDINATE SYSTEM: NAD 1983 STATEPLANE CALIFORNIA V FIPS 0405 FEET
3. MAP SERVICE LAYER CREDITS: SOURCES: ESRI, HERE, GARMIN, INTERMAP, INCREMENT P CORP., GEBCO, USGS, FAO, NPS, NRCAN, GEOBASE, IGN, KADASTER NL, ORDNANCE SURVEY, ESRI JAPAN, METI, ESRI CHINA (HONG KONG), (C) OPENSTREETMAP CONTRIBUTORS, AND THE GIS USER COMMUNITY

PROJECT
WILLOW ROCK ENERGY STORAGE CENTER SUPPLEMENTAL AFC

TITLE
VEGETATION MAP
MAP BOOK PAGE 15 OF 16

PROJECT NO.	PHASE	REV.	FIGURE
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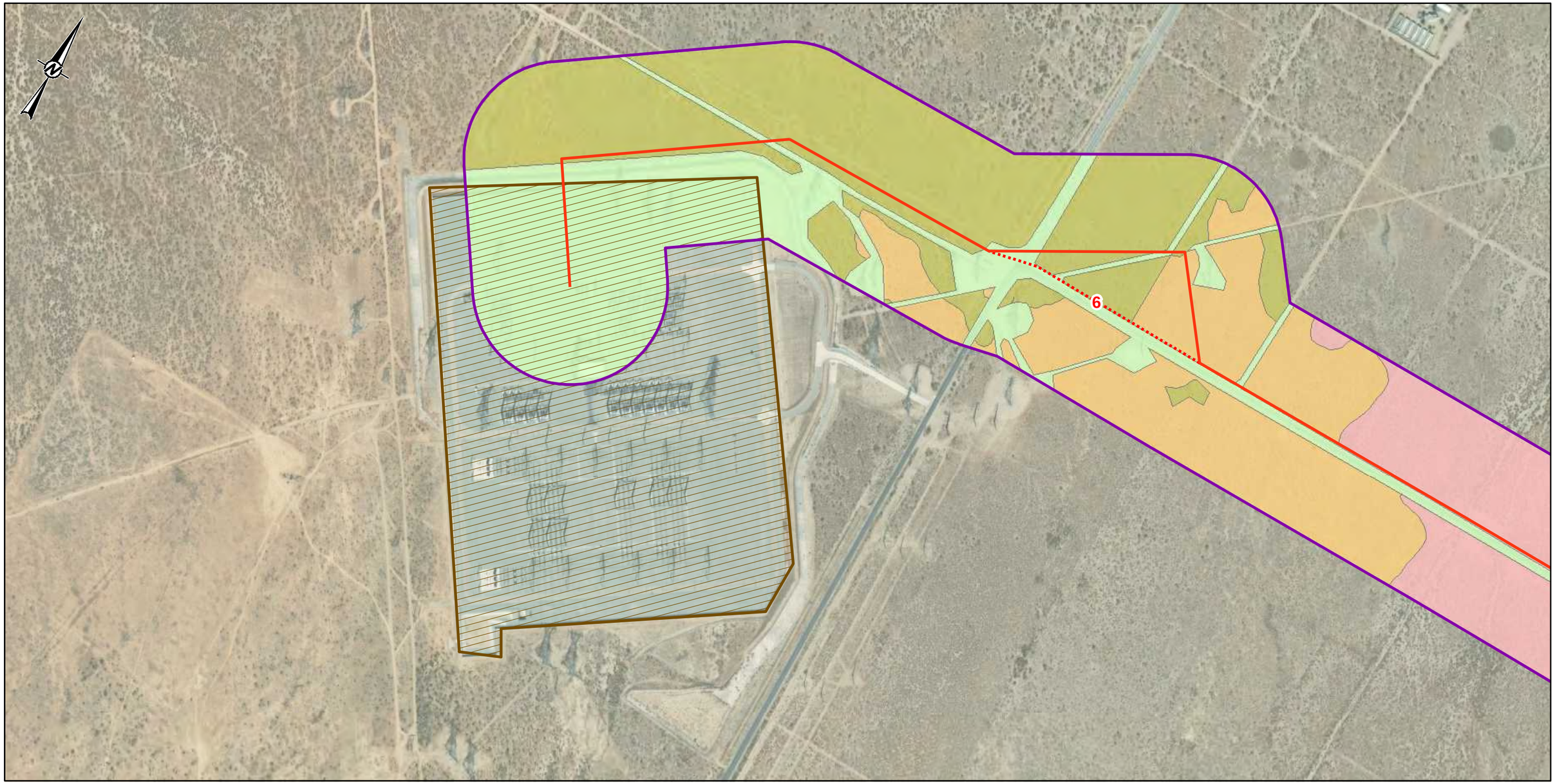


LEGEND

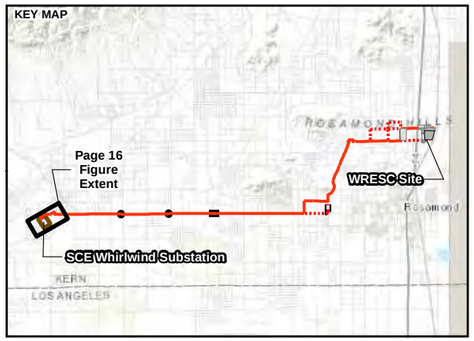
Vegetation Class

- Allscale scrub (ASSC)
- Cheesebush Scrub (CHBS)
- Creosote bush scrub (CBS)
- Disturbed/Developed (DH-DEV)
- Non-Native Grassland and Forbes (NNGF)

Proposed Transmission Line

- Preferred Route, Aboveground
- Route Options 1-6, Aboveground
- SCE Whirlwind Substation
- Project Survey Area

KEY MAP



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NOTE(S)

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REFERENCE(S)

1. CADFW - VEGETATION CLASSES
2. COORDINATE SYSTEM: NAD 1983 STATEPLANE CALIFORNIA V FIPS 0405 FEET
3. MAP SERVICE LAYER CREDITS: SOURCES: ESRI, HERE, GARMIN, INTERMAP, INCREMENT P CORP., GEBCO, USGS, FAO, NPS, NRCAN, GEOBASE, IGN, KADASTER NL, ORDNANCE SURVEY, ESRI JAPAN, METI, ESRI CHINA (HONG KONG), (C) OPENSTREETMAP CONTRIBUTORS, AND THE GIS USER COMMUNITY

CLIENT
GEM A-CAES LLC

CONSULTANT
wsp

PROJECT
WILLOW ROCK ENERGY STORAGE CENTER
SUPPLEMENTAL AFC

YYYY-MM-DD	2024-02-28
DESIGNED	MK
PREPARED	MK
REVIEWED	SC
APPROVED	SH

TITLE
VEGETATION MAP
MAP BOOK PAGE 16 OF 16

PROJECT NO.	PHASE	REV.	FIGURE
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Table 5.2-6: Acreage of Land Use and Vegetation Communities

Vegetation Community / Land Use	Acreage
Allscale Scrub	567.50
Cheesebush Scrub	114.49
Creosote Bush — White Bursage Scrub	1,364.21
Creosote Bush Scrub	149.81
Disturbed/Developed	1,058.75
Joshua Tree Woodland	74.66
Needleleaf Rabbitbrush Scrub	77.08
Non-Native Grassland and Forbs	151.49
Rubber Rabbitbrush Scrub	119.35
Tamarisk Thickets	2.21
White Bursage Scrub	79.69
Total	3,759.25

Source: WSP 2023

Allscale Scrub

A total of 567.50 acres of Allscale Scrub habitat was mapped in the Project Area. Allscale Scrub is characterized by allscale (*Atriplex polycarpa*) as the dominant species. This vegetation community also contains four-wing saltbush (*Atriplex canescens*), shadscale saltbush (*Atriplex confertifolia*), and creosote bush with subdominant species that include shortpod mustard (*Hirschfeldia incana*), dove weed (*Croton setiger*), Nevada ephedra (*Ephedra nevadensis*) and Joshua tree. Shrubs are generally less than 3 meters tall, and understory consists of seasonal annuals. Total shrub cover varies throughout the Project Area, with increased cover corresponding with greater dominance by creosote bush. This vegetation community is not sensitive under the CDFW sensitivity ranking system.

Cheesebush Scrub

A total of 114.49 acres of Cheesebush Scrub habitat was mapped in the Study Area. Cheesebush (*Ambrosia salsola*) is the dominant species and is characterized as a low-growing, small, grayish-green leafed shrub commonly found in desert areas. Other species identified in this vegetation community include California matchweed (*Gutierrezia californica*) and rubber rabbitbrush (*Ericameria nauseosa*). Additionally, this vegetation community exhibits low overall cover and large gaps between shrubs. Shrubs are generally less than 2 meters tall, and understory is generally sparse, but when present typically consists of a variety of seasonal annuals. This vegetation community is not sensitive under the CDFW sensitivity ranking system.

Creosote Bush-White Bursage Series

A total of 1,364.21 acres of Creosote-White Bursage Series habitat was mapped in the Study Area. Creosote-White Bursage Series habitat is dominated by a combination of creosote bush (*Larrea tridentata*) and white bursage (*Ambrosia dumosa*) with subdominant species that include Cooper's goldenbush (*Ericameria cooperi*), Joshua tree, and Nevada ephedra. This is the most dominant vegetation community within the WRESC Site. Shrubs are generally less than 3 meters tall, and understory consists of seasonal annuals. This vegetation community is not sensitive under the CDFW sensitivity ranking system.

Creosote Bush Scrub

A total of 149.81 acres of creosote bush scrub habitat was mapped within the Study Area. Similar to Creosote-White Bursage Series, however, this habitat is entirely dominated by a single species of creosote bush. Co-dominant species are similar to those found in Creosote Bush-White Bursage Series but vary throughout the

habitat and are not present in sufficient numbers to be considered a co-dominant vegetation community. Shrubs are generally less than 3 meters tall, and the understory is open to intermittent with seasonal annuals or perennial grasses. This vegetation community is not sensitive under the CDFW sensitivity ranking system.

Disturbed/Developed

A total of 1,058.75 acres of Disturbed/Developed habitat was mapped in the Study Area. Developed/Disturbed habitat within the WRESC Site is composed of areas of bare ground either sparsely or moderately vegetated with a mix of mostly non-native, invasive, annual, weedy plant species with marginal cover of native species; developed areas consist of buildings, residences, and their associated parcel footprints; and existing solar array facilities. Dominant plant species observed in this habitat type included shortpod mustard, brome grasses (*Bromus* spp.), Russian thistle (*Salsola tragus*), bristly fiddleneck (*Amsinckia tessellata*), anglestem buckwheat (*Eriogonum angulosum*), and dove weed. Additional disturbed habitat was mapped as large areas of bare ground supporting little to no vegetation that indicate historical or current anthropogenic use (i.e., dirt roads, staging areas, vacant lots, and margins of developed areas). These areas have little to no habitat value to native plant and wildlife species. This vegetation community is not sensitive under the CDFW sensitivity ranking system.

Joshua Tree Woodland

A total of 74.66 acres of Joshua Tree Woodland habitat was mapped in the Study Area. Joshua Tree Woodland is characterized by a dense stand of Joshua trees with little to no other dominant or co-dominant species. Although individual Joshua trees occur throughout the Project Area, this habitat is characterized by an exceptionally dense stand of trees. Trees are generally well spaced and less than 14 meters tall. The understory is generally open to intermittent with perennial grasses and seasonal annuals. This vegetation community is listed as a S3 under the CDFW sensitivity ranking system.

Needleleaf Rabbitbrush Scrub

A total of 77.08 acres of Needleleaf Rabbitbrush Scrub was mapped in the Study Area. This vegetation community is dominated by needleleaf rabbitbrush (*Ericameria teretifolia*). Subdominant species include silver cholla (*Cylindropuntia acanthocarpa*), Nevada ephedra, California buckwheat (*Eriogonum fasciculatum*), and Dorr's sage (*Salvia dorrii*). Typical canopy is less than 2 meters tall and is generally sparsely covered. Shrubs are generally less than 2 meters tall, and understory is open to intermittent and grassy. This vegetation community is not sensitive under the CDFW sensitivity ranking system.

Non-Native Grassland and Forbs

Although not a classic vegetation community under the vegetation classification system, this vegetation community consists of non-native grasses and forbs and is usually the result of a recent disturbance that has just started a natural vegetation process. A total of 151.49 acres of non-native grassland and forbs habitat was mapped within the Study Area. Emergent shrubs may be present but are usually sparse and do not have enough individuals to be characterized as a separate vegetation community. This vegetation community is not sensitive under the CDFW sensitivity ranking system.

Rubber Rabbitbrush Scrub

A total of 119.35 acres of Rubber Rabbitbrush Scrub habitat was mapped in the Study Area. Rubber rabbitbrush is dominant or co-dominant in the shrub canopy with big sagebrush (*Artemisia tridentata*), Nevada ephedra, and California buckwheat, scalebroom (*Lepidospartum squamatum*). Emergent trees may be present at low cover, including western Joshua tree. Shrubs are generally less than 3 meters tall, and the understory is sparse and grassy. This vegetation community is listed as an S5 under the CDFW sensitivity ranking system.

Tamarisk Thickets

A total of 2.21 acres of Tamarisk Thicket habitat was mapped in the Study Area. Tamarisk (*Tamarix ramosissima*) is dominant or co-dominant species and may occur along with native species such as cottonwood (*Populus fremontii*) or willow (*Salix* spp.). Shrubs are generally less than 8 meters tall, and the understory is sparse. This vegetation community is commonly associated with arroyo margins, lake margins, ditches, washes, rivers, and

often artificially created watercourses. This vegetation community is not sensitive under the CDFW sensitivity ranking system.

White Bursage Scrub

A total of 79.69 acres of White Bursage Scrub was mapped in the Study Area. White bursage is the dominant or co-dominant species and may also include four-wing saltbush (*Atriplex canescens*), silver cholla, desert brittlebush (*Encelia farinosa*), Nevada ephedra, and creosote bush. Shrubs are generally less than 1 meter tall, and understory consists of seasonal annuals. This vegetation community is listed as an S5 under the CDFW sensitivity ranking system.

5.2.1.7 Sensitive and Special-Status Species

The Applicant's biologist evaluated the regional special-status plant and wildlife species list against observed conditions. This list includes regulatory status, habitat requirements, occurrence determination, and a rationale for the occurrence determination. The potential for each special-status species to occur in the Project Area was evaluated according to the following criteria:

Presumed Absent. Habitat on and adjacent to the site is clearly unsuitable for the species requirements (foraging, breeding, cover, substrate, elevation, hydrology, plant community, site history, disturbance regime), and species would have been identifiable onsite if present (e.g., oak trees). Protocol surveys (if conducted) did not detect species. There are no recorded occurrences of this species within 3 miles of the Project Area.

Low. Few of the habitat components meeting the species requirements are present, and/or the majority of habitat on and adjacent to the site is unsuitable or of very poor quality. This species may have had a previously recorded occurrence within 3 miles of the Project Area. Due to a lack of suitable habitat, these species are not likely to be found in the Project Area.

Moderate. Some of the habitat components meeting the species requirements are present, and/or only some of the habitat on or adjacent to the Project Area is unsuitable. This species has been observed within 3 miles of the Project Area. The species has a moderate probability of being found on the Project Area.

High. All habitat components that meet the species requirements are present, and/or most of the habitat on or adjacent to the Project Area is highly suitable. This species has been observed within 3 miles of the Project Area. The species has a high probability of being found in the Project Area.

Present. The species was previously recorded within the Project Area or was observed onsite or within the Project Area during recent surveys.

Sensitive and Special-status Plant Species

Surveys for sensitive plant species were conducted in 2023, during a super-bloom event. Approximately 46 plant species were identified during the literature review for further analysis (see Table 8 in Willow Rock Energy Storage Project Biological Resources Assessment, WSP 2024a). The Applicant's biologist evaluated the special-status plant species for their potential to occur within the Project Area. The following special-status species were identified by CNDDB and CNPSEI within a 10-mile radius or the Project Area (see Appendix 5.2A):

- Mt. Pinos onion (*Allium howellii var. clokeyi*)
- Horn's milk-vetch (*Astragalus hornii var. hornii*)
- Lancaster milk-vetch *(Astragalus preussii var. laxiflorus*)
- California ayenia (*Ayenia compacta*)
- Slender mariposa lily (*Calochortus clavatus var. gracilis*)
- Palmer's mariposa lily (*Calochortus palmeri var. palmeri*)
- Alkali mariposa lily (*Calochortus striatus*)
- Peirson's morning-glory (*Calystegia peirsonii*)
- White pygmy-poppy (*Canbya candida*)
- San Fernando Valley spineflower (*Chorizanthe parryi var. fernandina*)
- Parry's spineflower (*Chorizanthe parryi var. parryi*)
- Mojave spineflower (*Chorizanthe spinosa*)
- Clokey's cryptantha (*Cryptantha clokeyi*)
- desert cymopterus (*Cymopterus deserticola*)
- Recurved larkspur (*Delphinium recurvatum*)

- Calico monkeyflower (*Diplacus pictus*)
- Rosamond eriastrum (*Eriastrum rosamondense*)
- Few-flowered eriastrum (*Eriastrum sparsiflorum*)
- Tracy's eriastrum (*Eriastrum tracyi*)
- Barstow woolly sunflower (*Eriophyllum mohavense*)
- Tejon poppy (*Eschscholzia lemmonii ssp. kernensis*)
- Red Rock poppy (*Eschscholzia minutiflora ssp. twisselmannli*)
- Inland gilia (*Gilia interior*)
- Golden goodmania (*Goodmania luteola*)
- Coulter's goldfields (*Lasthenia glabrata ssp. coulteri*)
- Pale-yellow layia (*Layia heterotricha*)
- Madera leptosiphon (*Leptosiphon serrulatus*)
- Sagebrush loeflingia (*Loeflingia squarrosa var. artemisiarum*)
- Mojave monardella (*Monardella exilis*)
- Southern Sierra monardella (*Monardella linoides ssp. anemonoides*)
- Tehachapi monardella (*Monardella linoides ssp. blonga*)
- Aparejo grass (*Muhlenbergia utilis*)
- Spreading navarretia (*Navarretia fossalis*) (Federally Listed Threatened)
- Baja navarretia (*Navarretia peninsularis*)
- Robbins' nemacladus (*Nemacladus secundiflorus var. robbinsii*)
- Hort-joint beavertail *(Opuntia basilaris var. brachyclada*)
- Bakersfield cactus (*Opuntia basalaris var. treleasei*) (Federally Listed endangered)
- Adobe yampah (*Perideridia pringlei*)
- California alkali grass (*Puccinellia simplex*)
- Latimer's woodland-gilia (*Saltugilia latimeri*)
- Cove's cassia (*Senna covesii*)
- Salt Spring checkerbloom (*Sidalcea neomexicana*)
- Southern jewelflower (*Streptanthus campestris*)
- Greata's aster (*Symphyotrichum greatae*)
- Lemmon's syntrichopappus (*Syntrichopappus lemmonii*)
- Western Joshua tree (*Yucca brevifolia*) (Candidate State-listed Endangered) (WSP 2024a)

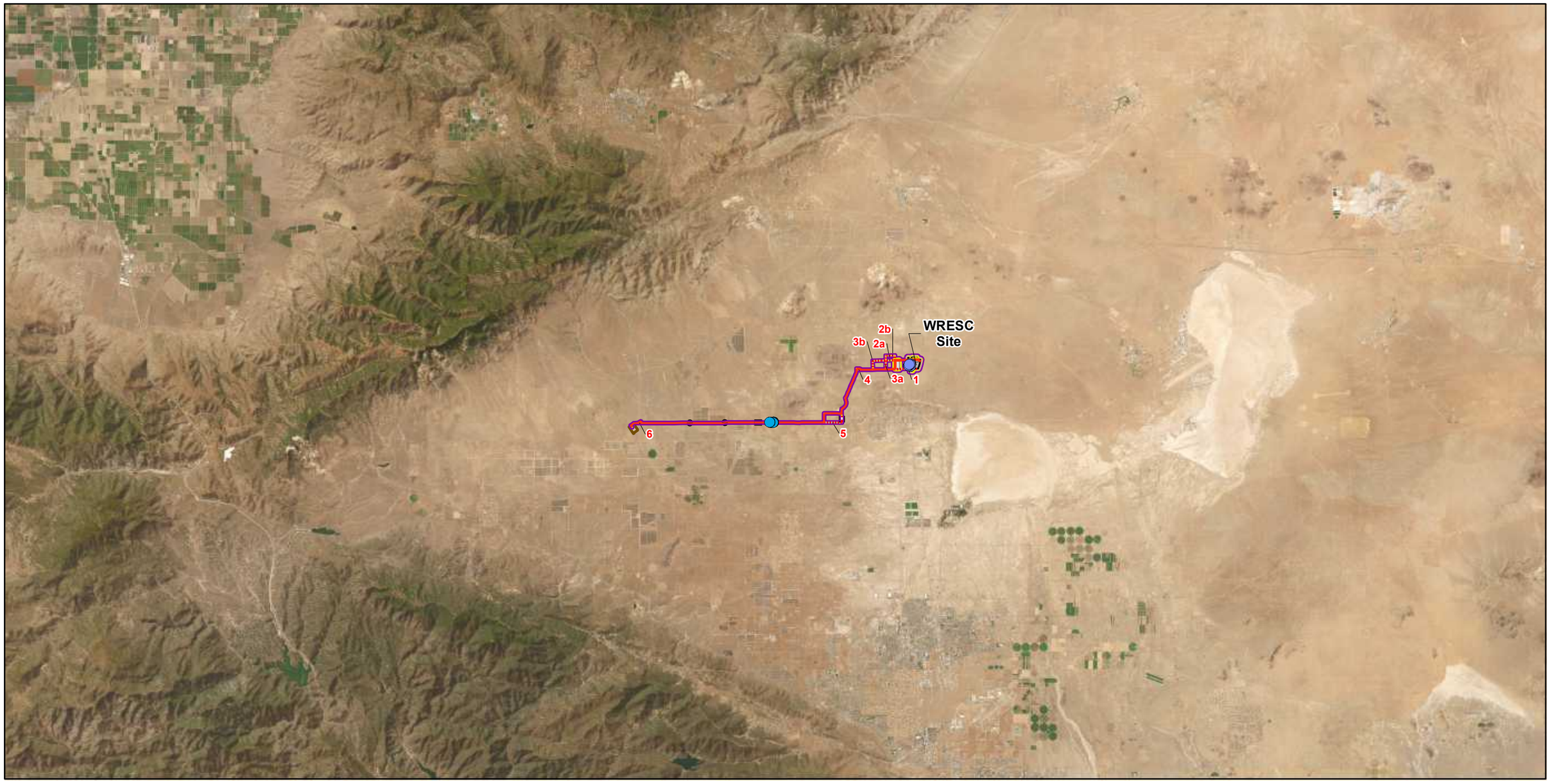
Thirty-six of these sensitive plant species do not have suitable habitat within the Project Area or the Project Area is outside of their geographic and/or elevational range and are not discussed further in the document (including two federally and state-listed endangered species, Bakersfield cactus and one federally listed threatened species, spreading navarretia). Of the 10 remaining plants, only one—western Joshua tree—has state protection under CESA. The remaining nine species are registered with the CNPS but do not have any state or federal protection under federal ESA or CESA. Eight plant species were identified as having some potential to occur: including Lancaster milk-vetch, white pygmy-poppy, Mojave spineflower, Clokey's cryptantha, desert cymopterus, recurved larkspur, Barstow woolly sunflower, and golden goodmania. Plants identified by the CNPS Inventory as 1B or 2 are considered rare under California Environmental Quality Act (CEQA) guidelines.

The Applicant's biologist performed seasonally timed botanical surveys within accessible portions of the Project Area. As discussed in Section 5.2.1.5, due to certain topographic limitations (e.g., steep or treacherous areas where safety was a concern) or private property issues, not all areas could be observed directly. Specific methods used during biological surveys are also discussed in Section 5.2.1.5.

Of the 46 special-status species identified within a 10-mile radius of the Project Area (Appendix 5.2A), the only special-status plant species observed in the WRESC Site were western Joshua tree, alkali mariposa lily, sagebrush loeflingia, and Mohave monardella. These species are discussed below. All other assessed special-status plant species were presumed absent based on the criteria in the definitions set forth above in Section 5.2.1.7. **Figure 5.2-6** maps all documented occurrences of special-status plant species identified during biological surveys.

Western Joshua tree is a state candidate species that occurs in well-drained soils within hot, dry sites on flats, mesas, bajadas, and gentle slopes. This species persists in areas with cold winters, hot summers, and nominal precipitation. Joshua trees provide cover for a variety of wildlife and nesting substrate for numerous avian species, including special-status species such as loggerhead shrike (*Lanius ludovicianus*) and Swainson's hawk. Primary threats to Joshua trees include climate change and habitat loss due to development. This species was found throughout the Project Area, primarily associated with Creosote-White Bursage Scrub, Saltbush Scrub, and California Matchweed-Rubber Rabbitbrush vegetation communities. The Western Joshua Tree Census identified 2,718 individual western Joshua trees. Due to some inaccessible private property, not all western Joshua trees were mapped.

Alkali mariposa lily is listed as CNPS list 1B.2 but is not a federal or state-listed threatened or endangered species. It is commonly found in chaparral, chenopod scrub, meadows, seeps, and Mojavean desert scrub in alkaline/mesic soils. Suitable Mojavean desert scrub is present within the WRESC Site. This plant occurs within an elevation range between 70 meters (230 feet) and 1,959 meters (6,430 feet) above mean sea level. This species blooms between April and June. A small population of approximately 20 individual alkali mariposa lilies was identified along Rosamond Boulevard at 95th Street. This species is considered present only within the gen-tie line alignment and not within the WRESC Site.



LEGEND

Sensitive Plant Species Common Name
- Alkali Mariposa Lily
- Sagebrush loeflingia

Proposed Transmission Line
- Preferred Route, Aboveground
- Preferred Route, Underground
- Route Options 1-6, Aboveground
- Route Options 1-6, Underground

Project Components
- WRESC Site
- Other Project Parcels
- Project Boundary
- Project Survey Area
- Portions of the Survey Area Not Surveyed
- SCE Whirlwind Substation

KEY MAP

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NOTE(S)
1. THE SURVEY AREA IS CALCULATED BASED ON A 500 FT BUFFER AROUND TRANSMISSION LINES AND A 1000 FT BUFFER AROUND PROJECT PARCELS.

REFERENCE(S)
1. WSP 2022, 2023 - SPECIAL STATUS PLANT OBSERVATION DATA
2. COORDINATE SYSTEM: NAD 1983 STATEPLANE CALIFORNIA V FIPS 0405 FEET
3. MAP SERVICE LAYER CREDITS: SOURCES: ESRI, HERE, GARMIN, INTERMAP, INCREMENT P CORP., GEBCO, USGS, FAO, NPS, NRCAN, GEOBASE, IGN, KADASTER NL, ORDNANCE SURVEY, ESRI JAPAN, METI, ESRI CHINA (HONG KONG), (C) OPENSTREETMAP CONTRIBUTORS, AND THE GIS USER COMMUNITY

CLIENT
GEM A-CAES LLC

PROJECT
WILLOW ROCK ENERGY STORAGE CENTER
SUPPLEMENTAL AFC

CONSULTANT
wsp

YYYY-MM-DD	2024-02-28
DESIGNED	MK
PREPARED	MK
REVIEWED	SC
APPROVED	VG/LL

TITLE
OBSERVED SPECIAL-STATUS SPECIES - PLANTS

PROJECT NO.	PHASE	REV.	FIGURE
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Sagebrush loeflingia is listed as CNPS list 2B.2 but is not a federally or state-listed threatened or endangered species. It is commonly found in sandy flats and dunes, sandy areas around clay slicks in Great Basin, Sonoran, and Mojave desert scrub. Suitable sandy areas in Mojave desert scrub occur within the WRESC Site. This species occurs within an elevation range between 700 meters (2,300 feet) and 1,615 meters (5,300 feet). It blooms between April and May. A small population of approximately 20 individual sagebrush loeflingia was identified within the western edge of the P1 additional workspace area north of Dawn Road between two parallel unnamed dirt roads approximately 1,000 feet east of SR 14. This species is considered present within portions of the additional workspace but is not within the WRESC Site or gen-tie alignment.

Mojave monardella is listed as CNPS list 4.2 but is not a federal or state-listed threatened or endangered species. This species is commonly found on sandy soils in chenopod scrub, Great Basin scrub, Joshua tree "woodland," lower montane coniferous forest, Mojavean desert scrub, pinyon, and juniper woodland. This species occurs within an elevation range between 600 meters (1,968 feet) and 2,050 meters (6,725 feet). It blooms between April and September. Suitable chenopod scrub, Joshua tree woodland, and Mojavean desert scrub habitat occur within the Project Area. This species was observed scattered throughout the WRESC Site within suitable soils. It was not observed along the gen-tie alignment. It is considered present within portions of the WRESC Site.

Sensitive or Special-Status Wildlife Species Present within the Project Site

A comprehensive list of special-status species that the CNDDB identified within a 10-mile radius of the WRESC Site is located in Appendix 5.2A. CNDDB field survey forms are provided in Appendix 5.2D. The following wildlife species characterized as special-status potentially occur within the Study Area:

- Crotch's bumble bee (*Bombus crotchii*) (Candidate State-listed Endangered)
- Vernal pool fairy shrimp (*Branchinecta lynchi*) (Federally Listed Threatened)
- Comstock's blue butterfly (*Euphilotes glaucon comstocki*)
- Tehachapi Mountain silverspot butterfly (*Speyeria egleis tehachapina*)
- Whitefir shoulderband (*Helminthoglypta concolor*)
- Soledad shoulderband (*Helminthoglypta fontiphila*)
- Mohave shoulderband (*Helminthoglypta greggi*)
- Yellow-blotched Ensatina (*Ensatina eschscholtzii croceater*)
- Foothill yellow-legged frog – south coast distinct population segment (*Rana boylii* pop. 6) (Federally Listed Endangered, State-listed Endangered)
- Northern California legless lizard (*Anniella pulchra*)
- Southern rubber boa (*Charina umbratica*) (State-listed Threatened)
- Western pond turtle (*Emys marmorata*) (Federally Proposed Threatened)
- Desert tortoise (*Gopherus agassizii*) (Federally Listed Threatened, State-listed Threatened)
- Coast horned lizard (*Phrynosoma blainvillii*)
- Tri-colored blackbird (*Agelaius tricolor*) (State-listed Threatened)
- Golden eagle (*Aquila chrysaetos*) (State Fully Protected)
- Burrowing owl (*Athene cunicularia*)
- Short-eared owl (*Asio flammeus*)
- Long-eared owl (*Asio otus*)
- Ferruginous hawk (*Buteo regalis*)
- Swainson's hawk (*Buteo swainsoni*) (State-listed Endangered)
- Western snowy plover (*Charadrius alexandrines nivosus*) (Federally Listed Threatened)
- Mountain plover (*Charadrius montanus*)
- Northern harrier (*Circus hudsonius*)
- California horned lark (*Eremophila alpestris actia*)
- Merlin *(Falco columbarius*)
- Prairie falcon (*Falco mexicanus*)
- California condor (*Gymnogyps californianus*) (Federally Listed Endangered, State-listed Endangered)
- Bald eagle (*Haliaeetus leucocephalus*) (State Fully Protected)
- Loggerhead shrike (*Lanius ludovicianus*)
- White-faced ibis (*Plegadis chihi*)
- LeConte's thrasher (*Toxostoma lecontei*)

- Least Bell's vireo (*Vireo bellii pusillus*) (Federally Listed Endangered, State-listed Endangered)
- Townsend's big-eared bat (*Corynorhinus townsendii*)
- Hoary bat *(Lasiurus cinereus*)
- Lodgepole chipmunk (*Neotamias speciosus speciosus*)
- Tulare grasshopper mouse (*Onychomys torridus tularensis*)
- San Joaquin pocket mouse *(Perognathus inornatus*)
- Tehachapi pocket mouse (*Perognathus alticola inexpectatus*)
- American badger (*Taxidea taxus*)
- Mohave ground squirrel (*Xerospermophilus mohavensis*) (State-listed Threatened) (WSP 2024a)

Based on the analysis of the potential for sensitive species to occur within the Project Area, the following species were identified as not having any potential to occur, based on a lack of habitat and distance from known recorded occurrences, and are not discussed further in this document: vernal pool fairy shrimp, Comstock's blue butterfly, Tehachapi Mountain silverspot butterfly, whitefur shoulderband, Soledad shoulderband, Mohave shoulderband, yellow-blotched Ensatina, foothill yellow-legged frog, southern rubber boa, western pond turtle, tri-colored blackbird, western snowy plover, mountain plover, bald eagle, least Bell's vireo, hoary bat, lodgepole chipmunk, Tulare grasshopper mouse, and Tehachapi pocket mouse. Four sensitive species, described below, were directly observed within the Project Area and immediate vicinity and are considered present within the Project Area: Crotch's bumble bee, Swainson's hawk, loggerhead shrike, and LeConte's thrasher. Two additional species were not directly observed, but evidence of these species occurs within the Project Area and are assumed to be present including desert kit fox and American Badger.

Crotch's bumble bee A single Crotch's bumble bee was detected during the first protocol survey. One queen Crotch's bumble bee was identified within the north P2 additional workspace. The queen was observed foraging on phacelia flowers and slowly moving from one clump of flowers to the next, making identification easy. This species was only observed within the phacelia patches, and only foraging behavior was observed. Although no hives or worker bees were identified, this species is considered present within the Project Area, but no hive has been established. With implementation of avoidance and minimization measures, direct impacts to this species are not anticipated.

Swainson's hawk Trees suitable for Swainson's hawk nests were found generally throughout the Study Area. Each tree was evaluated for evidence of previous nest activity and/or potential use in the future. The focused Swainson's hawk surveys resulted in mapping a total of 78 suitable nest sites within the Study Area (both active and inactive nests). Of the 78 total suitable nest sites observed within the 0.5-mile buffer surrounding the Project Area (Study Area), only one was occupied by a Swainson's hawk. Of the remaining suitable potential nest trees, 12 of the nests were not in use, one nest was occupied by a house finch, and the remaining 65 were occupied by competitors (namely, red-tailed hawks [*Buteo jamaicensis*] [two] and common ravens [*Corvus corax*] [63]). The competitors' nests were observed in trees, distribution poles, lattice towers, and other structures within the Study Area. One active raven nest was identified within the WRESC Site. A single raven nest was also identified within the central portion of the additional workspace area west of SR 14. Sixteen additional nests were observed within the gen-tie alignment (one house finch nest and 13 raven nests).

A single female Swainson's hawk was observed during protocol surveys in a medium-sized western Joshua tree. It was recorded offsite, 1.5 miles north of Rosamond Boulevard between 120th and 125th Street West. This female was observed sitting on a nest and was monitored throughout the protocol survey until nest completion. The nesting attempt was successful, and two hatchlings fledged the nest. Two other incidental observations of Swainson's hawk were recorded along portions of the gen-tie line alignment. One was just south of an existing water tank on a rocky outcrop north of Dawn Road and between 20th and 30th Street West, and the second was south of Rosamond Boulevard and east of 140th Street West. It is possible that these sightings were of the same nesting individual identified as present within the Study Area, as there were no other signs of nesting activity or behavior in the surrounding area.

The Swainson's hawk used a mature Joshua tree as nesting substrate and native open creosote scrub with Joshua trees intermixed as immediately adjacent foraging habitat. For these reasons, Swainson's hawk is considered to be present within the Project Area, but only for foraging purposes. Project-related impacts within

0.5 miles of the Project Area include approximately 50 gen-tie poles totalling less than 0.1 acres. With implementation of avoidance and minimization measures, direct impacts to this species are not anticipated during construction of the WRESC.

Results from surveys are summarized in **Table 5.2-7**.

Table 5.2-7: Focused Swainson's Hawk Survey Results

Observation	Total within Study Area	Total Subset Located within Project Site
Active Swainson's Hawk Pair and Nesting Territory	1	0
Swainson's Hawk-Suitable Potential Nesting Trees	78	23
Active Competitor Nests	65	20
Transient/Dispersing Individual Swainson's Hawk	2	0

Source: WSP 2024b

Loggerhead shrike is designated as a state SSC and is federally protected under the MBTA. This species occurs in a variety of open habitats with scattered shrubs and availability of perches, including Joshua tree habitats, where high densities of this species are known to thrive. Nests are built in densely foliaged shrubs or trees, typically no higher than 50 feet (15 meters) above the ground. While no nests or sign of nesting were detected on the WRESC Site, numerous loggerhead shrikes were observed foraging throughout the Project Area and were generally seen during each of the 2023 protocol-level surveys. Due to the species' presence in suitable, connected habitat, the loggerhead shrike is considered to be present within the Project Area. With implementation of avoidance and minimization measures, direct impacts to this species are not anticipated during construction of the Project.

LeConte's thrasher is designated as a state SSC and is federally protected under the MBTA. This species occurs in open desert wash and desert scrub, as well as open Joshua tree habitats. Its preferred habitat includes areas with scattered shrubs that are used for cover and large, open areas that allow for visibility and ease of foraging. LeConte's thrashers nest in dense, spiny shrubs that include saltbush. While no nests were observed within the Project Area, multiple detections of this species foraging within the Project Area were found during the 2023 survey. Observation occurred within native saltbush scrub and creosote-white bursage series habitat, including in and adjacent to the gen-tie line alignment. Due to the presence of this species' suitable habitat within the Project Area, the LeConte's thrasher is considered present. With implementation of avoidance and minimization measures, direct impacts to this species are not anticipated during construction of the Project.

American badger is state-listed as an SSC. This species can be found in grasslands, parklands, rangelands, agricultural areas, and generally treeless areas with loose soils and ample (rodent) prey. It may also be found in forests, meadows, marshes, brushy areas, deserts, and montane meadows. A known recorded occurrence of this species was identified within 1 mile of the Project Area. Suitable habitat occurs throughout the Study Area, and large burrows suitable for this species were documented during the 2023 surveys (WSP 2023). American badger is a wide-ranging species and may occupy portions of the Study Area at any time, and therefore this species is assumed to be present. With implementation of avoidance and minimization measures, direct impacts to this species are not anticipated during construction of the WRESC.

Desert Kit Fox. The desert kit fox has no official federal or state protection but is considered a sensitive species by the CDFW. This species typically occurs in open desert habitat ranging from creosote bush scrub to desert sand dunes. Although there are no previous recorded occurrences in the CDFW's CNDDB, this species is known to occur throughout the Mojave Desert and is separated by the Tehachapi mountain range from the federally listed endangered and state-listed threatened sub-species San Joaquin kit fox (*Vulpes macrotis mutica*). Habitat loss is becoming a significant issue for the desert kit fox sub-species, as it was ultimately the result of listing the San Joaquin kit fox sub-species as a federally endangered and state threatened species. Based on survey results for other sensitive species, suitable kit fox size burrows and scat were identified within the WRESC Site, and therefore this species is assumed to be present. With implementation of avoidance and minimization measures, direct impacts to this species are not anticipated during construction.

Special-Status Wildlife Species with Potential to Occur within the Project Site

Each species identified as potentially occurring within the Project Area based on the preliminary biological surveys is described below. The Applicant's biologist evaluated the special-status wildlife species for their potential to occur within the Project Area and associated Study Area. Of these, desert tortoise, burrowing owl, merlin, prairie falcon, and Townsend's big-eared bat have a high potential to occur. Golden eagle, long-eared owl, California horned lark, San Joaquin pocket mouse, and Mohave ground squirrel—have moderate potential of being found in or near the Project Area. The remaining species that were evaluated have low probability to occur due to limited habitat in the area or are presumed absent due to no suitable habitat in the area; these species are northern legless lizard, coast horned lizard, short-eared owl, ferruginous hawk, northern harrier, California condor, and white-faced ibis. It is highly unlikely that these species would occur within the Project Area, and they are not discussed further in this document. **Figure 5.2-7** maps all occurrences of wildlife special-status species identified during the biological survey. The following is a description of those special-status species that have a moderate to high potential to occur within the Project Area.

LEGEND

Common Name

- Black-tailed Jackrabbit
- Crotch's bumblebee
- Loggerhead Shrike
- Swainson's hawk

Proposed Transmission Line

- Preferred Route, Aboveground
- Preferred Route, Underground
- Route Options 1-6, Aboveground
- Route Options 1-6, Underground

Project Components

- WRESC Site
- Other Project Parcels
- Project Boundary
- Project Survey Area
- Portions of the Survey Area Not Surveyed
- SCE Whirlwind Substation

KEY MAP

0 5 10

1:3,000,000 MILES

NOTE(S)

1. THE SURVEY AREA IS CALCULATED BASED ON A 500 FT BUFFER AROUND TRANSMISSION LINES AND A 1000 FT BUFFER AROUND PROJECT PARCELS.

REFERENCE(S)

1. WSP 2022, 2023 - SPECIAL STATUS PLANT OBSERVATION DATA
2. COORDINATE SYSTEM: NAD 1983 STATEPLANE CALIFORNIA V FIPS 0405 FEET
3. MAP SERVICE LAYER CREDITS: SOURCES: ESRI, HERE, GARMIN, INTERMAP, INCREMENT P CORP., GEBCO, USGS, FAO, NPS, NRCAN, GEOBASE, IGN, KADASTER NL, ORDNANCE SURVEY, ESRI JAPAN, METI, ESRI CHINA (HONG KONG), (C) OPENSTREETMAP CONTRIBUTORS, AND THE GIS USER COMMUNITY

CLIENT
GEM A-CAES LLC

CONSULTANT
wsp

PROJECT
WILLOW ROCK ENERGY STORAGE CENTER
SUPPLEMENTAL AFC

YYYY-MM-DD	2024-02-28
DESIGNED	MK
PREPARED	MK
REVIEWED	SC
APPROVED	VG/LL

TITLE
OBSERVED SPECIAL-STATUS SPECIES - WILDLIFE

PROJECT NO.	PHASE	REV.	FIGURE
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IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B

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HIGH POTENIAL

Desert tortoise. No live desert tortoises or any definitive desert tortoise sign was observed within the Project Area or within the 500-foot buffer area during the survey. No desert tortoise burrows, scat, carcasses, tracks, drinking depressions, or courtship rings were observed. The Project Area is located at the far western edge of the desert tortoise range. Although we cannot completely rule out the possibility of tortoise entering the Project Area in the future, the fence around Edwards Airforce Base and railroad tracks to the east and SR 14 to the west, make it nearly impossible for desert tortoise to enter the Project Area, Therefore, desert tortoise is considered to be absent from the Project Area and is not discussed further in this document. With implementation of avoidance and minimization measures, direct impacts to this species are not anticipated during construction. Indirect impacts to desert tortoise that may occur within the vicinity of the Project Area will be mitigated through the implementation of a Raven Management Plan.

Burrowing owl is a state SSC and is also federally protected under the MBTA. This species occurs in a variety of habitats, including agricultural land, fallow fields, and sparsely vegetated areas that allow for visibility of both prey and predators. Burrowing owls feed on arthropods and small mammals, lizards, amphibians, and birds. Mammal burrows or natural cavities are required for nesting and for shelter during variable weather conditions.

During the 2023 protocol surveys for burrowing owl, a total of 25 unoccupied suitable burrowing owl burrows were identified during the burrow survey between April 18 and April 27, 2023 (WSP 2024d). Five burrows were within the WRESC parcel (431-022-13) along Dawn Road (two were located east of Sierra Highway), as well as parcel 431-022-11 (associated with the P1 additional work area, observed with binoculars as they occur along the eastern edge of the property). The focused burrowing owl surveys identified an additional seven suitable burrows within the 500-foot buffer around the WRESC Site. Four burrows were identified within the additional workspace areas west of SR 14 within parcel (431-022-08), with an additional five burrows within the 500-foot buffer area. Only a single suitable burrowing owl burrow was identified within the gen-tie line alignment, along Rosamond Boulevard between 82nd Street and 85th Street (WSP 2024d). None of the documented suitable burrowing owl burrows contained any previous or recent burrowing owl sign (i.e., pellets and/or whitewash).

During the protocol-level surveys, no burrowing owls were identified within the Study Area, which included the Project Area plus a 500-foot (152-meter) buffer. Therefore, this species is considered absent from the Project Area.

However, a single incidental observation of burrowing owl was observed within 0.5 miles (805 meters) southeast of the Project Area. Due to the species' presence in suitable habitat within the vicinity of the Project Area and availability of suitable burrows within the Project site, there is potential for burrowing owls to forage and/or nest on and/or adjacent to the Project Area at any time in the future. With implementation of avoidance and minimization measures, direct impacts to this species are not anticipated during construction of the WRESC Project and associated gen-tie line.

Merlin is federally protected under the MBTA. This species winters in open country, shrubland, forests, parks, grassland, and prairies. It breeds in northern Canada and Alaska. Although this species is not likely to occur within the Project Area in the spring and summer, there is suitable wintering habitat within the Project Area. This species has a high potential to occur within the Project Area, but only during winter months. With implementation of avoidance and minimization measures, direct impacts to this species are not anticipated during construction.

Prairie falcon is federally protected under the MBTA and occurs in desert scrub, rangeland, grasslands, savannahs, and agricultural land. This species forages in open terrain and usually nests on sheltered cliff ledges. It may utilize old raven or eagle stick nests on cliffs, bluffs, or rock outcrops for nesting. The species was previously observed within the vicinity of the Project Area in 2021 perched on telephone poles and flying overhead. Due to a lack of suitable nesting habitat within the Study Area, there is no potential for prairie falcons to nest in the Study Area. However, the species is considered present and is likely to forage in the general vicinity. With implementation of avoidance and minimization measures, direct impacts to this species are not anticipated during construction of the WRESC.

Townsend's big-eared bat is designated as a state SSC. This species is commonly found in coniferous forests, mixed forests, deserts, native prairies, riparian communities, active agricultural areas, and coastal habitat. It roosts in caves, with population centers occurring in areas dominated by exposed, cavity-forming rock and/or

historic mining districts. Townsend big-eared bats prefer open roosting areas in large rooms and do not tuck themselves into cracks and crevices like many bat species do. There are significant mine areas in the vicinity of the Project Area. However, the Project Area does not contain any suitable roosting areas. This species has a high potential to forage in and around the Project Area but is not likely to roost in the Project Area. With implementation of avoidance and minimization measures, direct impacts to this species are not anticipated during construction of the WRESC.

MODERATE POTENTIAL

Golden eagle is state-listed as an FP species and is also federally protected under the MBTA. This species is commonly found in mountainous/hilly areas, with cliffs and open fields required for habitat. Jackrabbits are the primary food source for golden eagles. The species' potential of occurrence is moderate. Suitable foraging habitat is present throughout the Project Area, but there is no suitable nesting habitat. Potentially suitable nesting habitat consisting of rocky cliff faces occurs west of and outside of the WRESC Site. There is also potential suitable nesting areas associated with the large lattice towers along the existing utility lines. However, no active golden eagle nests were identified during the 2023 surveys. This species was not observed during any of the protocol-level surveys in 2023; therefore, it is considered absent from the Project Area and is not discussed further in this document.

Long-eared owl is currently a state SSC and is also federally protected under the MBTA. This species occurs in riparian habitat, live oak thickets, and dense stands of trees. It utilizes old corvid, hawk, heron, and squirrel nests in trees with a dense canopy. One adult long-eared owl was observed on April 9, 2021 (Blackhawk 2021), within a narrow windrow composed of non-native tamarisk west of the intersection of Rosamond Boulevard and 90th Street West, in the gen-tie line area. Stands of trees offering a dense canopy and unoccupied stick nests suitable for nesting occur irregularly along the southern and eastern portions of the Study Area; however, these trees are associated with residential development. Additionally, the Study Area and surrounding areas support a high number of nest competitors such as common ravens, which may also result in increased rates of predation on long-eared owl young. The potential for long-eared owls to nest within the Study Area is low, given the likelihood of competition for nesting sites and proximity of available nest trees to development. This species has a high potential to forage within the Project Area. With implementation of avoidance and minimization measures, direct impacts to this species are not anticipated during construction of the WRESC.

California horned lark is federally protected under the MBTA. This sub-species is commonly found in coastal and cismontane southern California. It favors open habitats such as recently disked fields, grasslands, playas, disturbed areas, and open desert areas. Since there is some suitable habitat within the Project Area, and this species was not observed during any of the protocol-level surveys, California horned lark is considered to be absent from the Project Area and is not discussed further in the document. With implementation of avoidance and minimization measures, direct impacts to this species are not anticipated during construction.

San Joaquin pocket mouse is designated as imperiled by the CDFW state listing system. There is no other federal or state protection for this species. It occurs in annual grasslands, desert scrub, and Joshua tree woodland. The Project Area is on the eastern edge of the known range of the species. The closest recorded occurrence of this species is 2.5 miles (4 kilometers) west of the Project Area. No San Joaquin pocket mice were observed in the Project Area. Due to the presence of suitable habitat and known records from the vicinity, this species is considered to have a moderate potential to occur on the Project Area. With implementation of avoidance and minimization measures, direct impacts to this species are not anticipated during construction of the WRESC.

Mohave ground squirrel. Based on the survey results, no Mohave ground squirrels were observed or otherwise detected during the protocol survey. Although the Project site is located within the historic range of the species, there have been no recorded occurrences for this species near the Project Area for over 50-years (Leitner 2021). Therefore, this species is considered absent from the Project Area and there is no chance of Mojave ground squirrel moving into the area in the future based on current trends for species occurrence. This species will not be discussed further in the document.

Migratory Bird Treaty Act

All Project-related vegetation removal and initial ground disturbance should avoid the nesting bird season, which is generally from February to September but can vary based on weather conditions. The WRESC's onsite reservoir will be covered, which should reduce the likelihood that onsite water storage will attract migratory birds. Additionally, the WRESC's stack is low in profile (125 feet high) and is not likely to result in significant bird strikes due its distance from bodies of water. The current 230-kV gen-tie line design prevents electrocution and collisions involving raptors and would parallel existing aboveground electrical infrastructure. The Applicant will protect any active migratory bird nests identified during pre-construction surveys against take. With implementation of avoidance and minimization measures, direct impacts related to the MBTA are not anticipated during construction of the WRESC.

Bald and Golden Eagle Protection Act

The golden eagle is a state FP species and a CDFW watchlist species that is also protected by the federal Bald and Golden Eagle Protection Act. The Applicant's biologists determined that the species' potential to occur within the Project Area is moderate. The habitat within the Study Area is suitable for golden eagles to forage; however, no suitable habitat for nesting is present within the WRESC Site. Potentially suitable nesting habitat is present east of the WRESC Site. Birds that forage near the site may attract eagles. The WRESC's stacks will be low in profile (125 feet high) and are not likely to result in significant bird strikes. The gen-tie line is raptor safe and would parallel existing electrical infrastructure. With implementation of avoidance and minimization measures, direct impacts to this species are not anticipated during construction of the WRESC.

Federal Endangered Species Act

Applicants for projects that could result in adverse impacts on any federally listed species are required to mitigate potential impacts in consultation with the USFWS. The WRESC Site supports suitable habitat for federally listed species. The literature review indicated no federal ESA-listed species within the 10-mile radius from the site except for the California condor. However, the Applicant's biologist did not observe any California condors during the biological reconnaissance surveys. The California condor has a low potential for occurrence because there is with limited foraging habitat located approximately 8 miles northwest of the WRESC Site. With implementation of avoidance and minimization measures, direct impacts to this species are not anticipated during construction of the WRESC.

California Endangered Species Act

Species listed under the CESA cannot be taken or harmed, except under a specific incidental take permit. The literature review indicated that the desert tortoise, California condor, Crotch's bumble bee, Swainson's hawk, and Mohave ground squirrel are CESA-listed threatened or endangered species that potentially occur within the Project Area. As noted above, the California condor has a low potential for occurrence, with limited foraging habitat and designated critical habitat located approximately 20 miles west of the WRESC Site. No desert tortoises or Mohave ground squirrels were identified during recent protocol-level surveys. Crotch's bumble bee and Swainson's hawks were recorded within the Project Area and are considered present. With implementation of avoidance and minimization measures, direct impacts to these state-listed species are not anticipated during construction of the WRESC Project, and therefore no formal consultation with CDFW is required.

State Fully Protected Species

FP species may not be taken or possessed at any time, and no licenses or permits may be issued for their take, except for collecting these species for necessary scientific research, relocation of the bird species for the protection of livestock, or if they are a covered species whose conservation and management are provided for in a Natural Community Conservation Plan. The following are the only state-listed FP species identified as potentially occurring species within the Project Area.

Golden eagle. Potential for occurrence is moderate, with suitable foraging habitat, but no suitable nesting habitat, present throughout the Project Area. Suitable nesting habitat occurs east of and outside of the Project Area. With implementation of avoidance and minimization measures, direct impacts to this species are not anticipated during construction of the proposed Project.

California condor. Potential for occurrence is low, with limited foraging habitat located approximately 8 miles northwest of the WRESC Site. With implementation of avoidance and minimization measures, direct impacts to this species are not anticipated during construction of the WRESC.

State Species of Special Concern

The following SSC have been documented within the vicinity of the Project Area, with their respective probabilities of occurrence in parentheses:

Reptiles: Northern legless lizard (low), western pond turtle (absent), coast horned lizard (low).

Birds: burrowing owl (high), short-eared owl (low), long-eared owl (moderate) western snowy plover (absent), mountain plover (absent), northern harrier (low), loggerhead shrike (present), LeConte's thrasher (present).

Mammals: Townsend's big-eared bat (high), Tulare grasshopper mouse (absent), Tehachapi pocket mouse (absent), American badger (present) (WSP 2024a).

With implementation of avoidance and minimization measures, direct impacts to these species are not anticipated during construction of the WRESC.

5.2.2 Environmental Analysis

Potential direct and indirect impacts to biological resources were evaluated to determine the permanent and temporary effects of construction and operation of the WRESC Project. Results from the field surveys, habitat evaluations, and aerial imagery interpretation were evaluated to address the potential for presence of sensitive biological resources within the Project Area are presented in Section 5.2.1, above.

This section identifies the biological resources that may be affected directly or indirectly and may have temporary or permanent impacts. These impact categories are defined as follows:

Direct. CEQA defines direct impacts as those that result from a project and occur at the same time and place. Project-related activities such as alteration, disturbance, or destruction of biological resources are considered a direct impact.

Indirect. CEQA defines indirect impacts as impacts that are caused by a project but do not occur at the same time but rather at different but a reasonably foreseeable future time.

Permanent. While not defined in CEQA, impacts on biological resources are not transitory.

Temporary. While not defined in CEQA, temporary impacts on biological resources are impacts whose effects are reversible.

5.2.2.1 Significance Criteria

Factors used to evaluate the significance of project-related biological resources are set forth in Appendix G of CEQA. Appendix G is a screening tool, not a method for setting thresholds of significance. Appendix G is typically used in the Initial Study phase of the CEQA process, asking a series of questions. The purpose of these questions is to determine whether a project requires an Environmental Impact Report, a Mitigated Negative Declaration, or a Negative Declaration. As the Governor's Office of Planning and Research stated, "Appendix G of the Guidelines lists a variety of potentially significant effects but does not provide a means of judging whether they are indeed significant in a given set of circumstances." The answers to the Appendix G questions are not determinative of whether an impact is significant or less than significant. Nevertheless, the questions presented in CEQA Appendix G are instructive.

Significant biological impacts resulting from the WRESC Project were assessed by the following criteria:

- Have a substantial adverse effect, either directly or through habitat modifications, on any species identified as endangered, threatened, candidate, sensitive, or special-status in local or regional plans, policies, or regulations, or by the CDFW or USFWS.

- Have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, or regulations, or by the CDFW or USFWS.
- Have a substantial adverse effect on federal or state-protected WOTUS (including wetlands), as defined by Sections 404 and 401 of the 1972 Amendments to the Federal Water Pollution Control Act, commonly known as the Clean Water Act, or the Porter-Cologne Water Quality Control Act, either through direct removal, filling, hydrological alteration, or other means.
- Interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory native wildlife corridors or impede the use of wildlife nursery sites.
- Conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance.
- Conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional, or state habitat conservation plan.

CEQA Section 15380 provides that a plant or animal species may be treated as “rare or endangered” even if the species is not on one of the official lists if, for example, it is likely to become endangered in the foreseeable future.

5.2.2.2 Potential Impacts of Construction

WRESC Facility

The WRESC will require approximately 88.6-acres of permanent disturbance within APN 431-022-13 and approximately 0.1 acres for transmission poles and approximately 6.4 acres for new access roads, for a total of approximately 95 acres of permanent disturbance. If all the excavated cavern rock were re-used onsite, the total facility size would increase by up to an additional approximately 74.6 acres for a total of approximately 163.2 acres. Constructions is anticipated to last 60-months and require several construction tasks to occur simultaneously. The Project’s target milestone schedule is provided in Table 2-8.

The WRESC’s general arrangement includes associated support equipment and an administration building. Installation of temporary access roads and laydown areas may result in impacts to previously disturbed vegetative communities and land uses. Noise and construction activities could temporarily displace wildlife from foraging and nesting in the Project Boundary. Any special-status bird species found nesting during pre-construction surveys will be protected by implementation of the measures listed in Section 5.2.4.

Construction Site and Laydown Area

The A-CAES construction tasks include site civil foundations, turbine hall construction, spherical pressure vessels, surface reservoir, reservoir fill time, installation of primary equipment/modules, structural and architectural work, controls and piping, and mechanical and electrical work. A laydown area and additional workspaces for parking as part of the A-CAES construction will occur within the boundaries of the WRESC Site in areas designated as P1, P2, and an optional workspace area. If cavern rock is removed from the WRESC Site and stored offsite, P1 will be utilized as a laydown area and P2 will be used for parking and equipment storage. The optional workspace will not be required under this scenario. The alternative workspace will only be used if cavern rock is reused as an architectural berm on-site. In that scenario, the P2 workspace will be used as a laydown yard, and the optional workspace area will be used for parking and equipment storage.

There is no existing pavement or asphalt on the site, and workspace area preparation will only require clearing of existing vegetation, as discussed in Section 5.2.1.6. Impacts on special-status species vegetation are discussed in Section 5.2.2.2.4, below. Construction of the WRESC may also result in temporary noise impacts to wildlife species within the vicinity. On average, noise levels will be less than 60 decibels over the course of an hour if construction activities occur within the vicinity of sensitive wildlife species. The Applicant will coordinate with the USFWS and CDFW on construction avoidance and minimization measures, and with these measures, impacts associated with the construction laydown area will be less than significant.

Gen-Tie Line

As discussed in Chapter 3, Electric Transmission, the Preferred Gen-Tie Alignment Route circuit will connect to the existing SCE Whirlwind Substation via an approximately 19-mile gen-tie line(see Chapter 3, Electric

Transmission). Activities related to the construction of the Gen-Tie Line and/or options of the gen-tie line alignment will require site preparation. The grid connection will be capable of power import and export, rated to suit all operating scenarios.

Construction of the gen-tie line alignment will occur in areas that contain a mix of previously developed/disturbed and undeveloped land and will follow already existing overhead powerlines. Installation of the gen-tie line poles assumes a temporary workspace with no more than a 10-foot by 10-foot construction footprint. A permanent impact will occur at a no more than 3-foot by 3-foot footing with steel poles. An estimated 125 poles will be required, with spans that very from 500 to 1,000 feet. Construction of the poles will temporarily affect no more than 0.29 acres and permanently affect no more than 0.025 acres. Gen-tie line construction will include the installation of new steel transmission poles, but since the alignment runs along existing roads, additional road grading is not anticipated.

Potential temporary impacts to biological resources from gen-tie line construction include clearing and grubbing and noise. The Applicant will coordinate with regulatory agencies on the appropriate mitigation requirements for the WRESC's construction, if necessary. Based on the results of informal agency consultation, the Applicant will prepare and implement a mitigation plan and a Worker Environmental Awareness Program that will help minimize adverse impacts to biological resources. Standard conservation practices that assist in limiting adverse impacts to special-status plant species include pre-construction surveys and installation of construction fencing around protected species. The Applicant will coordinate with the CDFW and CEC staff on construction mitigation measures, and with these measures, impacts related to gen-tie line will be less than significant.

Construction Impacts to Special-Status Plant Species

Construction of the WRESC will include complete vegetation removal within the WRESC Site as well as P1 and P2 Staging Areas. Impacts on special-status plant species will occur during construction of the WRESC. As discussed in Section 5.2.1.7, the special-status plant species identified during the rare plant surveys include western Joshua tree, alkali mariposa lily, Mohave monardella, and sagebrush loeflingia. Western Joshua trees and alkali mariposa lily are both present within the gen-tie alignment and will be avoided during pole placement design. Approximately 2,718 Joshua trees were documented during the 2023 Western Joshua Tree Census. Due to Project-related impacts to sensitive plant species, minimization and mitigation measures will be required. Mitigation measures are discussed in Section 5.2.4.2 below.

Construction Impacts to Special-status Wildlife Species

Temporary direct and impacts resulting from Project construction may affect special-status wildlife species identified as present or species with a moderate or high potential to occur within the Project Area. Construction activities could also temporarily displace common birds protected under the Migratory Bird Treaty Act. For a complete list of avian species protected under the MBTA, please reference: https://www.federalregister.gov/documents/2023/07/31/2023-15551/general-provisions-revised-list-of-migratory-birds. The following list of construction activities, although not exhaustive, could cause adverse impacts to special-status wildlife species:

- Removal of vegetation growing within the WRESC Site and along the gen-tie line corridor.
- An increase in dust during grading activities.
- Introduction of invasive weeds.
- Hazardous materials spills.
- Leaving trenches uncovered — Ground-dwelling animals could become trapped in uncovered trenches if left open overnight or if the contractor does not provide suitable egress for special-status wildlife species.
- Working near nesting habitat — Impacts on nesting birds could occur if construction activities take place adjacent to natural habitat during the nesting season.
- Temporary adverse impacts could be associated with increased noise from construction or incidental incursions into nesting habitat.

The implementation of avoidance and minimization measures and agency-approved mitigation practices will prevent permanent direct adverse impacts to special-status wildlife species. Mitigation measures are discussed in Section 5.2.4.2 below.

Impacts to Wildlife Corridors

Wildlife movement corridors, or habitat linkages, are generally defined as connections between habitat patches that allow for physical and genetic exchange between otherwise isolated animal populations. Such linkages may serve a local purpose, such as providing a linkage between foraging and denning areas, or they may be regional. Some habitat linkages may serve as migration corridors, wherein animals periodically move away from an area and then subsequently return. Others may be important as dispersal corridors for young animals. A group of habitat linkages in an area can form a wildlife corridor network.

The WRESC Site consists primarily of undeveloped land, which can provide opportunity for undisturbed localized wildlife movement. The Study Area broadly includes areas of sparse to moderately high desert vegetation cover, intermixed with disturbed areas. Temporary impacts to wildlife corridors would be limited to the construction laydown area, and permanent impacts to wildlife corridors would be limited to the Project Area within the WRESC boundaries. The proposed gen-tie line poles would be constructed in existing ROW that contains disturbed habitat. There is unobstructed open desert habitat in a 3-mile radius surrounding the Project Area, Therefore, the WRESC is expected to have less than significant temporary and permanent adverse impacts to wildlife corridors.

Wetlands and Waters of the United States

Seven features were found to have observable hydrologic indicators such as shelving, sedimentation, and cracked soil surfaces with drainage patterns. Since all features identified within the Project Area were found to be ephemeral and non-wetland areas, there is no USACE jurisdiction. Also, there were no drainage features within the WRESC Site. One ephemeral drainage feature was identified within the P2 south additional work area. The remaining drainage features are associated with the gen-tie alignment. All of which will be avoided based on Project design and has been confirmed by the Applicant. Despite the ephemeral status of local drainages within the gen-tie line ROW and P2 south, construction will avoid all drainage features, to the extent feasible. If construction must impact drainage or drainages, the Project will use best management practices (BMPs), and the Applicant will obtain the appropriate permits from applicable agencies, including the CDFW and RWQCB, prior to any work. However, it is not anticipated at this time. With appropriate avoidance measures, impacts to wetlands, WOTUS, and waters of the state area less than significant.

5.2.2.3 Potential Impacts of Operation

Hydrostor's energy storage technology provides long-duration, emission-free storage, providing multi-hundred megawatts of generation capacity and a suite of ancillary services. The system stores compressed air in purpose-built underground storage caverns. This energy storage system uses non-toxic materials and does not use fossil fuels during normal operation. During operation, the WRESC will produce noise and light. The potential for each of these biproducts to adversely impact sensitive biological resources is discussed in the following subsections.

No Combustion Turbine Emissions

The A-CAES system does not involve the use of a combustion turbine. The WRESC will be an energy storage facility consisting of four 130 MW power blocks. Each power block will contain an electric motor-driven air compressor drivetrain, heat exchangers, and an air turbine generator and their ancillary equipment. Therefore, the Project will have no impacts associated with combustion turbine emissions.

Stormwater and Process Water Discharge

The WRESC will be developed so that no wastewater or stormwater is discharged offsite. Stormwater will be directed to on-site retention ponds to be retained for future site use or evaporated. Stormwater (sheet flow) from the upland areas northeast of the WRESC will be diverted around the site, where it will continue to flow to its current pre-construction locations. Stormwater will be retained on-site for use as makeup water, and therefore, there will be no floodplain or stormwater runoff impacts from WRESC operations. The retained stormwater will be treated as necessary prior to re-use.

The Applicant will construct a surface reservoir utilizing earthen berms. The reservoir will be equipped with an engineering liner and an inter-locking floating cover to minimize water loss due to percolation and/or evaporation. As discussed in Section 5.15, Water Resources, the WRESC is expected to generate non-potable recharge quality water. The surplus water will be either stored in the surface compensation reservoir or injected into the

local aquifer for recharge. As a result of not discharging water offsite, the WRESC operations will not adversely impact water quality that supports sensitive habitats and species. A perimeter fence will be installed around the entire WRESC facility, which will reduce the likelihood of animal attraction/entrapment within the basins.

Noise and Light from Plant Operations

The WRESC Site is adjacent to agricultural and undeveloped land uses. These existing conditions involve minimal sources of noise emissions. Operation of the WRESC will produce some noise, as described in Section 5.7, Noise. As previously noted, the Project will consist of four 130 MW power blocks. Each power block will contain a motor-driven air compressor drivetrain, heat exchangers, and an air turbine generator and their ancillary equipment. Such equipment is not known to cause offsite ground vibration or airborne low-frequency noise during normal operations. Noise levels during daily operations will be consistent and the standard significant noise level (greater than 60 dBA) is reached at a distance of no greater than 1,500 linear feet from the Project Area.

The WRESC Site is undeveloped. As discussed in Section 5.13, Visual Resources, sources of light come from rural residences, nearby communities, and numerous red safety lights related to wind turbines along the horizon to the east. The WRESC's operations will introduce new light sources into the existing nighttime environment, such as facility lighting for safety and security purposes. The WRESC's outside lighting will include a combination of pole-mounted LED lighting and wall-mounted fixtures. The Applicant will apply best practices to minimize the effects of obtrusive exterior lighting. These practices will include shielding light fixtures, directing light downward and away from the adjacent open-space, and scheduling controls.

Based on the WRESC's equipment, the limited application of outdoor lighting, and use of best practices, noise and light impacts from the WRESC's operations are expected to have a less than significant impact on special-status wildlife.

Potential for Collision and Electrocution Hazards

The WRESC facility will include multiple structures that are less than 100 feet in height. The tallest structure will be the low-pressure exhaust stack. That structure, as well as a new 230-kV gen-tie line, could potentially result in bird collisions. Most collisions involve nocturnal migrants flying at night in inclement weather and low-visibility conditions. Bird collisions with electric conducting wires occur when birds are unable to see the lines, especially during fog or rain events. Factors that affect the risk of collision include weather conditions, behavior of the species of bird, and design and location of the line. The collisions typically occur when migrating birds collide with tall, guyed television or radio transmission towers (CEC 1995; Kerlinger 2000). Migratory birds generally fly at an altitude that would avoid ground structures, except when crossing over topographic features or when inclement weather forces the birds closer to the ground. Based on the WRESC's design and location, the Project's operations are likely to result in less than significant impacts from potential collisions.

Electrocutions occur when a bird with a wide wing-span simultaneously contacts two conductors of different phases or contacts a conductor and a ground. This happens most frequently when a bird attempts to perch on a structure with insufficient clearance between these components. On a 230-kV gen-tie line, all clearances between conductors or between conductors and ground are sufficient to protect even the largest birds, according to the Avian Power Line Interaction Committee (1996). As such, operation of the WRESC will not result in adverse impacts to wildlife from electrocution.

Effects of Operation on Special-Status Species

Impacts to Special-Status Plants

The A-CAES system does not involve the use of a combustion turbine. As such, operation of the WRESC will not produce combustion emissions that could adversely impact special-status species plants. Stormwater will be retained onsite, and therefore, there will be no floodplain or stormwater runoff impacts from the WRESC's operations that could adversely impact sensitive plant habitat types. Based on the WRESC's design, the facility's operations will have a less than significant impact on special-status plant species and their habitat.

Impacts to Sensitive and Special-Status Wildlife Species

As noted above, the A-CAES system does not involve the use of a combustion turbine, and therefore operation of the WRESC will not produce combustion emissions that could adversely impact special-status species wildlife. Stormwater water will be retained onsite. Therefore, there will be no floodplain or stormwater runoff impacts from WRESC operations that could adversely impact surface waters supporting special-status wildlife species.

The WRESC equipment will be designed to minimize ground- or airborne vibration impacts. Only a nominal amount of habitat outside of the WRESC Site will experience noise levels within in the 60 A-weighted-decibel (dBA) equivalent sound level (L_{eq}) contour (less than 1,500 linear feet includes 370-acres surrounding the WRESC Site). The wildlife species observed in the vicinity of the WRESC Site occur in areas that have relatively undisturbed desert habitat with evidence of human impacts, such as trash dumping and off-road vehicle use. The Project Area is also adjacent to a major highway (SR 14), a major arterial road (Sierra Highway), and a railroad. Wildlife in the area are expected to adapt to the new noise levels, which will be less than the typical noise effect threshold of 60 dBA L_{eq} hourly. Ambient noise levels and ground vibration from operation of the WRESC will be less than significant.

While lighting required during operation of the WRESC will create prominent new sources of light for nearby wildlife, the effects from light will not result in substantial light or glare. Based on the localized adverse affect of new mitigated lighting sources, the long-term impact to special-status wildlife from WRESC-generated light will be less than significant. Based on the WRESC's design, the facility's operations will have a less than significant impact on special-status wildlife species and their habitat.

Operation Phase Impacts to WOTUS

Since stormwater will be collected in onsite retention ponds to be retained for future site use or evaporated or percolated, no offsite flows will occur during the operational phase. Therefore, operational phase impacts will be less than significant.

5.2.3 Cumulative Effects

Section 15355 of the CEQA Guidelines defines "cumulative impacts" as "two or more individual effects which, when considered together, are considerable or which compound or increase other environmental impacts." Subsection b of Section 15355 states, in part, that "The cumulative impact from several projects is the change in the environment which results from the incremental impact of the project when added to other closely related past, present, and reasonably foreseeable probable future projects." Thus, cumulative impacts under CEQA involve the potential interrelationships of two or more projects, not the impacts from a single project. Specifically, under Section 15130 of the CEQA Guidelines, an Environmental Impact Report is required to discuss cumulative impacts when the project's incremental effect is "cumulatively considerable." Section 15065(a)(3) then defines "cumulatively considerable" as meaning "that the incremental effects of an individual project are significant when viewed in connection with the effects of other closely related past projects, the effects of other current projects and the effects of probable future projects."

Currently, within a 3-mile buffer around the Project (excluding gen-tie line), there is approximately 28,000 acres. 24,219 acres is considered undeveloped natural habitat (86 percent). Currently, there is 885 acres of solar facilities and 2,071 acres of rural residence (11 percent). The total temporary and permanent impacts combined for this Project are approximately 248.5 acres (approximately 153.5 acres of temporary and approximately 95 acres of permanent) without the architectural berm and up to approximately 325.6 acres (approximately 155.9 acres of temporary and approximately 169.7 acres of permanent) with the architectural berm. Additional projects in the foreseeable future include the Gem Hill Quarry project and the Mojave Micro Mill project. The combined total of future development within the 3-mile buffer around the Project Area is 816 acres. The total development footprint, including existing and future projects, is 3,772 acres. The proposed Project has an estimated increase in development within the 3-mile buffer of up to approximately 0.09 percent. Cumulative impacts from the WRESC are expected to be less than significant.

5.2.4 Best Practices, Design Features, and Mitigation Measures

This section describes the measures that are intended to avoid and minimize potential adverse effects of the Project to biological resources. A Biological Resources Mitigation Implementation and Minimization Plan (BRMIMP) will be prepared prior to construction that outlines how the Applicant will implement the mitigation and protection measures developed specifically for the Project through consultation with pertinent agencies.

5.2.4.1 Minimization Measures for Construction

Pre-Project Protocol Survey. Based on informal consultation with CDFW staff, a protocol-level Crotch's bumble bee survey will be required the season prior to Project construction to ensure that no new populations of Crotch's bumble bee are established onsite.

Pre-Construction Surveys. Prior to onset of any vegetation removal or soil disturbance, a qualified biologist will conduct a pre-construction survey for sensitive biological resources, including burrowing owl, desert tortoise, Crotch's bumble bee, Swainson's hawk, loggerhead shrike, Le Conte's thrasher, American badger, and desert kit fox within and near the Project Area. Should special-status species be found, avoidance measures recommended by the biologist will be incorporated into the Project to reduce the likelihood of species impacts. Measures may include but are not limited to avoiding portions of the work area and/or having a biological monitor present during construction activities.

Environmental Awareness Training. A qualified biologist will present an education program on Joshua tree, burrowing owl, Crotch's bumble bee, Swainson's hawk, and other listed/special-status species found within the WRESC Site to all Project employees prior to the start of construction and before new employees begin work onsite. The program will include, at a minimum, the following topics: (1) species description, general behavior, and ecology; (2) species distribution and occurrence near the WRESC Site; (3) species' sensitivity to human activities; (4) legal protection; (5) penalties for violating state and federal laws; (6) reporting requirements; and (7) conservation measures specific to the Project. The biological monitor will document the names, dates, and affiliation of persons who attend the training.

Biological Monitoring. A qualified biologist will be present on-site during all clearing, grubbing, vegetation removal, leveling, grading, and/or other ground-disturbing activities to monitor work and ensure that conservation measures are appropriately implemented. In addition, a qualified biologist will monitor specific construction activities that occur on or near sensitive communities and special-status species locations, including vegetation removal and ground-disturbing activities.

Nesting Bird and Raptor Avoidance. Potential impacts on nesting birds and raptors would be minimized through the implementation of pre-construction surveys and avoidance measures during the nesting season. Although nesting season in California can occur year-round, vegetation removal should be limited to winter months when nesting activity is at its lowest. Nest surveys should be conducted by a qualified biologist within the Project Area plus a 500-foot buffer within 7 days prior to onset of any vegetation removal or ground-disturbing activities. Should the biologist discover any nesting birds, then appropriate measures, as determined by the biologist, will be implemented to minimize impacts. These measures may include, but are not limited to: (1) redirecting work to other locations within the Project Area, (2) staking/flagging avoidance areas around active nests, (3) establishing a minimum "no work" buffer, and/or (4) installing temporary fencing, and/or (5) installing a noise barrier.

Sensitive Species Management Plan. A Sensitive Species Management Plan (the plan) will be prepared to identify all necessary and recommended avoidance and minimization measures as well as BMP, as to avoid incidental take of any sensitive plant or wildlife species either present or with a moderate to high potential to occur. A Project-specific Sensitive Species Management Plan will be prepared by a qualified biologist and will be submitted to appropriate agencies for review. The plan will explore available minimization measures and include pre-construction clearance surveys, construction monitoring, and post-construction documentation (such as a final as-built document). The plan will include species-specific requirements, if appropriate. By specifically addressing avoidance and monitoring measures for those species with some potential too occur or are considered present, impacts are expected to be minimized significantly. The plan will include activity windows for each species to understand each avoidance windows, as well as biological monitoring requirements (including frequency,

durations, and coverage). In addition to minimization measures identified in the plan for sensitive plant and wildlife species, an invasive weed treatment plan will also be incorporated.

Raven Management Plan. The Project Area provides suitable habitat for desert tortoise and common raven (*Corvus corax*). Although no desert tortoise were identified within the Project Area, there are recorded occurrences within 3 miles of the Project Area. There are numerous active common raven nests throughout the Project Area. Both of these species occur throughout the Mojave Desert. Ravens are predators of juvenile desert tortoises and thrive in areas of human development. This Raven Management Plan will be implemented by the Applicant to prevent unwanted indirect impacts of the Project to the desert tortoise populations that may occur near the Project Area. The Raven Management Plan will be prepared in accordance with the Common Raven Management Plan Template (USFWS 2010). The primary purpose of the Raven Management Plan, is to eliminate and/or minimize the availability of subsidies and the potential for ravens to occupy the Project site during all phases of development and use, including construction, operation and maintenance, and decommissioning (USFWS 2010).

Best Management Practices

For jurisdictional drainages, the Applicant will adhere to all avoidance and minimization mitigation measures required by the local agencies, if regulatory permits are required. For areas with unavoidable impacts, the Applicant will submit applications for the appropriate permits prior to any work, authorization to work within the drainage(s) must be provided prior to any impacts to drainage features.

BMPs to address erosion and excess sedimentation will be incorporated into the Project plans.

Work will be limited to the construction footprint, as outlined in the Project plans. Access routes, staging areas, and the total footprint of disturbance shall be the minimum number/size necessary to complete the Project and will be selected/placed to avoid impacts to sensitive habitat/resources.

Sensitive resources will be marked and protected by temporary fencing (e.g., orange plastic fencing, silt fencing, signage) or other acceptable methods. Work limits will be clearly marked in the field and confirmed by the Project biologist/biological monitor prior to the start of operations. All staked/fenced boundaries will be maintained in good repair throughout construction. The Applicant will consult with state and local agencies to generate conservation measures for the western Joshua tree under the Western Joshua Tree Conservation Act.

Where applicable, weed-free products will be used to minimize the accidental spread of exotic plants. All construction equipment used for the WRESC will be clean and free of soil and plant material before it is brought to the site and before it leaves the work area, to prevent the spread of invasive plants. A weed eradication plan will be prepared to ensure non-native invasive weedy species are construction during and immediately following Project installation.

All storage and staging areas will be placed, to the greatest extent feasible, on existing developed or disturbed locations (e.g., paved, or bare ground surfaces) that have been reviewed and approved by the Project biologist.

All areas used for stockpiling will be kept free of trash and other waste. No Project-related items will be stored outside approved staging areas at any time. If additional staging areas are needed for installation of the gen-tie alignment, previously disturbed areas should be selected to avoid any additional environmental impacts.

All contractor equipment and vehicles will be inspected for leaks immediately prior to the start of construction and regularly thereafter until the equipment and/or vehicles are removed from the Project premises. Any leaks will be properly contained, or the equipment/vehicle(s) repaired; if repair is not possible, the equipment/vehicles will be removed from the site.

Unless authorized by regulatory authority, Project-related activities—particularly those involving cleaning or fueling or motorized equipment—will occur greater than 100 feet from jurisdictional waters or potentially jurisdictional waters. Contaminated water, sludge, spill residue, or other hazardous compounds will be disposed of offsite at a lawfully authorized destination.

Dust impacts will be minimized by implementing appropriate measures that will reduce/control emissions generated by the Project. Water will be applied using a water truck in sufficient quantities to prevent airborne dust from leaving the Project Area.

Any areas of excavation (e.g., pits, trenches, drilling holes) will be covered overnight or during periods of inactivity. Routes of escape from excavated pits and trenches will also be installed for wildlife that could become entrapped (e.g., wood planks, sticks, or equivalent with dimensions of roughly 2-inch-thick by 6-inch-wide, and earthen ramps/slopes). These locations will be regularly inspected over the course of the Project and immediately prior to filling. If any entrapped wildlife are discovered, work will be suspended at the excavation site until the animal can be safely relocated by the biological monitor or Project biologist.

5.2.4.2 Minimization Measure for Special-Status Species

Burrowing Owl. Within 14 days of initiating initial ground disturbance and/or construction activities, a pre-construction take-avoidance survey for burrowing owl will be conducted per guidelines specified in the Staff Report on Burrowing Owl Mitigation (CDFW 2012). In addition, within 24 hours of initiating ground disturbance and/or construction activities, a final pre-construction take-avoidance survey will be conducted. The surveys will include areas within the WRESC Site and a surrounding 500-foot (150-meter) buffer.

If the take-avoidance survey identifies occupied burrows, a Burrowing Owl Exclusion Plan will be developed and approved by the CDFW and will include the following: burrow excavation procedures, on-site and post-relocation monitoring of occupied burrows, and reporting. A qualified biologist will be on-site during all ground-disturbing construction activities in potential burrowing owl habitat. A qualified biologist possesses a bachelor's degree in wildlife biology or a related field and has demonstrated field experience in the identification and life history of burrowing owl. The biologist will be responsible for implementing and overseeing burrowing owl avoidance and minimization measures as described in the BRMIMP.

If burrowing owls are present during construction, adaptive mitigation measures for temporary impacts may include, but would not necessarily be limited to, scheduling the construction during nonbreeding periods, avoiding proximal areas of occupied burrows during construction, biological monitoring of occupied burrow sites during construction, passive relocation of non-nesting burrows, and instituting buffer zones and/or "shelter in place" techniques around occupied burrows.

Swainson's Hawk. The Project has the potential to adversely affect locally occurring Swainson's hawks, both permanently and temporarily. By preparing the BRMIMP, which will provide targeted avoidance and minimization measures, temporary and permanent Swainson's hawk impacts will be adequately mitigated. Because the closest active nest to the Project Area is over 5 miles away, additional mitigation for loss of foraging habitat will not be required.

Joshua Tree. Compliance with the Western Joshua Tree Conservation Act will provide appropriate mitigation for this species. Although impacts to Joshua trees are anticipated because of the WRESC Site construction, they will be avoided during gen-tie line design and installation. Although western Joshua tree avoidance measures cannot be completed within the WRESC Site, relocation of up to 325 trees, and avoidance measures will assist in minimizing impacts to the special-status plant species, to the extent feasible. The Applicant will coordinate with state and local agencies and participate in the Western Joshua Tree Act or pursue an incidental take permit under Section 2081 of the California Fish and Game Code. As such, permanent impacts to Joshua trees from the construction of the WRESC may have less than significant impacts, with the incorporation of mitigation measures.

Other Special-Status Plant Species Avoidance. Prior to surface-disturbing activities, a survey for special-status plants will be conducted within and near the Project Area to assess the presence/absence of rare plants potentially not detected during the 2023 rare plant surveys. The CDFW will be contacted by the Project biologist 30-days prior to the site being graded and give CDFW the opportunity to either collect seed or transplant sensitive plant species. At a minimum, temporary fencing or flagging will be placed around the perimeter of the Project to reduce and/or eliminate any unauthorized impacts outside of the established work area. This will provide a conspicuous, visual barrier. Any other measures deemed necessary by the Project biologist shall also be implemented to prevent disturbance of onsite sensitive species. Regular updates will be provided by the Project biologist during construction meetings or the environmental awareness training to inform staff of areas supporting special-status plants and measures needed to avoid/minimize potential impacts.

Other Special-Status Wildlife Species Avoidance. The Project has the potential to adversely affect other special-status wildlife species such as desert kit fox and American badger. Temporary and permanent impacts to special-status wildlife species would be mitigated by implementing a Project-specific Sensitive Species Management Plan and providing targeted mitigation measures. During vegetation clearing, trimming or removal, and/or ground-disturbing work, a qualified biologist will be onsite to monitor for the presence of these additional special-status species. If any wildlife of concern are discovered during these activities, the biologist will coordinate with the construction foreman regarding appropriate measures to safeguard the health/life of the individual(s) (e.g., avoidance, flushing, safely relocating away from the site).

5.2.5 Laws, Ordinances, Regulations, and Standards

The following subsections describe the LORS that apply to potential impacts on biological resources in the WRESC Site and list the agencies responsible for enforcing the regulations. A summary of the pertinent LORS is provided in **Table 5.2-8**.

Table 5.2-8. Laws, Ordinances, Regulations, and Standards for Biological Resources

LORS	Requirements/Applicability	Administering Agency
Federal		
Federal Endangered Species Act (16 USC 1531 et seq.)	Designates and protects federally listed threatened and endangered plants and animals and their critical habitat. Applicants for projects that could result in adverse impacts on any federally listed species are required to consult with and mitigate potential impacts in consultation with the USFWS.	USFWS
Migratory Bird Treaty Act (16 USC 703 to 711)	Protects all migratory birds, including nests and eggs.	USFWS
Bald and Golden Eagle Protection Act (16 USC 668)	Specifically protects bald and golden eagles from harm or trade in parts of these species.	USFWS
State		
California Endangered Species Act (California Fish and Game Code Section 2050 et seq.)	Species listed under this act cannot be “taken” or harmed, except under specific permit. Take in the context of California Endangered Species Act means to hunt, pursue, kill, or capture, as well as any other actions that may result in an adverse impact when attempting to take a listed species.	CEC, CDFW
California Fish and Game Code Section 3511	This section of the code describes bird species, primarily raptors that are Fully Protected. Fully Protected birds may not be taken or possessed, except under specific permit requirements.	CDFW
California Fish and Game Code Section 3503	This section of the code states that it is unlawful to take, possess, or needlessly destroy the nest or eggs of any bird, except as otherwise provided by this code or any regulation made pursuant thereto.	CDFW
California Fish and Game Code Section 3503.5	It is unlawful to take, possess, or destroy any birds in the orders Falconiformes or Strigiformes (birds of prey) or to take, possess, or destroy the nest or eggs of any such bird except as otherwise provided by this code or any regulation adopted pursuant thereto.	CDFW
California Fish and Game Code Section 3513	It is unlawful to take or possess any migratory nongame bird as designated in the Migratory Bird Treaty Act or any part of such migratory nongame bird except as provided by rules and regulations adopted by the Secretary of the Interior under provisions of the Migratory Bird Treaty Act.	CDFW
California Fish and Game Code Section 3511, 4700, 5050 and 5515	Lists bird, mammal, amphibian/reptile, and fish species that are Fully Protected in California.	CDFW
Native Plant Protection Act Fish and Game Code Sections 1900 et seq.	The Native Plant Protection Act lists threatened, endangered, and rare plants listed by the state.	CDFW

LORS	Requirements/Applicability	Administering Agency
California Fish and Wildlife Code Sections 1900 et seq.,	The Native Plant Protection Act lists threatened, endangered, and rare plants listed by the state.	CDFW
Title 14 CCR, Sections 670.2 and 670.5	Lists animals designated as threatened or endangered in California.	CDFW
State Porter-Cologne Water Quality Control Act	Protects water quality and the beneficial uses of water and applies to surface waters, wetlands, and ground water and to both point and non-point sources of pollution.	RWQCB
California Fish and Game Code Sections 1601 – 1607	Prohibits alteration of any stream, including intermittent and seasonal channels and many artificial channels, without a permit from CDFW.	CDFW
CEQA Public Resources Code Section 15380	CEQA requires that the effects of a project on environmental resources must be analyzed and assessed using criteria determined by the lead agency.	CEC
Warren-Alquist Act Public Resources Code Section 25000, et seq.	Warren-Alquist Act is a CEQA-equivalent certified regulatory program implemented by the CEC.	CEC

CCR = California Code of Regulations; CDFW = California Department of Fish and Wildlife; CEC = California Energy Commission; CEQA = California Environmental Quality Act; RWQCB = Regional Water Quality Control Board; USC = United States Code; USFWS = U.S. Fish and Wildlife Service

5.2.5.1 Federal Laws, Ordinances, Regulations, and Standards

Federal Endangered Species Act

The Endangered Species Act (ESA) of 1973 (16 United States Code [USC] §§ 1531–1543) provides policy and authority for the conservation of threatened and endangered plants and animals and their habitats. The lead federal agencies for implementing the ESA are the USFWS and the National Marine Fisheries Service (NMFS). The law requires federal agencies to ensure that actions they authorize, fund, or carry out are not likely to jeopardize the continued existence of any listed species or result in the destruction or adverse modification of designated critical habitat of such species. The law also prohibits any action that causes a "taking" of any ESA-listed species.

The ESA prohibits the taking of listed species unless specifically authorized by permit from the USFWS or the NMFS. "Take" is defined in 16 USC § 1532 (19) as "to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect or attempt to engage in any such conduct." The law's definition of "harm" includes significant habitat modification or degradation that results in death or injury to ESA-listed species by significantly impairing behavioral patterns such as breeding, feeding, or sheltering (50 CFR § 17.3).

Section 7(a)(2) of the ESA requires the lead federal agency to consult with either the USFWS or NMFS, depending which agency has jurisdiction over the ESA-listed species in question, when a federally funded project either may have the potential to adversely affect an ESA-listed species, or a federal action occurs within or may have the potential to impact Designated Critical Habitat (DCH). Section 7 of the ESA requires that federal agencies must ensure that any activities they authorize, fund, or carry out are not likely to destroy or adversely modify an ESA-listed species DCH.

Migratory Bird Treaty Act

The Migratory Bird Treaty Act (MBTA) of 1918 (16 USC §§ 703–711) provides a program for the international conservation of migratory birds that fly through lands of the United States. The lead federal agency for implementing the MBTA is the USFWS. The law makes it illegal to take, possess, import, export, transport, sell, purchase, barter, or offer for sale, purchase, or barter, any migratory bird, or the parts, nests, or eggs of such a bird except under the terms of a valid federal permit.

Bald and Golden Eagle Protection Act

The Bald and Golden Eagle Protection Act (16 U.S.C. §§ 668–668c), enacted in 1940, and amended several times since, prohibits anyone, without a permit issued by the Secretary of the Interior, from "taking" bald or golden eagles, including their parts, nests, or eggs. The act provides criminal penalties for persons who "take, possess, sell, purchase, barter, offer to sell, purchase or barter, transport, export or import, at any time or any manner, any bald eagle ... [or any golden eagle], alive or dead, or any part, nest, or egg thereof." The act defines "take" as "pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, molest or disturb."

5.2.5.2 State Laws, Ordinances, Regulations, and Standards

California Endangered Species Act

CESA (California Fish and Game Code Sections 2050–2116) created the categories of "threatened" and "endangered" species to align with federal regulations. The CDFW requires a CESA Section 2081(a) permit for take of candidate or listed threatened and endangered animals for scientific, educational, or management purposes, as well as a CESA Section 2081(b) permit for incidental take of listed threatened and endangered animals from all activities.

Incidental Take Permits allow a permittee to take a CESA-listed species if such taking is incidental to, and not the purpose of, carrying out an otherwise lawful activity. These permits are most commonly issued for construction, utility, transportation, and other infrastructure-related projects. Permittees must implement species-specific minimization and avoidance measures, and fully mitigate the impacts of the project. (California Fish and Game Code § 2081 (b); California Code of Regulations [CCR] 14, §§ 783.2–783.8).

California Fish and Game Code Sections 3500, 3503.5, and 3800

All birds are provided protection under Sections 3500, 3503.5, and 3800 of the California Fish and Game Code. Section 3503.5 prohibits the take, possession, and needless destruction of any bird of prey or nests or eggs of any species covered by the MBTA list except as otherwise provided in the codes and regulations. Disturbance of any active bird nest during the breeding season is prohibited. When nesting birds are present on a specific property, take must be avoided, and project proponents are required to reduce or eliminate disturbances within the active nesting territories or during the nesting season.

California Fish and Game Code Section 3511

This code identifies bird species, primarily raptors, which are FP. FP birds may not be taken or possessed except under specific permit requirements.

California Fish and Game Code Section 3513

This code makes it unlawful to take, possess, or destroy any birds of prey or to take, possess, or destroy the nest or eggs of any such bird.

Plants and Animals of California Declared to be Endangered or Threatened (14 CCR Sections 670.2 and 670.5) and Agency Conferred SSC

These codes list plants and animals designated as threatened or endangered in California under CESA.

In addition, "State SSC" is a category conferred by the CDFW on species that are indicators of regional habitat changes or are considered potential future protected species. These species do not have any special legal status but are intended by the CDFW for use as a management tool to take these species into special consideration when decisions are made concerning the future of any land parcel.

Porter-Cologne Water Quality Control Act

The RWQCB regulates activities pursuant to Section 401(a)(1) of the Clean Water Act. Section 401 of the Clean Water Act specifies that certification from the state is required for any applicant requesting a federal license or permit, including a Section 404 permit. Through the Porter-Cologne Water Quality Control Act, the RWQCB

asserts jurisdiction over Waters of the State of California, which is generally the same as WOTUS but may also include waters not in federal jurisdiction.

The State Wetland Definition and Procedures for Discharges of Dredged or Fill Material to Waters of the State was adopted in April 2019 and put into effect statewide on April 2, 2019 (SWRCB 2021). The State Water Boards define wetlands as follows:

> *An area is wetland if, under normal circumstances, (1) the area has continuous or recurrent saturation of the upper substrate caused by groundwater, or shallow surface water, or both; (2) the duration of such saturation is sufficient to cause anaerobic conditions in the upper substrate; and (3) the area's vegetation is dominated by hydrophytes or the area lacks vegetation.*

The California Water Code defines Waters of the State of California broadly to include "any surface water or groundwater, including saline waters, within the boundaries of the state." Waters of the State of California include all WOTUS but also include waters not under federal jurisdiction (SWRCB 2021).

California Fish and Game Code Section 1600-1607

The CDFW regulates water resources under Section 1600–1607 of the California Fish and Game Code. Section 1602 states:

> *An entity may not substantially divert or obstruct the natural flow of, or substantially change or use any material from the bed, channel, or bank of, any river, stream, or lake, or deposit or dispose of debris, waste, or other material containing crumbled, flaked, or ground pavement where it may pass into any river, stream, or lake*

Evaluation of CDFW jurisdiction in relation to the entire Project Area followed guidance in the California Fish and Game Code and A Review of Stream Processes and Forms in Dryland Watersheds (CDFW 2010). In general, under 1602 of the code, CDFW jurisdiction extends to the maximum edge of a stream on the landscape (CDFW 2010). The CDFW defines a stream as "a body of water that flows perennially or episodically and that is defined by the area in a channel which water currently flows, or has flowed over a given course during the historic hydrologic course regime, and where the width of its course can reasonably be identified by physical or biological indicators" (Brady and Vyverberg 2014). Thus, a channel is not defined by a specific flow event, nor by the path of surface water as this path might vary seasonally. Rather, the CDFW defines the channel based on the topography or elevations of land that confine the water to a definite course when the waters of a creek rise to their highest point.

CEQA (Public Resources Code Section 15380)

CEQA defines "rare" in a broader sense than the definitions of threatened, endangered, or species of special concern. Under the CEQA definition, the CDFW can request additional consideration of species not otherwise protected. CEQA requires that the effects of a project on environmental resources must be analyzed and assessed using criteria determined by the lead agency. CEQA defines rare as:

a. Although not presently threatened with extinction, the species is existing in such small numbers throughout all or a significant portion of its range that it may become endangered if its environment worsens; or
b. The species is likely to become endangered within the foreseeable future throughout all or a significant portion of its range and may be considered "threatened" as that term is used in the Federal Endangered Species Act.

Warren-Alquist Act (Public Resources Code Section 25000, et seq.)

The AFC process is a certified regulatory process pursuant to the Warren-Alquist Act and, therefore, fulfills the requirements of CEQA. CEQA is codified in the California Public Resources Code, Section 21000-21178.1. Guidelines for implementation of CEQA are codified in CCR 15000–15387.

5.2.5.3 Local Laws, Ordinances, Regulations, and Standards

The WRESC facility will conform to all local requirements. The following local authorities and documents were identified as applicable to the Project.

Kern County General Plan

The Applicant has identified that 1.10.5 Threatened and Endangered Species and 1.10.10 Oak Tree Conservation subsections within the Kern County General Plan, General Provisions would apply to the WRESC Project. The General Plan has identified Kern County as "County" in the following Policies and Implementation Measures (KPNRD 2009):

Kern County General Plan 1.10.5 Threatened and Endangered Species

Policy 27. *Threatened or endangered plant and wildlife species should be protected in accordance with State and federal laws.*

Policy 28. *County should work closely with State and federal agencies to assure that discretionary projects avoid or minimize impacts to fish, wildlife, and botanical resources.*

Policy 29. *The County will seek cooperative efforts with local, State, and federal agencies to protect listed threatened and endangered plant and wildlife species through the use of conservation plans and other methods promoting management and conservation of habitat lands.*

Policy 30. *The County will promote public awareness of endangered species laws to help educate property owners and the development community of local, State, and federal programs concerning endangered species conservation issues.*

Policy 31. *Under the provisions of the CEQA, the County, as lead agency, will solicit comments from the California Department of Fish and Game and the U.S. Fish and Wildlife Service when an environmental document (Negative Declaration, Mitigated Negative Declaration, or Environmental Impact Report) is prepared.*

Policy 32. *Riparian areas will be managed in accordance with United States Army Corps of Engineers, and the California Department of Fish and Game rules and regulations to enhance the drainage, flood control, biological, recreational, and other beneficial uses while acknowledging existing land use patterns.*

Implementation Measure Q. *Discretionary projects shall consider effects to biological resources as required by CEQA.*

Implementation Measure R. *Consult and consider the comments from responsible and trustee wildlife agencies when reviewing a discretionary project subject to the California Environmental Quality Act.*

Implementation Measure S. *Pursue the development and implementation of conservation programs with State and federal wildlife agencies for property owners desiring streamlined endangered species mitigation programs.*

Kern County General Plan 1.10.10 Oak Tree Conservation

Policy 65. *Oak woodlands and large oak trees shall be protected where possible and incorporated into project developments.*

Policy 66. *Promote the conservation of oak tree woodlands for their environmental value and scenic beauty.*

Implementation Measure KK. *The following applies to discretionary development projects (General Plan Amendment, zone change, conditional use permit, tract maps, parcel maps, precise development plan) that contains oak woodlands, which are defined as development parcels having canopy cover by oak trees of at least ten percent (10%), as determined from base line aerial photography or by site survey performed by a*

licensed or certified arborist or botanist. If this study is used in an Environmental Impact Report, then a Registered Professional Forester (RPF) shall perform the necessary analysis.

a) Development parcels containing oak woodlands are subject to a minimum canopy coverage retention standard of thirty percent (30%). The consultant shall include recommendations regarding thinning and diseased tree removal in conjunction with the discretionary project.

b) Use of aerial photography and a dot grid system shall be considered adequate in determining the required canopy coverage standard.

c) Adjustments below thirty percent (30%) minimum canopy standard may be made based on a report to assess the management of oak woodlands.

d) Discretionary development, within areas designated as meeting the minimum canopy standard, shall avoid the area beneath and within the trees unaltered drip line unless approved by a licensed or certified arborist or botanist.

***Implementation Measure LL.** The following applies to development of parcels having oak tree canopy cover of less than ten percent (10%) but containing individual oak trees equal to or greater than a 12-inch diameter trunk at 4.5 feet breast height.*

a) Such trees shall be identified on plot plans.

b) Discretionary development shall avoid the area beneath and within the trees unaltered drip line unless approved by a licensed or certified arborist or botanist.

c) Specified tree removal related to the discretionary action may be granted by the decision-making body upon showing that a hardship exists based on substantial evidence in the record.

Kern County Valley Floor Habitat Conservation Plan

The Kern County Valley Floor Habitat Conservation Plan (VFHCP Program) distributed December 2006, was designed to conserve federally protected species, state-protected species, and other species of concern. The VFHCP Program includes most of the San Joaquin Valley floor and portions of Kern County, up to an elevation of 2,000 feet. The Project Area is not within the defined VFHCP Program boundaries and is not subjected to the conditions it establishes.

5.2.6 Permits and Permit Schedule

An Incidental Take Permit will be required for impacts associated with western Joshua tree. Participation in the Western Joshua Tree Conservation Act will satisfy the mitigation requirement and is anticipated to take no more than 90-days to coordinate the permit effort. No regulatory agency permits area anticipated at this time for permits under associated with drainage features. If necessary, regulatory agency permits can take anywhere from 3 to 9 months between application submittal and permit issuance but are not anticipated at this time.

5.2.7 Agency Contacts

Table 5.2-9 lists regulatory agency contacts for biological resources for this Project.

Table 5.2-9: Regulatory Agency Contacts for Biological Resources

Issue	Agency	Contact Information
State-listed species	California Department of Fish and Wildlife, Central Region	Jeremy Pohlman 3196 S. Higuera Suite A San Luis Obispo, CA 93401 805-503-2375 Jeremy.Pohlman@wildlife.ca.govmailto:reg4sec@wildlife.ca.gov

Issue	Agency	Contact Information
Federally listed species	U.S. Fish and Wildlife Service	2493 Portola Road Suite B Ventura, CA 93003 (805) 644-1766
Mitigation measures for construction phase	Kern County Planning Department	2700 M Street Suite #100 Bakersfield, CA 93301 661-862-8600

5.2.8 References

Aardvark Biological Services, LLC. 2023. Hydrostor - Willow Rock Preferred Project. Mohave Ground Squirrel Protocol Survey Report.

Avian Power Line Interaction Committee (APLIC). 1996. Suggested Practices for Raptor Protection on Power Lines: The State of the Art in 1996. Edison Electric Inst./Raptor Found., 701 Pennsylvania Ave. NW, Washington, 20004-2696.

Baldwin, B. G., D. H. Goldman, D. J. Keil, R. Patterson, T. J. Rosatti, and D. H. Wilken, editors. 2012. The Jepson Manual: Vascular Plants of California, Second Edition. University of California Press, Berkeley, California.

Blackhawk Environmental. 2021. Hydrostor, Inc. Gem Energy Storage Center Application for Certification Project, Biological Technical Report. Willow Springs, Kern County, California.

Brady, Roland H. III, Kris Vyverberg. 2014. Methods to Describe and Delineate Episodic Stream Processes on Arid Landscapes for Permitting Utility-Scale Solar Power Plants. California Energy Commission. Publication Number: CEC-500-2014-013.

Bunn, David, Adrea Mummert, Marc Hoshovsky, Kirsen Gilardi, and Sandra Shanks. 2007. California Wildlife: Conservation Challenges. California's Wildlife Action Plan. Prepared by the UC Davis Wildlife Health Center for the California Department of Fish and Game, Sacramento, California.

California Department of Fish and Wildlife (CDFW). 2009. Protocols for Surveying and Evaluating Impacts to Special-status Native Plant Populations and Natural Communities. Sacramento, California: California Department of Fish and Game, November 24, 2009.

CDFW 2010. A Review of Stream Processes and Forms in Dryland Watersheds. Prepared by Kris Vyverberg. December 2010.

CDFW. 2012. Staff Report on Burrowing Owl Mitigation. State of California Natural Resources Agency.

CDFW. 2023a. Sensitive Natural Communities List. Available at: https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=153609&inline. June 1, 2023.

CDFW. 2021b. Vegetation Classification Reports and Maps. Available at: https://wildlife.ca.gov/Data/VegCAMP/Reports-and-Maps. Accessed September 20, 2021.

CDFW. 2023. Survey Considerations for California Endangered Species Act (CESA) Candidate Bumble Bee Species.

CDFW 2024. Special Animals List. January 2024.

CDFW 2024a. Census Instruction. https://wildlife.ca.gov/Conservation/Environmental-Review/WJT/Permitting/Census-Instructions.

California Department of Parks and Recreation (CDPR). 2021a. About Us. Available at: https://www.parks.ca.gov/?page_id=91. Accessed September 27, 2021.

California Department of Parks and Recreation (CDPR). 2021b. Antelope Valley California Poppy Reserve State Natural Reserve. Available at: https://www.parks.ca.gov/?page_id=627. Accessed September 27, 2021.

California Department of Parks and Recreation (CDPR). 2021c. Arthur B. Ripley Desert Woodland State Park. Available at: https://www.parks.ca.gov/?page_id=634. Accessed September 27, 2021.

California Energy Commission (CEC). 1995. Avian Collision and Electrocution: An Annotated Bibliography. P. 114.

California Energy Commission and California Department of Fish & Wildlife (CEC and CDFW). 2010. Swainson's Hawk Survey Protocols, Impact Avoidance, and Minimization Measures for Renewable Energy Projects in the Antelope Valley of Los Angeles and Kern Counties, California. June 2, 2010.

California Natural Diversity Data Base (CNDDB). 2024. California Department of Fish and Wildlife RareFind 5 records of sensitive elements.

California Protected Areas (CPAD). 2018. California Protected Database and California Conservation Easement Database. Available at: https://www.calands.org/. Accessed September 24, 2021.

California State Lands Commission (CSLC). 2021. About the California State Lands Commission. Available at: https://www.slc.ca.gov/about/. Accessed September 27, 2021.

Cypher, E. A. 2002. General Rare Plant Survey Guidelines. California State University, Stanislaus. Endangered Species Recovery Program, Revised July 2002.

Desert & Mountain Conservation Authority (DMCA). 2006. Desert & Mountain Conservation Authority. Available at: http://www.dmca.ca.gov/index.html. Accessed September 27, 2021.

Holland, Robert F. 1986 Preliminary Descriptions of the Terrestrial Natural Communities of California. State of California, the Resources Agency. Department of Fish and Game.

Kerlinger, Paul. 2000. Avian Mortality at Communication Towers: A Review of the Recent Literature, Research; and Methodology. Prepared for U.S. Fish and Wildlife Service, Office of Migratory Bird Management. pp. 38.

Kern County Planning and Natural Resources Department (KPNRD). 2009. Planning Documents – Kern County General Plan. Available at: https://kernplanning.com/planning/planning-documents/. Accessed July 7, 2021.

Leitner, P. 2021. Current status of the Mohave Ground Squirrel: An update covering the period 2013–2020. California Fish and Wildlife

Journal, (CESA Special Issue), 300–316. https://doi.org/10.51492/cfwj.cesasi.18

Los Angeles County Parks and Recreation (LACPR). 2021a. Apollo Community Regional Park. Available at: https://parks.lacounty.gov/apollo-community-regional-park/. Accessed September 27, 2021.

Los Angeles County Parks and Recreation (LACPR). 2021b. Neenach Wildlife Preserve. Available at: https://parks.lacounty.gov/neenach-wildlife-preserve/# Accessed October 1, 2021.

Los Angeles County Parks and Recreation (LACPR). 2021c. George R. Bones Wildlife Sanctuary. Available at: https://parks.lacounty.gov/george-r-bones-wildlife-sanctuary/. Accessed October 1, 2021.

City of Lancaster (Lancaster). 2021. Mariposa Park. Available at: https://www.cityoflancasterca.org/our-city/departments-services/parks-recreation-arts/parks-and-facilities/mariposa-park. Accessed September 27, 2021.

Mountains Recreation and Conservation Authority (MRCA). 2021. About. Available at: https://mrca.ca.gov/about/. Accessed September 27, 2021.

Randall, J. M., S.S. Parker, J. Moore, B. Cohen, L. Crane, B. Christian, D. Cameron, J. MacKenzie, K. Klausmeyer and S. Morrison. 2010. Mojave Desert Ecoregional Assessment. Unpublished Report. The Nature Conservancy, San Francisco, California. 106 pages + appendices. Available at: http://conserveonline.org/workspaces/mojave/documents/mojave-desertecoregional-2010/@@view.html.

Oberbauer, T. A., M. Kelly, and Jeremy Buegge. 2008. Draft Vegetation Communities of San Diego County. Based on Preliminary Descriptions of the Terrestrial Natural Communities of California.

Sawyer, J. O., T. Keeler-Wolf, and J. M. Evens. 2009. A Manual of California Vegetation, Second Edition. California Native Plant Society. Sacramento, California.

Sharp, Robert P. 1975. Geology, Field Guide to Southern California. Kendall/Hunt Publishing Company, Dubuque, Iowa.

State Water Resources Control Board. 2021. State Policy for Water Quality Control: State Wetland Definition and Procedures for Discharges of Dredged or Fill Material to Waters of the State, revised April 6, 2021.

U.S. Army Corps of Engineers (USACE). 1987. Wetlands Delineation Manual; Technical Report Y-87-1.

U.S. Department of Agriculture Forest Service. 2021. About the Forest. Available at: https://www.fs.usda.gov/main/angeles/about-forest. Accessed September 27, 2021.

U.S. Environmental Protection Agency (U.S. EPA) and the Department of the Army. 2020. Final Rule: The Navigable Water Protections Rule. Available at: https://www.federalregister.gov/documents/2020/04/21/2020-02500/the-navigable-waters-protection-rule-definition-of-waters-of-the-united-states. Accessed October 12, 2021.

U.S. Fish and Wildlife Service (USFWS). 2011 Revised Recovery Plan for the Mojave Population of the Desert Tortoise. Available at Desert Tortoise Final Revised Recovery Plan (fws.gov).

U.S. Fish and Wildlife Service (USFWS). 2009. General Ecology and Survey Protocol for Determining Presence/Absence and Abundance for the Desert Tortoise - Mojave Population.

U.S. Fish and Wildlife Service (USFWS). 1996. Guidelines for Conducting and Reporting Botanical Inventories for Federally Listed, Proposed, and Candidate plants. Sacramento, California.

U.S. Fish and Wildlife (USFWS). 2017. Critical Habitat What is it? https://www.fws.gov/sites/default/files/documents/critical-habitat-fact-sheet.pdf.

U.S. Fish and Wildlife Service (USFWS). 2019. Preparing for any Action that may occur within the Range of the Mojave Desert Tortoise (*Gopherus agassizii*).

U.S. Fish and Wildlife (USFWS). 2023. National Wetlands Inventory Wetlands Mapper. Available at: https://fwsprimary.wim.usgs.gov/wetlands/apps/wetlands-mapper/. Accessed October 6, 2023.

U.S. Geological Survey (USGS). 2023.National Hydrography Dataset. Available at: C Accessed September 14, 2023.

U.S. Geological Survey (USGS). 2021. 7.50-minute Soledad Mountain, Rosamond, Willow Springs, Tyler horse Canyon, Fairmont Butte, and Little Buttes, California Topographic Quadrangle.

Wilbur, S., D. Esplin, R. Mallette, J. Borneman, and W. Radtkey, W. 1979 California Condor Recovery Plan. Available at: https://www.wildlifeprofessional.org/western/transactions/transactions_1976_4.pdf.

WSP USA Environment and infrastructure (WSP). 2024a. Hydrostor, Inc. Willow Rock Energy Storage Project Biological Resources Assessment.

WSP USA Environment and infrastructure. 2024b. Hydrostor, Inc. Willow Rock Energy Storage Project Swainson's Hawk Protocol Survey Report.

WSP USA Environment and infrastructure. 2024c. Hydrostor, Inc. Willow Rock Energy Storage Project Desert Tortoise Protocol Survey Report.

WSP USA Environment and infrastructure. 2024d. Hydrostor, Inc. Willow Rock Energy Storage Project Burrowing Owl Protocol Survey Report

WSP USA Environment and infrastructure. 2024e. Hydrostor, Inc. Willow Rock Energy Storage Project Sensitive Plant Protocol Survey Report

WSP USA Environment and infrastructure. 2024f. Hydrostor, Inc. Willow Rock Energy Storage Project Crotch's Bumble Bee Protocol Survey Report.

WSP USA Environment and infrastructure. 2024g. Hydrostor, Inc. Willow Rock Energy Storage Project Jurisdictional Delineation Report.

WSP USA Environment and infrastructure. 2024h. Hydrostor, Inc. Willow Rock Energy Storage Project Western Joshua Tree Census Report.

5.3 Cultural Resources

The Willow Rock Energy Storage Center (WRESC, or Willow Rock) will be located on approximately 88.6 acres of private land immediately north of Dawn Road and between State Route (SR) 14 and Sierra Highway within unincorporated, southeastern Kern County, California. The WRESC will be a nominal 520-megawatt (MW) gross (500 MW net) and 4,160 megawatt-hour (MWh) gross (4,000 MWh net) facility using Hydrostor, Inc.'s (Hydrostor's) proprietary, advanced compressed air energy storage (A-CAES) technology. Energy stored at the WRESC will be delivered to Southern California Edison's (SCE's) Whirlwind Substation located southwest of the WRESC at the intersection of 170th Street W and Rosamond Boulevard, via a new approximately 19-mile 230-kilovolt (kV) generation-tie (gen-tie) line. The WRESC will be capable of operating on a 24-hour basis, 365 days a year with an approximately 50-year lifespan.

This section analyzes the potential effects that construction and operation of the WRESC proposed by GEM A-CAES, LLC (GEM, the Applicant), or its appurtenances, may have on known or previously unrecorded cultural resources located within the Study Areas. Cultural resources include pre-Contact resources; historic buildings, structures, objects, districts, and sites; and sites and resources of concern to Native Americans and other ethnic groups. Cultural resources include any tangible or observable evidence of past human activity, regardless of significance, found in direct association with a geographic location, including tangible properties possessing intangible traditional cultural values, such as artifacts, archaeological sites, buildings, bridges, and other structures.

The Project Area encompasses the WRESC Site, the parcels within the Project Boundary, and the right-of-way (ROW) associated with the WRESC's gen-tie line, as shown in Chapter 1, Introduction, Figure 1-6. The Project Boundary encompasses the WRESC Site and the parcels of land (an additional 133 acres of private land surrounding the WRESC) that will be allocated for potential temporary staging and laydown area (referred to herein as the Staging Area) during construction, or the construction of a permanent architectural berm constructed from the material excavated during cavern construction.

The Records Review Area consisted of the WRESC Site plus an approximate 1-mile buffer surrounding the WRESC Site and 0.5 miles surrounding the linear features, as shown in Figure A.3 in Appendix 5.3B. WSP conducted an intensive pedestrian survey of the Study Area for archaeological resources, which consists of a 200-foot buffer around the Project Boundary and a 50-foot buffer around the linear features. Additionally, four alternative routes were investigated, spanning an additional 69 linear miles with 50-foot buffers on either side. The alternatives and archaeological survey buffer encompassed an additional 836 acres along public rights-of-way. To date, approximately 7 linear miles of the preferred gen-tie route that crosses private land has not been surveyed for cultural resources, pending landowner permission and approval. The total cultural resources survey footprint for the Project is 1,351 acres.

Additionally, WSP conducted a windshield architectural survey of the Built Environment Survey Area (BESA), which extends 0.5 miles out from all proposed WRESC Sites and aboveground linear features in rural areas and one parcel's distance out from the proposed WRESC Site and aboveground linear features in urban and suburban areas per California Energy Commission (CEC) guidelines and data adequacy requirements.

The delineation of the Study Area was performed following the CEC's *Rules of Practice and Procedure and Power Plant Site Regulations Revisions, Appendix B (g)(2)(c)* (CEC 2023). The WRESC will deliver electricity to the existing SCE Whirlwind Substation via an approximately 19.6-mile gen-tie line from the 500-MW net A-CAES system. There are several alternative routes to the SCE Whirlwind Substation in addition to the Preferred Gen-Tie Route. Section 5.3.1 provides a contextual background for cultural resources in the area that may be affected by the WRESC; Section 5.3.2 describes the design of the archival research, literature review, and subsequent fieldwork conducted during the cultural resources inventory for the WRESC; Section 5.3.3 presents an environmental analysis of construction and operation of the WRESC with respect to cultural resources; Section 5.3.4 discusses whether there will be any cumulative effects on cultural resources from the WRESC; and Section 5.3.5 presents mitigation measures that will be implemented to avoid construction impacts. As discussed in this Section, the Applicant does not anticipate that the WRESC will require ongoing mitigation for cultural resources once the facility is operational. Section 5.3.6 discusses the laws, ordinances, regulations, and standards (LORS) applicable to the protection of cultural resources, Section 5.3.7 lists the agencies involved and agency contacts,

Section 5.3.8 discusses permitting, and Section 5.3.9 lists reference materials used in preparing this section. According to CEC Data Adequacy requirements, this section also includes the following appendices:

- Appendix 5.3A provides copies of all correspondence with Native American tribes and the Native American Heritage Commission, under Assembly Bill 52.
- Confidential Appendix 5.3B provides the cultural resources technical report, which includes the following elements:
- California Department of Parks and Recreation (DPR) Series 523 forms for all newly recorded and updated resources
  - Archival materials, including copies of historical maps and aerial survey imagery of the Project
  - A series of tables and figures containing the metadata and locational information associated with the previous reports and previously recorded resources identified in the California Historical Resources Information System (CHRIS) records search
  - Copies of all previous technical reports and previously recorded resources occurring within 1 mile of the WRESC and 0.5 miles of linear facilities

The Applicant will submit Appendix 5.3B separately to the CEC, per confidentiality requirements pertaining to the locations of archaeological and Native American sacred sites defined in California Code of Regulation §15120(d), California Government Code §6254, California Public Resources Code §5097.9, the Archaeological Resources Protection Act of 1979 (16 U.S.C. 470hh) and Section 304 of the National Historic Preservation Act (54 U.S.C.307103).

This section is consistent with state regulatory requirements for cultural resources under the California Environmental Quality Act (CEQA) and this study complies with the CEC's cultural resources guidelines for review for an Application for Certification (AFC). The cultural resources assessment prepared for the WRESC Project includes the following:

- A description of the Project Area, affected environment, and existing site conditions
- Contextual background regarding the ethnographic pre- and post-Contact history of the region
- A review of previously recorded cultural resources and previous cultural resource investigations within 1 mile of the WRESC facility and 0.5 miles of all linear facilities
- A pedestrian survey of the Project Area conducted by the Applicant's cultural resources specialists (CRSs), consisting of the WRESC facility and the linear facility routes extending 50 feet from either side of the preferred alignment and alternative routes and extending out to 0.5 miles (in rural areas) or one parcel's distance (in urban and suburban areas) as appropriate for built environment resources.
- Native American consultation

The Applicant contracted WSP USA Inc. (WSP) to conduct the cultural resources evaluation of the WRESC Project. The cultural resources effort was led by Ms. Allegria Garcia, M.A., RPA, Ms. Kate Umlauf, M.A., and Mr. Michael Amorelli, B.S./B.A. Ms. Garcia is a Secretary of the Interior-qualified archaeologist with 9 years of experience in cultural resource management, primarily in the state of California. Ms. Garcia holds bachelor's degrees in anthropology and history from the University of California, Riverside, and a Master of Arts in art history from California State University, Los Angeles. Ms. Umlauf exceeds Secretary of the Interior Professional Qualifications in architectural history. Ms. Umlauf holds a bachelor's degree in anthropology from Saint Louis University, a Master of Arts in heritage management from the University of Galway, and a certificate in historic preservation from Boston Architectural College. Mr. Amorelli has 8 years of experience in cultural resource management in California, primarily in the Mojave Desert and Great Basin regions, and holds bachelor's degrees in anthropology and classical studies from the University of California, Riverside. Mr. Amorelli is a Master of Arts candidate in the Cultural Heritage Management program at Johns Hopkins University. The findings of their study can be found in the *Cultural Resources Assessment of the GEM A-CAES Willow Rock Energy Storage Center (WRESC)* technical report in Appendix 5.3B.

5.3.1 Affected Environment

The WRESC Project will be located in the unincorporated communities of Ansel, Hidden Valley, Rosamond, and Willow Springs, in the southeastern portion of Kern County, between 170th Street West to the west, Sierra Highway to the east, Backus Road to the north, and Rosamond Boulevard to the south. Regionally, the Project Area is depicted on the *Tylerhorse Canyon, Fairmont Butte, Willow Springs, Little Buttes, Rosamond*, and *Soledad Mountain* 7.5-minute topographic quadrangle maps. The WRESC will be within Sections 13, 14, 23, and 24 in Township 9 North, Range 15 West, Sections 1–5 and 8–24 in Township 9 North, Range 14 West, Sections 1–11 and 13–24 in Township 9 North, Range 13 West, Sections 3–5, 8–9, and 16–21 in Township 9 North, Range 12 West, Section 36 in Township 10 North, Range 13 West, and Sections 15–22, 27, 28, and 31–34 in Township 10 North, Range 12 West, San Bernardino Baseline and Meridian.

The Project Area lies within the Fremont and Antelope Valleys in the Western Mojave Desert. The Mojave Desert is bounded on the south and southwest by the Transverse and Peninsular Mountain Ranges and on the west by the Sierra Nevada. The Colorado and Yuma Deserts bound the Mojave on the east and southeast and the Great Basin bounds the Mojave Desert to the north. The Western Mojave Desert comprises several valleys, including the Antelope, Fremont, Victor, and Lucerne Valleys, with the Mojave River being the most substantial active watercourse. The Project Area crosses and borders several notable landforms and geological formations, including the Rosamond Hills, Willow Butte, and Tropico Hill. Rosamond Dry Lake is a large dry playa located 3.6 miles to the southeast of the proposed WRESC facility and was the largest waterbody in historical times, though the entire region was at one time dotted with small pluvial lakes. Willow and Bean Springs are the most significant springs along the Project's transmission route, though numerous other unnamed springs may have been active throughout the hills in recent history.

5.3.1.1 Cultural Chronology

There is no agreement on any one pre-Contact chronology defined as universal for the region. Moratto's compilation (1984) presents the chronologies most cited by researchers historically, but there are varying accounts of Southern California material culture before the Contact period. Most chronologies are based on minute changes that appear as unique to researchers when patterned in a local context.

There are four different regional culture chronology syntheses for the Mojave Desert referred to in the archaeological literature consulted. The first describes four cultural horizons or time periods: Horizon I to Early Man (11,000 to 8000 years before present [BP]), Horizon II to Milling Stone Assemblages (8000 to 5000 BP), Horizon III to Intermediate Cultures (5000 BP to Anno Domini [AD] 500), and Horizon IV to Late Pre-Contact Cultures (AD 500 to the Contact period) (Wallace 1955). Wallace later refined the chronology using absolute chronological dates obtained after 1955 (Wallace 1978). The second cultural chronology is based broadly on Southern California pre-Contact cultures (Warren 1968) further revised for the area (Warren 1984; Warren and Crabtree 1986). This chronology consists of five periods: Lake Mojave (7000 to 5000 BP), Pinto (5000 to 4000 BP), Gypsum (4000 to 2500 BP), Rose Springs (Saratoga Springs) (2500 to 1200 BP), and Protohistoric (1200 BP to the Contact period) (Warren 1984). These form the basis for the more specifically defined chronologies that would follow.

The third chronology, presented by Hall in 2000, divides the chronology into five periods: Lake Mojave (circa 8000 to 5500 years before Christ [BC]), Pinto (circa 5500 to 2500 BC), Newberry (circa. 1500 BC to 500 AD), Saratoga (circa 500 to 1200 AD), and Tecopa (circa 1200 to the 1770s AD). The most important revision within Hall's chronology was the inclusion of the material culture of the Western Stemmed Tradition within the Lake Mojave sequence and continuing until the Pinto Period.

Hall also identified the Newberry Period and saw it as a time of distinct cultural change. Based on his research, he concluded that the geographic ranges of small bands between localities increased, long distance trade developed, and the diffusion of cultural traits increased. Hall listed the artifacts that typify this period as Elko and Gypsum Contracting Stem projectile points and Split Oval beads. The Saratoga and Tecopa periods showed a change to seasonal group settlement close to resource patches and increased use of plant resources marked by the presence of ground stone artifacts. The artifacts specifically assigned to the Saratoga Period include Rosegate (Rose Springs and Eastgate) projectile points and Anasazi grayware pottery. The Tecopa period

brought a change to Desert Side-notched and Cottonwood projectile points, buffware and brownware ceramics, and the appearance of Thin Lipped, Tiny Saucer, Cupped, Cylinder, steatite, and glass beads (Hall 2000:16).

Sutton et al. presented the fourth and most recent chronology in 2007 (with revisions in 2017) that recognized seven cultural complexes spanning from the Late Pleistocene through to the Holocene. Their chronology is the most widely accepted at present and includes the complexes of Paleo-Indian (12,000 to 10,000 BP), Lake Mojave (10,000 to 8500 BP), Deadman Lake (9500 to 7200 BP), Pinto (8500 to 4000 BP), Gypsum (4000 to 1800 BP), Rose Springs (1800 BP to 900 BP), and Late Pre-Contact (900 BP to the Contact period) (Sutton et al. 2007). A brief description of each of the Sutton et al. pre-Contact cultural complexes follows.

5.3.1.2 Paleo-Indian Period (12,000 BP to 9,500 cal. BP)

Paleo-Indian sites are most often found along the shores of ancient pluvial lakes (Davis 1970; Clark et al. 2014) and are represented by Clovis materials, but there are recognized associations with Great Basin Stemmed series points (Sutton et al. 2007). Davis and others have suggested that there is an interior versus coastal adaptation represented, which they name the Paleo-Desert complex (1970). These Paleo-Indian site assemblages found in the Mojave Desert have fluted or stemmed projectile points and additional tools like scrapers, burins, awls, and choppers used for plant and animal processing (Sutton et al. 2007).

5.3.1.3 Lake Mojave Period (9,500 BP to 7,000 BP)

The Lake Mojave Period marked a major change in the floral and faunal composition of the desert regions. These major environmental changes caused migration of peoples from inland to coastal areas. As the resource economy shifted to an exploitation of littoral resources, technological changes occurred to cause the appearance of more ground stone tools for nut and seed processing (Sutton et al. 2007:234, Sutton 1996:228). Small mobile hunting and gathering bands inhabited the Mojave Desert during this period. The artifacts that most define this period include Great Basin Stemmed points and crescents of flaked stone (Hall 2000).

5.3.1.4 Pinto Complex (8,500 BP to 4,000 BP)

The Pinto complex is defined by a continued generalized usage of flaked stone technology with a decreased dependence on obsidian and cryptocrystalline silicates. A prevalence of ground stone tools may show a shift in cultural adaptations in the changing desert environment between 7500 and 5000 BP (Warren 1984). In the Pinto complex Olivella spire-lopped beads also become common (Hall 2000:14–15). These adaptations may be as old as 8820 BP, as suggested by excavations on Fort Irwin and Twenty-Nine Palms that have found Pinto assemblages that are as old as the Lake Mojave complex. Glennan (1971) defines the Sweetser Site (CA-KER-302), located approximately 3 miles southwest of the WRESC facility, as a type site for the Pinto Period rhyolite toolmaking tradition.

5.3.1.5 Gypsum Complex (4,000 BP to 1,800 BP)

The Gypsum complex is much like the Pinto with the addition of new tools that were either borrowed or innovated. These tools suggest further specializations and adaptations to desert environments. Medium to large stemmed and notched projectile points appear in Gypsum sites, including Elko series, Humboldt Concave Base, and Gypsum styles. The Gypsum toolkit also includes rectangular-based knives, flake scrapers, larger scraper planes, choppers, hammer stones, and a suite of milling equipment including hand stones and grinding slabs and the first appearances of the mortar and pestle. Increased population created contact and trade between peoples living during the time of the Gypsum complex, and an abundance of rock art suggests an increased incidence of ritual activities (Sutton et al. 2007:241).

5.3.1.6 Rose Springs Complex (1,800 BP to 900 BP)

The Rose Spring complex is characterized by a shift to small projectile points of the Rosegate series and possibly the ancestral Cottonwood series, as well as stone knives, drills, pipes, bone awls, various milling implements, and marine shell ornaments. The use of obsidian, particularly Coso Obsidian, became common within this complex (Sutton et. al. 2007:241). An introduction of bow and arrow technology and decline of the atlatl and spear weaponry is shown by the usage of the smaller projectiles. Sutton has found large concentrations of Rose Spring complex sites near springs, washes, and lakeshores of the Mojave Desert (Sutton 1996:235). The subsistence

practices within the Rose Springs Complex shifted to an exploitation of medium-sized and small game and an increased dependance on milling of plant foods, as evidenced by numerous bedrock milling features like mortar cups and slicks that are associated with rich midden deposits. There is evidence of permanent living structures found during this time and the eastern Mojave Desert saw the development of agricultural practices because of either influence or control by Ancient Puebloan populations who entered the northeastern Mojave Desert by 1300 BP (Sutton et al. 2007:241–242).

5.3.1.7 Late Pre-Contact Period (900 BP to the Contact Period)

The Late Pre-Contact complex has a material culture that is drastically different than that of the preceding complexes. Artifacts that are found in the assemblages of these sites include Desert Series projectile points, Brownware and Lower Colorado buffware ceramics with increased numbers of milling stones, incised stones, and shell beads (Warren and Crabtree 1986). Deer, rabbits/hares, reptiles, and rodents show to be favored prey in the analysis of faunal elements. The use of obsidian dropped off during this time and the use of cryptocrystalline silicates became prevalent. Large complex house pit village sites such as the Guapiabit site in Summit Valley and others found in Antelope Valley were founded along the headwaters of the Mojave River, leaving evidence of large populations in occupation of both semipermanent and permanent villages (Sutton 1981).

Increased linguistic complexity within the Mojave Desert occurred during this complex with an expansion of Numic-speakers throughout the Great Basin. One of the most important regional developments of the Late Pre-Contact complex was sometime around 1000 BP. The Numic intrusion spread west from the southwest Great Basin, possibly near Death Valley (Lamb 1958) or Owens Valley (Bettinger and Baumhoff 1982). Archaeologists disagree about how or when the Numic spread occurred (Madsen and Rhode 1994), but there is no disagreement that the intrusion occurred and significantly changed the cultural landscape.

5.3.1.8 Ethnographic Setting

Three groups consider this portion of the Antelope and Fremont Valleys to be within their traditional use area: the Kitanemuk, the Tataviam, and the Kawaiisu. This subsection presents ethnographic information for each of these groups.

5.3.1.8.1 Kitanemuk

The Kitanemuk are the northern subdivision of the Taaqtam or “Serrano” peoples. The name “Serrano,” meaning “mountaineer” or “highlander,” was given to the Taaqtam by Spanish missionaries in the late 18th century. Though grouped together by ethnographers according to linguistic similarities, Kitanemuk people in the early ethnographic period did not identify as Serrano. Kitanemuk are speakers of the Serran language, which is derived from the Takic linguistic family (Bright 1975). Takic speakers are believed to have replaced earlier Uto-Aztecan speakers throughout areas of Southern California during the Late Pre-Contact complex (Bergin and Ferraro 1999; Sutton 1980,2017).

The Kitanemuk primarily resided in the higher ground of the Tehachapi Mountains, though during cooler seasons, they often did dwell within the arid lowlands of the Antelope Valley (Blackburn and Bean 1978). Their highland territory spanned the Tehachapis from Caliente Creek on the north to Pastoria Creek to the south, but their lowland territory encompassed an area ranging from the foothills of the Tehachapi Mountains to reach areas that included both Rosamond and Rogers Lakes, though the Kitanemuk and other Serrano groups purportedly held the majority of the Antelope Valley (King and Blackburn 1978). In terms of cultural territory, this group was bordered by the Tataviam on the south, the Kawaiisu on the north and east, other Serrano groups on the far east, and Southern Valley Yokuts to the north and west. Although relations were hostile between Kitanemuk and their immediate neighbors at times, they maintained excellent trade relationships with distant groups including the Chumash, Tubatulabal, Mojave, and Quechan (Harrington 1917; Blackburn and Bean 1978).

The Kitanemuk resided in permanent winter villages of 50 to 80 residents or more, dispersing into smaller gathering groups throughout the warmer months. Largely dependent on plant food sources, subsistence staples among the Kitanemuk included acorns, pinyon seeds, yucca, elderberry, and mesquite beans, but venison was a common protein source. The take of a man’s first deer was an important rite of passage among the Kitanemuk. Little is known about their traditional dwellings, but some early twentieth-century studies suggest that wattle and daub was a common building material (Blackburn and Bean 1978). On his 1769 visit to a Kitanemuk village,

Franciscan missionary Francisco Garces made note of a large communal dwelling made of tule with a central courtyard. However, it is believed that the structure that Garces referenced was a ceremonial structure (Coues 1900; Blackburn and Bean 1978). The village that Garces visited was likely the Kitanemuk settlement at Willow Springs (Sutton 1980; Lien 2021).

Funerary rites among the Kitanemuk involved a ceremony similar to a wake, where the body was held for several days at the home of the chief and was attended to by elders. Individuals were buried intact in dedicated cemeteries, where the elders sang and cried to the dead to inform them of the decedent's arrival. At the time of burial, the cranium of the decedent was opened with a stone and a small portion of the brain was given to each mourner to consume (Blackburn and Bean 1978). Valuables were placed in the grave with the decedent before the grave was closed with baskets of dirt. Following burial, the decedent's clothing and other possessions were burned in a hole outside of their former home.

5.3.1.8.2 Tataviam

The language of the Tataviam was influenced by Takic family groups (if not Takic in origin itself), but Harrington notes that Tataviam language is not particularly of Serran or Cupan stock (1917). The language began to differentiate and diverge from other groups in Southern California around 1,000 BP and as the language changed, mortuary practices also moved to a common practice of cremation. However, earlier Tataviam cemeteries and villages resembled those of neighboring Takic-speaking groups, including the Kitanemuk and Serrano (King and Blackburn 1978).

Tataviam territory was separated from the Kitanemuk by the Liebre and Sawmill Mountains, of which the Tataviam populated the southern slopes (King and Blackburn 1978). The Kitanemuk bordered the Tataviam to the north, Chumash groups bordered them to the west, and the southern and eastern boundaries of Tataviam territory were held by Tongva and Kizh groups. The southern boundary of Tataviam territory is historically considered to be the Santa Clara River, and the western boundary Piru Creek, with the Tataviam mostly dwelling at elevations between 1,500 and 3,000 feet within the eastern Santa Ynez Mountains and the western San Gabriels. Several Tataviam villages, however, including Chibuna, Najayanga and Najavait, were located to the south of the Project Area in the vicinity of present-day Lancaster (Fernandeño Tataviam Band of Mission Indians n.d.).

Subsistence among the Tataviam was similar to that of the Kitanemuk, with deer and small mammals being the basis of animal protein sources and yucca, acorn and juniper berries being the major plant sources. Yucca buds were baked in earth ovens and these staple foods were used to support larger population centers sustaining as many as 200 members (King and Blackburn 1978). Smaller satellite settlements of 10 to 15 members were essential for resource procurement to support the wider population. It is believed that at the time of historic contact, the total population of the Tataviam did not exceed 1,000 people.

5.3.1.8.3 Kawaiisu

The Kawaiisu are the westernmost group of the Numic language family and covered a territory ranging from the Southern Sierra Nevada to the Coso and Argus Ranges, through Death Valley, and to the Mojave River, Rogers Lake, and the Tehachapi Pass (Zigmond 1986). Kawaiisu territory expanded into the Fremont Valley and possibly reached into the northern extremes of the Antelope Valley. With such a widely varied territory, the Kawaiisu survived on a varied diet of plant sources including acorns and mesquite beans (Zigmond 1981). Deer and small game such as rodents, birds, lizards, and pandora moth caterpillars were staple protein sources, and taboo meat sources, such as coyote and buzzards, were often used as emergency food sources. As food gathering tools, the Kawaiisu wove and used a wide variety of baskets for collection, seed threshing, and leaching with bedrock mortars, metates, and slicks used for processing (Zigmond 1986). Obsidian tools such as knives and scrapers were commonly used, and major obsidian sources along the Coso Range were located within Kawaiisu territory. The Kawaiisu cultivated and utilized two principal varieties of tobacco for ritual use, *Nicotiana attenuata* and *Nicotiana bigelovii.*

Previous archaeological studies near the Tehachapi Pass have identified sites attributed to the Kawaiisu with large concentrations of bedrock mortars and extant house rings (Schiffman and Garfinkel 1981). By the ethnographic period, Kawaiisu population numbers were estimated to be no more than 500, although, from the development of associated sites, those numbers were likely much higher in antiquity. Kawaiisu houses were

constructed on circular bases with vertical willow poles to create the structure, which were surrounded by bark and tule mats to make the houses waterproof.

5.3.1.9 Historic Setting

While Spanish, Russian, and British explorers did visit areas of coastal California for brief periods from 1529 to 1769, the general post-Contact history of the state of California, especially within the desert interior, does not begin until the establishment of the settlement at San Diego and the founding of the Mission San Diego de Alcala in 1769. As such, the historic context of the state is generally divided into three distinct and continuous periods: the Spanish period (1769–1822), the Mexican Period (1822–1848) and the American Period (1848–the present).

5.3.1.9.1 Spanish Period (1769–1822)

Early Spanish missionaries and colonists residing in Mexico believed California to be an island. Because of this, the peninsula now known as Baja California was named for the Amazon Queen Califa of Garci Ordoñez de Montalvo's 1510 novel *Las Sergas de Esplandian,* who ruled a beautiful and mystical island (Hoover et al. 2002). It was not until 1542 that Juan Rodriguez Cabrillo and his expedition first made landfall in Alta California, when they arrived on the shore of present-day Santa Catalina Island. Cabrillo and his men then explored the San Pedro and Santa Monica Bays before departing. Spanish colonization of Alta California did not occur until the overland expedition of Captain Gaspar de Portola. With a band of soldiers and missionaries, Portola established the first Spanish settlement in Alta California, the Presidio of San Diego. Under decree of the Spanish king Charles III to establish a campaign of the Franciscan Order in the Americas, Father Junipero Serra founded the Mission San Diego de Alcala, the first of the Spanish missions in California, in July 1769 (Bancroft 1885; Gumprecht 1999). From 1769 to 1823, an additional 20 missions were established across Alta California. In 1776, Franciscan missionary Francisco Garces briefly entered the Antelope Valley and was known to have visited one or more Kitanemuk villages, but little is known about what transpired, other than some notes that were kept in Garces' diaries (Coues 1900; Blackburn and Bean 1978). Other Spanish expeditions into the Mojave Desert around this period included the expedition of Lieutenant Governor Pedro Fages in 1772. Fages entered the desert through the Cajon Pass and searched the foothills of the San Gabriel Mountain, looking for deserters of the Spanish Army who had fled to live among the Serrano, but Fages' expedition did not travel deeply into the Antelope Valley. Though mission lands absorbed the entirety of the fertile coastal interior, they did not extend beyond the Transverse Ranges, as the lands were not seen as suitable for cattle grazing. However, by 1810, virtually all of the Tataviam had been baptized into the Mission San Fernando Rey de España and many Kitanemuk had been recruited into the San Fernando, San Gabriel, and San Buenaventura Missions (King and Blackburn 1978; Blackburn and Bean 1978).

Spanish travel through other areas of the Western Mojave was conducted across a trade route referred to as the Old Spanish Trail. In order to connect Santa Fe to Los Angeles, the Spanish utilized old Native American trails and routes to link the two important settlements. The Old Spanish Trail crossed from Santa Fe into Colorado and Utah before turning southwest into Southern Nevada through present-day Las Vegas, eventually entering the San Bernardino Valley through the Cajon Pass before reaching Los Angeles (Sutton and Earle 2017). Merchants, missionaries, explorers, and soldiers used this trail, crossing the Western Mojave, far to the southeast of the present Project Area.

5.3.1.9.2 Mexican Period (1822–1848)

Following years of unrest and violence, Mexico gained its independence from Spanish rule in 1821 and California was secured as a Mexican territory in 1822 before becoming a federal republic in 1824 (Hine and Farragher 2000). During Spanish rule, great emphasis was placed on the campaign of conversion and the spread of Christianity through the mission system, in which it was expected that Native Americans would be incorporated into Spanish Christian society. Following Mexican independence, all former mission lands were confiscated, and the secularization of the system began in 1834 under Governor Juan B. Alvarado. In 1836 Alvarado began to subdivide the lands formerly controlled by the missions into large land grants called ranchos. As mission lands did not reach the Antelope Valley, the subdivision of the ranchos did not directly affect the vicinity of the Project Area. During this period, American frontiersmen began to explore the desert by way of the Old Spanish Trail and other routes. In 1819 American trapper Jedediah Smith made his way across the desert via the Old Spanish Trail,

following the course of the Mojave River, to the Serrano settlement of Wa'peat (Earle 2005). John C. Fremont later used the Old Spanish Trail for his return to California in 1846 (Hine and Farragher 2000).

5.3.1.9.3 American Period (1848–Present)

War broke out in 1846 between Mexico and the United States over territorial tensions in Texas and, to a lesser degree, in California. After 2 years of fighting, peace was made with the Treaty of Guadalupe Hidalgo on February 2, 1848. Nine days after the treaty was signed, gold was "discovered" at Sutter's Mill, near Sacramento. News of the abundance of the precious metal spread quickly to the east coast and the new territory was quickly inundated with settlers and homesteaders from across the country, seeking fortune and a new life in the new west.

The desire for gold quickly led to settlement and conflict between Native Americans and settlers in what became the Antelope Valley. The Old Spanish Trail was a reliable overland route for homesteaders entering the region from the east, and with the discovery of gold in the Southern Sierra, prospectors soon entered the area of the Tehachapi Mountains and Fremont and Antelope Valleys. In 1853 the Sebastian Indian Reservation was established on the Rancho Tejon Mexican Land Grant by the Superintendent of Indian Affairs in California, Edward F. Beale, as the first reservation in California for the purpose of relocating and protecting both Native Americans who had been baptized into the mission system and those who were under threat by conflict with miners, cattle rustlers, and raids from other desert Native American groups, like the Paiute, Chemehuevi, and Mojave (Office of Historic Preservation n.d.). In 1854 the U.S. Army established Fort Tejon to protect the Reservation. Nearly all of the Kitanemuk were relocated from their territory within the Tehachapi Mountains and Antelope Valley and moved to Fort Tejon and the Sebastian Reservation. It is because of this association that descendant Kitanemuk are referred to as the Tejon Tribe (Blackburn and Bean 1978).

The desert provided water resources by way of springs for weary travelers, explorers, and miners. The most notable in the region was Willow Springs. Fremont stopped at Willow Springs in 1844 on one of his expeditions, as did the Jayhawk and Bennett-Arcan Parties in 1850 after losing their way in Death Valley (Lien 2021). Willow Springs was an important watering station for the Los Angeles-Havilah and Inyo Stage Lines and for freight teams hauling silver and borax across the flat expanse of desert. In 1862, by decree of President Abraham Lincoln, Willow Springs was transferred from public lands to private ownership and bestowed to Edward Beale.

As the population of the young state continued to grow, so did its agricultural product. Farmers in the Los Angeles Basin were eager for a new transportation route to export their goods to points north and east. In 1872 the Southern Pacific Railroad was proposed to connect Los Angeles to Fresno, Stockton, and Oakland by way of the San Joaquin Valley (Serpico 2000). Construction on the Soledad Canyon Route began in 1874, seeking to connect the operating Delano Station to Los Angeles by way of the Antelope Valley. Beginning at Delano and making its way south, the most difficult portion of rail to lay proved to be that of the Tehachapi Grade. The rail was originally intended to take a more direct course through Willow Springs, but because of a dispute over ROW negotiations with Beale, the line was rerouted (Lien 2021). Over the course of 15 months, a crew of thousands of mostly Chinese laborers reshaped the land to make the route passable by rail. Following this labor, the 35-mile segment of track that was laid on mostly flat expanses of the Mojave Desert, from Mojave to Alpine, was easy. An account of the first passage on this segment appeared in the August 17, 1876 edition of the *Kern County Gazette* and describes the voyage across the portion between Mojave and Rosamond Stations, in the vicinity of where the present Project Area lies: "We glide swiftly off the track in the midst of a vast expanse of desert, on whose surface there is nothing but a few cactus trees and a thin sickly growth of what we took to be a species of chaparral, while beneath the surface, at a distance from 2 to 12 feet, there is an abundance of cold pure water (Serpico 2000, citing *Kern County Gazette* 1876). Sand Creek Station, which later became known as Rosamond, was the location of a large water tank and a windmill-powered well, which provided important water along the route and eventually led to the decline of Willow Springs (Serpico 2000; Lien 2021). The development of the rail and the associated station led to the establishment of the Southern Pacific-owned townsite of Rosamond. The townsite was named after the daughter of a Southern Pacific official (Gurba 2013).

The stations at Mojave and Rosamond were important freight loading stations for the mineral and clay mining districts in the area. In 1880 Dr. L.A. Crandall discovered a clay deposit on the north side of a hill approximately 3.5 miles northwest of Rosamond Station and began exporting fire clay to brick and pipe makers in Los Angeles (Jackson 1968). In 1894, one of Crandall's customers, a retired soldier and brick maker named Ezra M. Hamilton, purchased the claim from Crandall, and after 2 years of prospecting within the claim, Hamilton struck gold in 1896 (Hoover et al. 2002). With the wealth that Hamilton acquired through the gold mine that he named the Lida Mine,

he purchased Willow Springs and the surrounding land in 1900 to develop as a resort town, which thrived during a period in which homesteads dotted the landscape and ranchers needed mail and other services. Hamilton later sold the Lida Mine to the Tropico Mining and Milling Company in 1909 and retired to Willow Springs until his death on July 4, 1914 (Plata 2021; Whitesitt and Moore 1987).

Although it thrived during the first World War, this segment of the rail saw a steep decline in the following years and the Rosamond and Acton stations were closed by 1924 (Serpico 2000). The Lida Mine, later renamed the Tropico Gold Mine, was also sold in 1924 to H. Clifford and Cecil Burton, who operated the mine until 1956 when operations became too expensive to maintain (Plata 2021). In 1933 Lieutenant Colonel H.H. “Hap” Arnold established the Muroc Bombing and Gunnery Range as a remote bombing range for the U.S. Army Air Corps. The small community of Muroc on the edge of Rogers Dry Lake got its name from the Corum family, an entrepreneurial homesteading family who helped other homesteaders develop their plots, clear their land, and drill their wells (Edward Air Force Base n.d.). The Corums, who settled there in 1910, had previously requested a post office, but the postmaster rejected their request because of a Coram, California, having been established north of Redding. To subvert this rejection, the Corums reversed the spelling of their name to Muroc and established their community. As the United States entered World War II, permanent bases and training facilities were established throughout the Mojave Desert and Muroc was activated as Muroc Army Air Base in July 1942 (Edwards Air Force Base n.d.). By October 1942, the test flights of the experimental Bell XP-59A Airacomet and Lockheed XP-80 jet planes were taking place on Rogers Dry Lake and on October 14, 1947, Captain Chuck Yeager became the first person to break the sound barrier at Muroc. Muroc Army Air Base was renamed Edwards Air Force Base in 1949, in honor of Captain Glen W. Edwards who was killed the previous year during a test flight of the Northrop YB-49 flying wing. Expansion of the base encroached onto areas historically used for homesteading. The formation of the base required the federal government to purchase 30,000 acres of land from the Southern Pacific Railroad and 12,526 acres of privately owned land in addition to the 38,720 acres that the government already held in the base’s vicinity (U.S. Army Air Forces 2020). The base has since expanded its boundaries several times and is currently the second largest base in the U.S. Air Force with a total installation landholding of 470 square miles (Department of Defense n.d.).

Following World War II, suburban development in the area of Rosamond boomed. As the homesteads of the area began to fade, housing tracts went into development to support the growing community of military personnel, skilled tradespeople, and laborers. As the area developed, roads did as well, bringing both greater commerce and vacationers and tourists who sought amusement and entertainment outside of the busy urban streets of Los Angeles. On November 23, 1953, Willow Springs International Raceway held its inaugural race and is the oldest permanent road track in the United States (Willow Springs International Raceway 2018). In addition to numerous National Association for Stock Car Auto Racing, LLC (NASCAR) and motorcycle races held, the track has also served as the location for several major motion pictures, including *Ford v. Ferrari* and *Furious 7*, and was registered as a California Point of Historical Interest in 1996.

After the opening of the raceway, the area continued to grow, with many more of the numbered streets extending north and paved from Palmdale and Lancaster. Despite the expansion of infrastructure, rural areas west and north of central Rosamond grew more slowly than other areas of the Antelope Valley, allowing for easier access and development of renewable energy projects in the area. The first wind farm was constructed in the 1980s in the foothills of the Tehachapi Mountains, west of the Project, and that has been followed by a number of solar and additional wind power facilities, as well as transmission corridors and SCE substations, over the last 40 years.

5.3.2 Research Design for the Cultural Resources Inventory

Archaeological investigation generally contributes to collective understanding of the past by describing, recording, and reconstructing past lifeways; testing hypotheses regarding activities in the past; and reinforcing, altering, or challenging the current assumptions of the past (Little and Seibert 2000:29). To do this, investigators identify guiding research questions. In this evaluation, research questions are separated into pre-Contact and historic subcategories.

5.3.2.1.1 Chronology

Chronological information can be used to understand the trajectory and rate of cultural change and to establish relationships among sites at both local and regional levels. Chronological information can be derived from historic-period sites through the analysis of maker’s mark and artifact styles, but pre-Contact sites will require

chronometric dates and formal diagnostic artifacts. Important questions or issues that can be addressed based on accurate chronological controls include but are not limited to the following:

- What was the period of occupation of the site and was the use or occupation continuous or discontinuous?
- Was the site contemporaneous with other sites in the area, or was it representative of a distinct period?
- How does this site inform previously established regional chronologies?
- Were different portions of the site utilized at different times?
- How did changes through time impact site occupation, resource procurement, and population density?
- Are historic artifact scatters reflective of distinct patterns of time or are they continual sites of deposit?
- What methods could be used for dating the site?

Temporally sensitive pre-Contact artifact types, such as shell beads and projectile points identifiable to specific time periods, can help place the site within the recognized pre-Contact cultural horizons developed thus far for Southern California. Specialized studies may also be conducted including obsidian hydration dating and C14 dating; materials that can be dated directly can provide specific chronological information for the site. Stratified cultural deposits can provide provenience for artifacts and material samples.

5.3.2.1.2 Flaked Stone Tool Technology

Flaked stone tools and the by-products of their production can be used to address important research questions regarding reduction trajectories employed in tool manufacture, as well as the types of activities carried out at an archaeological site. In addition, a valid sample of flaked stone material can help answer questions concerning how reduction sequences vary by type of material reduced, whether assemblages change over time, if assemblages represent local procurement or imported or partially finished materials, and if flaked stone assemblages can be characteristic of a specific cultural group. These data can help address questions related to the division and organization of labor, as well as questions that explore the relationships between people and their environment. Important questions or issues that can be addressed through flaked stone analysis include the following:

- What were the typical reduction trajectories employed in flaked stone tool manufacture at the site?
- Do these trajectories vary by the type of material used?
- How did flaked stone assemblages and material preferences change over time?
- Were flaked stone assemblages characterized by local raw material procurement and reduction, or were the assemblages more complex and inclusive of imported materials?
- What tool types comprised the flake stone assemblage and what sorts of activities were represented by flaked stone tool types?
- Did the flaked stone tool assemblage suggest the use of the site over a continuous period of time (indicated by a greater density and diversity of flaked stone tools, evidence of numerous stages of reduction and tool manufacture, and evidence of retooling) or did it reflect temporary or intermittent occupation (suggested by fewer stages of reduction, repair or retooling, with fewer tool types)?
- What changes in technology occurred during and between periods of occupation?
- Are there indications of symbolic or ritualistic use of flaked stone tools that may shed light on cultural practices in the area?
- What was the distribution of flaked stone materials on the site relative to other types of artifacts and features and how might those distributions have reflected task-specific behaviors?
- Are the tools different from those found at other sites in the region, and if so, what accounts for these differences?

Flaked stone tools must be recoverable in datable contexts or intact stratified cultural deposits or recovered in association with other temporally diagnostic artifacts or features. Variability in the distribution of flaked stone tool forms may provide clues as to site function, specific tasks that took place at the site, and temporal affiliation. A large and complex assemblage of tool forms and debitage made from various raw materials, excavated from

either individual or (to a lesser degree) site-wide features, can be used to examine changes in flaked stone tool manufacturing trajectories, technological development, and regional interaction through time.

5.3.2.1.3 Ground Stone Tool Technology

Ground stone artifacts can be used to address several research issues, including manufacturing method, change through time, or the division of labor and social organization. The presence or absence of certain ground stone tool types can be chronologically sensitive and could be used to answer questions relating to subsistence practices. Important questions or issues that can be addressed through analysis of ground stone technologies include the following:

- What were the cultural factors influencing the decision to deposit the artifact loci at this site?
- How did the spatial distribution of artifacts, features, and other cultural materials at the site reflect the location of the site relative to other food processing sites in the area?
- What types of materials were selectively deposited at this site, and do they reflect cultivation or other off-site activity?
- What was the nature of the activities that occurred at the site at various points in time?
- How or to what extend did artifact assemblages or subsistence practices shift as a result of the expanding farming presence in the Antelope Valley?

5.3.2.1.4 Trade and Exchange

The Antelope Valley represents a potential middle ground and rest location for trading parties, given the view of the entire valley that can be seen from certain ridges within the valley, and that travelers and animals would make use of the springs located in the vicinity. Pre-Contact occupants of the valley may have been positioned along regional trade and exchange routes that linked the coast and the desert interior. Important questions or issues that can be addressed include the following:

- What pre-Contact trade routes were associated with the area?
- How did the selection of raw materials for manufacture or the types of lithic materials used in finished tools reflect mobility patterns or preferences in socio-economic interactions with neighboring groups over time?
- The presence of shell artifacts would indicate interaction and trade with coastal groups; is there any indication that these materials were obtained through trade?
- What effects did trading and interacting with neighboring communities have on human activity in the area?
- What evidence from other sites in the region suggests pre-Contact coast/interior interaction? How can that evidence be employed to understand human activities at Mojave Desert sites?
- Are there tool types or styles found at the site that are characteristic of other areas of non-local assemblages?

Evidence for trade and socio-economic interaction can be gained through an examination of artifacts derived from identifiable local and non-local sources. Distinctive tool types can also be used to infer the group and temporal period that produced them. Such materials must be recovered from intact, datable deposits in order to be related to a particular time.

5.3.2.1.5 Subsistence Strategies

Subsistence strategies can be used to address research questions regarding the development and spread of agricultural practices within the Antelope Valley and Mojave Desert area. Tracing the development of food processing may allow researchers to understand the efficiency of resource exploitation and technological adaptations. Changes in strategies over time may reflect adaptations in response to specific environmental challenges faced through climatic fluctuations on food production. Important questions or issues that can be addressed through analysis of subsistence strategies:

- What regional variations exist in subsistence strategies? How did environmental factors influence the diversity of food production and consumption practices?
- To what extent did climatic change influence the evolution of subsistence strategies?

- What role did subsistence strategies play in social structures, including the division of labor and the development of social hierarchies within ancient communities?
- In what ways did agricultural practices shape patterns of human migration and establishment of settlements?
- Were gender roles delineated in the context of food production?

5.3.2.2 Resources Inventory

5.3.2.2.1 Record Research

The Applicant's cultural resources team WSP archaeologist Michael Amorelli conducted a literature review and records search at the Southern San Joaquin Valley Information Center (SSJVIC), housed at California State University, Bakersfield, on May 17, 2023 (SSJVIC No. 23-185). Mr. Amorelli conducted a second supplemental records search on September 6, 2023 (SSJVIC No. 23-380) in order to better inform areas of archaeological sensitivity that may be impacted by Project design changes and to gain a better understanding of the historical and archaeological record of the area. This inventory included the PProject Area and a 1-mile radius around the Project Area, collectively termed the Records Review Area (see Figure A.3 in Appendix 5.3B). The objective of this records search was to identify the nature of previously recorded pre-Contact and historical cultural resources that may be directly or indirectly affected by the Project's development and to aid in assessing the potential for impacts on unknown surface or subsurface cultural resources during Project construction. Such archival research is conducted prior to fieldwork in order to assess the current condition of known sites and to identify areas of particular surface sensitivity. An analysis of the potential archaeological sensitivity of the Project Area and the potential for sensitive cultural and tribal cultural resources to occur is provided in the confidential Appendix 5.3B. The understanding of the ethnographic, prehistory, and history of the region together with the results of the literature review informed the field survey methods to ensure proper identification of resources in the Project Area.

As part of the cultural resources inventory, historical maps, and aerial images were reviewed to characterize the developmental history of the Project Area and vicinity. The following historical maps were consulted:

- U.S. Geological Survey (USGS) *Elizabeth Lake, CA* (1915) 30-minute,
- USGS *Rosamond, CA* (1943 and 1965) 15-minute,
- USGS *Willow Springs, CA* (1943 and 1965) 15-minute,
- USGS *Soledad Mountain, CA* (1947 and 1973) 7.5-minute,
- USGS *Rosamond, CA* (1947) 7.5-minute,
- USGS *Los Angeles, CA* (1949) 1-degree,
- USGS *Little Buttes, CA* (1965) 7.5-minute,
- USGS *Fairmont Butte, CA* (1965) 7.5-minute USGS quadrangles,
- Bureau of Land Management (BLM) General Land Office Survey Plats for Township 10N, Range 12W, Township 10N, Range 13W, Township 9N, Range 12W, Township 9N Range 13W, Township 9N, Range 14W, and Township 9N, Range 15W, San Bernardino Baseline and Meridian.
- Historical aerial images from NETROnline dated 1948, 1959, 1963, 1972, 1974, 1987, 1990 and 1994.

Results of the archival records search indicate that several claims in addition to the Lida Mine had been staked on Tropico Hill by 1917, and that several isolated homesteads were located along Rosamond Boulevard by this time. Sierra Highway followed its current alignment by 1917, but segments of Mojave Tropico Road and Rosamond Boulevard were still unimproved and did not follow the present alignments. A network of dirt roads was developed in the Hidden Valley area to connect several isolated homesteads to Rosamond by 1943 and Mojave Tropico Road matched its modern alignment by this time. The neighborhood to the south of Tropico Hill was constructed and development along Rosamond Boulevard increased, though very little extends beyond 67th Street West, as most areas west of Willow Springs and north of Rosamond Boulevard were identified as a state game refuge. Homesteads beyond this point begin to appear around 1948. On the 1956 USGS *Rosamond, Calif.* 15-minute quadrangle map, a structure is noted on the proposed plant facility site. This structure and an ancillary building, as well as several dirt roads that border the proposed plant facility site on the south and west, are visible on the 1959 historic aerial survey. These dirt roads are still extant today. By 1965 more rural dirt roads west of Willow Springs begin to appear, and by 1972, SR-14 and Dawn Road followed their current alignments. The structure and

ancillary building on the proposed plant facility site also appear to have been destroyed by this time. Development in the Hidden Valley area slowly increased from this time until the late 1980s. In 1994 several parcels to the west of SR-14 were graded, but they remain undeveloped today. A water tank on a parcel owned by the California State Lands Commission first appeared at this time and is still extant.

The Records Search review indicates that no fewer than 292 previous investigations have been conducted and documented within 1 mile of the Project Area since 1961. A detailed list of the 292 previous studies that have been conducted within 1 mile of the proposed WRESC project is provided in Appendix 5.2B. Forty-one of these studies were conducted within portions of the Project Area (**Table 5.3-1**).

Table 5.3-1: Previous Cultural Studies Within the Record Search Area

Report#	Year	Author	Title	Project Component
KE-00302	1992	Brock, James	Cultural Resources Assessment of Assessors Parcel Number 431-022-09, Rosamond Hills Area of Kern County, California	Preferred Gen-Tie Route
KE-00303	1992	Brock, James and Davidson, Katherine D.	Cultural Resources Assessment of Section 31, Township 10 North, Range 12 West, Rosamond Hills Area of Kern County, California	Preferred Gen-Tie Route
KE-00304	1993	Brock, James	Cultural Resources Assessment of 240 Acres in Section 32, Township 10 North, Range 12 West, Rosamond Hills Area of Kern County, California	Preferred Gen-Tie Route
KE-00355	1994	Clift, Gregory R. and Sutton, Mark Q.	An Archaeological Assessment of Tentative Tract No. 5612, Rosamond, Kern County, California	Preferred Gen-Tie Route
KE-00678	1990	Murphy, Peggy and Sutton, Mark Q.	An Archaeological Assessment of 19.6 Acres Adjacent to Tropico School, Rosamond, Kern County, California	Preferred Gen-Tie Route
KE-00802	1989	Parr, Robert E.	An Archaeological Assessment of 480 Acres of Land West of Rosamond, Kern County, California	Preferred Gen-Tie Route
KE-00803	1989	Parr, Robert E.	An Archaeological Assessment of 80 Acres of Land West of Rosamond, Kern County, California	Preferred Gen-Tie Route
KE-00856	1995	Parr, Robert E.	Archaeological Assessment of Parcel 3, PM 260, and Parcels 2 and 4, PM 8161, near Rosamond, Kern County, California	P2 Staging Area, Preferred Gen-Tie Route
KE-00869	1990	Parr, Robert E. and Jackson, Scott	An Archaeological Assessment of 840 Acres of Land Near Willow Spring, Kern County, California	Preferred Gen-Tie Route
KE-01355	1989	Schiffman, Robert A.	Archaeological Investigation for a 1900 Acres West of Rosamond, Kern County, California	Preferred Gen-Tie Route
KE-01435	1992	Schiffman, Robert A.	Archaeological Investigation of Lots 1 & 32 of Tract #2085 Section 16, T.9N., R.13W. Kern County, California	Preferred Gen-Tie Route
KE-01605	1989	Sutton, Mark Q.	An Archaeological Survey of PM 8386, 20 Acres at 90th W. and Rosamond Blvd.	Preferred Gen-Tie Route
KE-01624	1990	Sutton, Mark Q. and Everson, G. Dicken	An Archaeological Assessment of 1,291 Acres of Land near Rosamond, Kern County, California	Preferred Gen-Tie Route

Report#	Year	Author	Title	Project Component
KE-01823	1991	Yohe II, Robert M.	An Archaeological Assessment of Approximately 350 Acres of Land in Hidden Valley Near Rosamond, Kern County, California	Preferred Gen-Tie Route
KE-02539	2001	Cunkelman, Sarah C.	Survey and Evaluation Report for Proposed Acton Phase I Land Exchange Near Tropico Mine	Preferred Gen-Tie Route
KE-02845	2003	Parr, Robert E.	A Cultural Resources Assessment of 2.29 Acres of Land on the North Side of Rosamond Boulevard, City of Rosamond, Kern County, California	Preferred Gen-Tie Route
KE-03212	2006	Romani, John	Archaeological Survey Report: Rosamond Boulevard from SR 14 to 90th Street West, Rosamond, Kern Co., CA	Preferred Gen-Tie Route
KE-03534	2006	Nilsson, Elena, Bevill, Russel, Kelly, Michael S., and Dwyer, Erin	Archaeological Inventory of the First and Second Los Angeles Aqueducts and Selected Access Roads, Kern, Inyo, and Los Angeles Counties, CA	Preferred Gen-Tie Route
KE-03546	2006	Ahmet, Koral, Mason, Roger, and Bholat, Sara	Cultural Resources Survey Report for Antelope Transmission Project: Segments 2 & 3 Los Angeles and Kern Counties	Preferred Gen-Tie Route
KE-03710	2008	Schmidt, James J.	Southern California Edison (SCE) Tehachapi Renewable Transmission Project, Racetrack Marshalling Yard, West Rosamond Boulevard and 75th Street West, Rosamond Area, Kern County, California	Preferred Gen-Tie Route
KE-03874	2009	Glover, Amy and Gust, Sherri	Supplemental Cultural and Paleontological Resources Assessment, Segment 3A, Section1, Tehachapi Renewable Transmission Project	Preferred Gen-Tie Route
KE-03941	2009	Price, Barry A., Baloian, Mary Clark, Lichtenstein, Robert, and Linder, Marc	Confidential Specialist Report: Cultural Resources Inventory for the Tehachapi Renewable Transmission Project Kern, Los Angeles, and San Bernardino Counties, California	Preferred Gen-Tie Route
KE-04057	2011	Hudlow, Scott M.	Phase I Cultural Resources Survey for PV3, Willow Springs, Kern County, California	Preferred Gen-Tie Route
KE-04058	2011	Hudlow, Scott M.	Phase I Cultural Resources Survey for PV-11, (Rosamond Solar Array) Rosamond, Kern County, California	Preferred Gen-Tie Route
KE-04080	2010	Wilson, Stacie and Jordan, Stacey C.	Cultural Resources Report for the Proposed RRG Antelope Valley Solar Project Kern and Los Angeles Counties, California	Preferred Gen-Tie Route
KE-04099	2012	Miller, Jason Andrew	Results of the AV Solar Ranch Survey (LSA Project No. SCE1105S)	Preferred Gen-Tie Route
KE-04132	2011	Schmidt, James J.	Archaeological Letter Report: EKWRA Telecommunications Sub-transmission Line Project (IO#307780), Rosamond Boulevard, Rosamond and Edwards Air Force Base, Kern County, California	Preferred Gen-Tie Route

Report#	Year	Author	Title	Project Component
KE-04136	2011	Parr, Robert E.	Cultural Resource Assessment for the Replacement of Twenty-three Southern California Edison Company Deteriorated Power Poles in Los Angeles and Kern Counties, California	Preferred Gen-Tie Route
KE-04156	2010	Bonner, Wayne H.	Cultural Resources Records Search and Site Visit Results for T-Mobile USA Candidate SV12516-B (APE Monopole), 7347 West Rosamond Boulevard, Rosamond, Kern County, California	Preferred Gen-Tie Route
KE-04190	2012	Romani, Gwendolyn	Archaeological Survey Report Improvements to 55th Street West from Rosamond Boulevard to Ash Street (approximately 0.65 miles), Rosamond, Kern County, California	Preferred Gen-Tie Route
KE-04217	2012	Hudlow, Scott M.	A Supplemental Phase I Cultural Resource Survey for Gen Tie Lines, RE Rosamond One, Kern County, California	Preferred Gen-Tie Route
KE-04224	2010	Pacific Legacy Inc.	Supplemental Archaeological Investigation and National Register of Historic Places and California Register of Historical Resources Eligibility Evaluation of Archaeological Site CA-KER-7214H Southern California Edison Tehachapi Renewable Transmission Project, Segment 9, Kern County, California	Preferred Gen-Tie Route
KE-04225	2010	Jackson, Thomas, Armstrong, Matthew, and Sikes, Nancy	Cultural Resources Inventory of the Southern California Edison Company Whirlwind to Rosamond and Rosamond to Windhub Telecommunication Line, Kern County, California	Preferred Gen-Tie Route
KE-04227	2010	Schneider, Tsim D. and Holson, John	Supplemental Archaeological Survey Report #2, Tehachapi Renewable Transmission Project Segment 10, Kern County, California	Preferred Gen-Tie Route
KE-04229	2010	Panich, Lee, Cimino, Stephanie, and Holson, John	Supplemental Archaeological Survey Report #1, Tehachapi Renewable Transmission Project Segment 10, Kern County, California	Preferred Gen-Tie Route
KE-04260	2011	Hudlow, Scott M.	A Phase I Cultural Resource Survey for Seven Kern Desert Solar Farm Sites, Kern County, California	Preferred Gen-Tie Route
KE-04953	2017	Whitley, David, Carey, Peter, and Azpitarte, Robert	Phase I Survey/Class III Inventory, AVEP Solar Project, Kern County, California	Preferred Gen-Tie Route
KE-05013	2017	Gilbert, Rebecca	Archaeological Survey Report for Southern California Edison's (SCE) North Rosamond Project near Whirlwind Substation, Kern County, California	Preferred Gen-Tie Route
KE-05027	2018	Berg, John	Archaeological Survey Report for the Rosamond-Mojave Rehabilitation Project on State Route 14, Kern County, California	Preferred Gen-Tie Route
KE-05163	2019	Hudlow, Scott M.	A Phase I Cultural Resource Survey for Property at the Northeast Corner of 170th Street West and Rosamond Boulevard, Rosamond, Kern County, California	Preferred Gen-Tie Route

Report#	Year	Author	Title	Project Component
KE-05192	2009	Harper, Veronica and Glover, Amy	Archaeological Assessment, Tehachapi Renewable Transmission Project, Segments 4 and 10 Rosamond to Whirlwind and Rosamond to Windhub Proposed Telecommunications Line, Kern County, California	Preferred Gen-Tie Route

The Applicant's archaeologists performed a desktop analysis of the identified resources in the Project Area. (**Table 5.3-2**). The CHRIS records search indicated there are 16 previously recorded archaeological resources within the Project Area and an additional 786 within the 1-mile records search buffer. **Table 5.3-2** provides a summary discussion of archaeological resources previously recorded in the Project Area.

Table 5.3-2: Previously Recorded Cultural Resources within the Project Area

Resource #	Author / Affiliation	Year Recorded	Description	Age	Project Component	Previous CRHR Status
P-15-003359/ CA-KER-3359	J. Brock, Archaeological Advisory Group	1992	Lithic scatter	Prehistoric	Preferred Gen-Tie Route	Not evaluated for eligibility
P-15-007591	Leroy M. Jackson, Kern County	1968	Tropico Gold Mine	Historic	Preferred Gen-Tie Route	Not evaluated for eligibility
P-15-008677	Richard Osborne	1993	Can scatter and possible quarry site	Multi-component	Preferred Gen-Tie Route	Not evaluated for eligibility
P-15-012171	James J. Schmidt, Compass Rose Archaeological, Inc.	2005	Rhyolite core	Prehistoric	Preferred Gen-Tie Route	Not evaluated for eligibility
P-15-012725/ CA-KER-7183H	Brad Brown, Keith Hamm, URS Corporation	2002	Debris scatter	Historic	Preferred Gen-Tie Route	Not evaluated for eligibility
P-15-012793/ CA-KER-7214H	R. Ramirez, J. Hamad, M. KE-03941Adame, F.H. Arellano, K.R. Way, C. Weaver, Pacific Legacy, Inc. K. Ross Way, Pacific Legacy, Inc.	2007 2010	Debris scatter	Historic	Preferred Gen-Tie Route	Recommended ineligible
P-15-013700	Victoria Harvey, Cogstone Resource Management, Inc.	2009	Amethyst glass fragment	Historic	Preferred Gen-Tie Route	Not evaluated for eligibility

Resource #	Author / Affiliation	Year Recorded	Description	Age	Project Component	Previous CRHR Status
P-15-014023/ CA-KER-11218H	N. Lawson, R. Rolston, B. Harmon, CH2M Hill Jeanette A. McKenna, McKenna et al.	2009 2019	Mojave Tropico Road	Historic	Preferred Gen-Tie Route	Not evaluated for eligibility
P-15-014896	Scott M. Hudlow, Hudlow Cultural Resource Associates Alyssa Newcomb, Rebekka Knierim, SWCA Environmental	2010 2015	Farm complex	Historic	Preferred Gen-Tie Route	Not evaluated for eligibility
P-15-014902	Scott M. Hudlow, Hudlow Cultural Resource Associates	2010	House ruins	Historic	Preferred Gen-Tie Route	Not evaluated for eligibility
P-15-014903	Scott M. Hudlow, Hudlow Cultural Resource Associates	2010	Agricultural standpipe	Historic	Preferred Gen-Tie Route	Not evaluated for eligibility
P-15-014906/ CA-KER-8328H	Scott M. Hudlow, Hudlow Cultural Resource Associates	2010	Tamarisk wind row	Historic	Preferred Gen-Tie Route	Not evaluated for eligibility
P-15-017221/ CA-KER-9431H	Scott M. Hudlow, Hudlow Cultural Resource Associates	2012	Debris scatter	Historic	Preferred Gen-Tie Route	Not evaluated for eligibility
P-15-017244	Desiree R. Martinez, Cogstone Resource Management	2013	Clam shell	Prehistoric	Preferred Gen-Tie Route	Not evaluated for eligibility
P-15-018681/ CA-KER-10204H	Michael Dice, POWER Engineers	2014	Los Angeles Department of Water and Power (LADWP) Owens Gorge 230 kV Transmission Line	Historic	Preferred Gen-Tie Route	Not evaluated for eligibility
P-15-020596	Wendy L. Tinsley Becker, Urbana Preservation & Planning, LLC	2020	Access Road to Southern California Edison's (SCE Big Creek Hydroelectric System Vincent 220 kV Transmission Line	Historic	Preferred Gen-Tie Route	Recommended not eligible

The Applicant's architectural historian performed a desktop analysis of the built environment in September and October of 2023. As part of the background research for this project, the architectural historian reviewed previously recorded CHRIS data, the Kern County Built Environment Resources Directory, the National Register of Historic Places (NRHP), the California Register of Historical Resources (CRHR), the lists of California Historical Landmarks, and California Points of Historical Interest and parcel data from the Kern County Recorder's Office. No historic built environment resources were present in the Project Area, though six were identified within the 0.5-mile built environment history Study Area **(Table 5.3-3**).

Table 5.3-3: Historic Built Environment Resources within 0.5 Miles of Project Area

Primary/Temporary No.	Address	Parcel Number	Resource Type/Style
15-003098	5335 Rosamond Boulevard	252-091-18	Spanish Style white stucco home (former home of Captain Chuck Yeager)
15-007591	--	--	Tropico Gold Mine
15-011586	3500 75th Street West	252-050-09	Willow Springs International Raceway
15-013833	--	--	General Petroleum Access Road
15-017243	--	--	SCE Big Creek Hydroelectric System Company Vincent 220 kV Transmission Line (Big Creek #3 Springville)
15-018681	--	--	LADWP Owens Gorge 230 kV Transmission Line (Segment)

5.3.2.2.2 Archaeological Field Survey

The primary goal of the pedestrian survey was to identify and document all cultural resources that appear within the Project component boundaries and associated survey buffers. The results obtained through the field survey provide a better understanding of potential Project impacts to be assessed, but also provide important information for understanding the region's past.

During the period from June 5, 2023, to January 19, 2024, WSP archaeologists Michael Amorelli, Allegria Garcia, Grant Conley, and Thomas Schloeman conducted intensive pedestrian surveys of the Study Area for archaeological resources over a total of 22 days. Additionally, WSP architectural historian Kate Umlauf, assisted by WSP archaeologists Allegria Garcia and Michael Amorelli, conducted an architectural history survey of the BESA (defined in Section 5.3.2 below) over a 3-day period, from September 25 to 27, 2023. Ms. Umlauf meets and exceeds the Secretary of the Interior's Professional Qualifications Standards for architectural history. The pedestrian survey was directed and supervised by Ms. Allegria Garcia, who meets the Secretary of the Interior's Professional Qualifications Standards for Archaeology.

The survey methods followed CEC standards, consisting of parallel pedestrian transects spaced at 10- to 15-meter (33- to 50-foot) intervals when allowed by terrain and vegetation. Crew members also examined subsurface exposures, including rodent burrows and cut banks, when possible. The survey crew navigated transects using georeferenced maps on tablets using the Esri Field Maps application and handheld global positioning system units.

All cultural materials and features of an eligible age (50 years) were recorded on DPR 523 forms during the surveys in accordance with the California Office of Historic Preservation (OHP) *Instructions for Recording Historical Resources* (OHP 1995). Cultural resource records are included in the confidential archaeological survey report, including a map depicting the locations of all previously known and newly identified cultural and tribal cultural resources (Figures C.1 to C.3 in **Appendix 5.3B**) Materials and features that could not be conclusively dated in the field as less than 45 years old were not recorded. Historic-period indicators include standing buildings, objects, auxiliary structures, remnants of structures, built drainage features, or concentrations of materials at least 45 years in age, such as domestic refuse (e.g., glass bottles, cans, and ceramics), refuse from other land use activities such as agriculture (e.g., metal tanks, farm machinery parts, and horseshoes), or structural materials (e.g., nails, brick, glass panes, corrugated metal, and wood posts). Pre-Contact site indicators

include areas of darker soil with concentrations of ash, charcoal, animal bone (burned or unburned), shell, flaked stone, ground stone, and pottery.

5.3.2.2.3 Architectural Field Survey

The primary goal of assessing the architectural history of the Project location is to identify and document all historic built environment resources within the immediate Project Area or viewshed that may be affected by the development of the Project associated infrastructure. Assessment of the historic built environment provides important insight into the historical usage of the area and permits evaluation of built environment resources for inclusion in the NRHP, CRHR, and other associated registers and listings.

WSP architectural historian Kate Umlauf conducted an architectural history survey and inventory of all identifiable historic built environment structures and features within a 0.5-mile buffer of the WRESC Project Area and Preferred Gen-Tie Route in rural areas and no less than one parcel's distance from the WRESC Site and the Preferred Gen-Tie Route in urban and suburban areas, in accordance with CEC standards. The "windshield" survey of the surrounding historic built environment was conducted between September 25 and 27, 2023, specifically addressing standing structures within the BESA older than 45 years that were identified during the desktop review and some buildings and features of particular note that were identified during the earlier surveys. The survey involved the photography and assessment of historic built environment structures, based on styles and unique architectural features. Field assessments of private structures were conducted from the public ROW. Ms. Umlauf exceeds the Secretary of the Interior's Professional Qualifications for Architectural History. WSP archaeologists Allegria Garcia and Michael Amorelli assisted Ms. Umlauf with the completion of this survey.

5.3.2.2.4 Native American Consultation

A request for a Sacred Lands File search for the WRESC Project Area and Native American contact list was sent to the Native American Heritage Commission (NAHC) on December 21, 2023. The objective of the Sacred Lands File search was to determine if the NAHC has any knowledge or record of significant Native American cultural resources (e.g., traditional use areas, sacred or ritual spaces, traditional cultural landscapes or Native American burial locations) within the immediate vicinity of the Project Area. A response was received from Cody Campagne NAHC on December 29, 2023. The response indicated that the Project vicinity is positive for Native American cultural resources and that the Kern Valley Indian Community be notified directly, as well as 13 additional Native American groups and individuals who may have knowledge of cultural resources on the Project site or in the immediate vicinity (Appendix 5.3A). Letters were sent to all Tribal contacts via certified mail and email on January 12, 2024, in order to gather information regarding significant cultural resource concerns associated with the proposed Project.

Over a 30-day period, all listed tribal representatives received several follow-up emails that included PDF copies of the letter and Project Area map that were mailed. Responses were received from multiple tribal affiliations. Copies of the Sacred Lands File search request letter, the list of contacts, a sample comment invitation letter, a contact/response matrix, and copies of all correspondence are included in Appendix 5.3A**.**

5.3.3 Environmental Analysis

This section describes the environmental impacts of the proposed WRESC construction and operation on cultural resources.

Significance Criteria

CEQA requires that a lead agency determine whether a project may have significant impacts on historical resources (Public Resources Code [PRC] §21084.1). If it is apparent in that a proposed project will cause adverse impacts to historical resources, the lead agency may require that a reasonable effort be made to preserve the resource. The preference for preservation under CEQA is for a resource to be preserved in place or left in an undisturbed state. Because of this, CEQA requires detailed studies to evaluate the state of cultural resources within a project's Area of Potential Effect and may require the development of alternative plans and additional mitigation measures. This requires the identification of historically significant resources and an assessment of whether the project will have a significant impact on them.

Pursuant to CEQA, significance of potential impacts is identified per the following guidelines:

- **Significant and Unavoidable** – An impact that cannot be reduced to below the threshold level given reasonably available and feasible mitigation measures.
- **Less than Significant with Mitigation Incorporated** – An impact that can be reduced to below the threshold level given reasonably available and feasible mitigation measures.
- **Less than Significant** – An impact that may be adverse but does not exceed the threshold levels and does not require mitigation measures. However, mitigation measures that could further lessen environmental effect may be suggested if readily available and easily achievable.
- **No Impact** – The proposed project would have no effect on environmental conditions or would reduce existing environmental problems or hazards.

Factors used to evaluate the significance of project related cultural resources are set forth in Appendix G of CEQA. Appendix G is a screening tool, not a method for setting thresholds of significance. Appendix G is typically used in the Initial Study phase of the CEQA process, asking a series of questions. The purpose of these questions is to determine whether a project requires an Environmental Impact Report, a Mitigated Negative Declaration, or a Negative Declaration. As the Governor's Office of Planning and Research stated, "Appendix G of the Guidelines lists a variety of potentially significant effects but does not provide a means of judging whether they are indeed significant in a given set of circumstances." The answers to the Appendix G questions are not determinative of whether an impact is significant or less than significant. Nevertheless, the questions presented in CEQA Appendix G are instructive.

In terms of potential cultural resources impacts associated with the construction and operations of the project, Appendix G, asks if the project would:

- Cause a substantial adverse change in the significance of a historical resource pursuant to § 15064.5?
- Cause a substantial adverse change in the significance of an archaeological resource pursuant to § 15064.5?
- Disturb any human remains, including those interred outside of dedicated cemeteries?

CEQA defines historically significant resources as "resources listed or eligible for listing on the California Register of Historical Resources (CRHR)" (PRC 5024.1). A cultural resource may be considered historically significant (or a "Historical Resource") if the resource is 45 years old or older, possesses integrity of location, design, setting, materials, workmanship, feeling, and association, and meets any of the following criteria for listing in the CRHR:

- Is associated with events that have made a significant contributing to the broad patterns of California's history and cultural heritage;
- Is associated with the lives of persons important to our past;
- Embodies the distinctive characteristics of a type, period, region, or method of construction, or represents the work of an important creative individual, or possesses high artistic values; or,
- Has yielded or may be likely to yield, information important in prehistory or history (public Resources Code Section 5024.1).

Cultural resources and tribal cultural resources together can be buildings, sites, humanly modified landscapes, traditional cultural places, structures, or objects that may have historical, architectural, cultural, or scientific importance. In accordance with CEQA, if a project will have a significant impact on important cultural resources, deemed historically significant, then project alternative and mitigation measures must be considered.

California PRC §21083.2(g) defines a unique archaeological resource as an artifact, object, or site for which it can be clearly demonstrated that, without merely adding to the current body of knowledge, there is a high probability that it meets one of the following criteria:

- Contains information needed to answer important scientific research questions and that there is a demonstrable public interest in that information.
- Has a special and particular quality, such as being the oldest of its type or the best available example of its type.
- Is directly associated with a scientifically recognized, important prehistoric or historic event or person.

Adverse impacts to archaeological resources that do not meet the criteria of a unique resource are generally not considered to be significant environmental impacts (PRC §21083.2(a)), but non-unique archaeological resources may be considered tribal cultural resources, a classification established in 2014 by California State Assembly Bill 52 (AB-52). Tribal cultural resources require further consideration for significant impact.

AB-52, signed into law in 2014, requires a lead agency to consider adverse effects to tribal cultural resources as significant environmental impacts during the CEQA review process. The law requires that consultation with California Native American tribes that have traditional or cultural affiliations with a geographical area be initiated before a project is determined to require a negative declaration, mitigated negative declaration, or environmental impact report (PRC §21080.3.1). Through the provisions provided in the legislation, a state-mandated local program was established. The law was established to extend enhanced state protections for sites, features, places, objects, and landscapes of cultural value to Native American tribes and incorporates direct input from and coordination with tribes for the protection and preservation of the aforementioned cultural resource classes. The term "tribal cultural resources" is intended to consider tribal cultural values in relation to historic and archaeological resources in determining impacts and mitigation measures.

PRC 21074 defines tribal cultural resources as follows:

1) *Sites, features, places, cultural landscapes, sacred places, and objects with cultural value to a California Native American tribe that are either of the following:*
   A. *Included or determined to be eligible for inclusion in the California Register of Historical Resources.*
   B. *Included in a local register of historical resources as defined in subdivision (k) of PRC §5020.1*
2) *A resource determined by the lead agency, in its discretion and supported by substantial evidence, to be significant pursuant to criteria set forth in subdivision (c) of PRC §5024.1. In applying the criteria set forth in subdivision (c) of PRC §5024.1 for the purposes of this paragraph, the lead agency shall consider the significance of the resource to a California Native American tribe (PRC §21074.).*

In addition to establishing and defining the category of tribal cultural resources, establishing a framework for Native American consultation in the CEQA review process, and establishing clear roles and directives for project proponents, consultants, agencies, and tribes in the tribal cultural resource mitigation process, Section 7 of AB 52 (PRC §21082.3) highlights and reinforces previous legislation, requiring that information, including locations, regarding tribal cultural resources be kept under strict confidentiality during the environmental review process.

Impacts to non-unique archaeological resources are generally not considered a significant environmental impact (PRC, Section 21083.2(a); 14 CCR 15064.5(c)(4)). However, if a non-unique archaeological resource qualifies as tribal cultural resource (PRC Sections 21074(c), 21083.2(h)), further consideration of significant impacts is required.

5.3.3.1 Construction Impacts

5.3.3.1.1 Archaeological Resources

The WRESC Site is located in an area of high archaeological sensitivity due to its proximity to prehistoric sites within the Rosamond Hills, historic period sites associated with the Southern Pacific Railroad and the presence of both prehistoric and historic sites on the facility site. However, an intensive literature review of data obtained from the SSJVIC within relative proximity to the Project Area revealed that testing and excavation of similar sites in the vicinity has resulted in both prehistoric and historic period resources being surficial in nature in the vicinity. Yet, the preponderance of previous data does not preclude the potential for subsurface resources to exist in the area, especially in areas of such high sensitivity.

As currently planned, the entirety of the WRESC Site parcel will be subject to vegetation removal and grading, prior to structure development and shaft construction. The WRESC will require approximately 88.6-acres of permanent disturbance within APN 431-022-13 and approximately 0.1 acres for transmission poles and approximately 6.4 acres for new access roads, for a total of approximately 95 acres of permanent disturbance. If all the excavated cavern rock were re-used onsite, the total facility size would increase by up to an additional approximately 74.6 acres for a total of approximately 163.2 acres. Constructions is anticipated to last 60-months and require several construction tasks to occur simultaneously. The Project's target milestone schedule is provided in Table 2-8.

The WRESC's general arrangement includes associated support equipment and an administration building. Development of the gen-tie line will require direct boring or excavation to a total depth of 11 feet with a horizontal impact diameter of approximately 6 to 8 feet per each pole. As planned, poles are expected to be spaced approximately 600 to 900 feet apart for the extent of the transmission route. Portions of the gen-tie line may be undergrounded. Undergrounding will require continuous trenching to depths of up to eight feet and as wide as 6 feet to accommodate lines and associated vaults.

The Applicant's cultural resources team indicates that potential significant impacts on historic archaeological resources are likely during WRESC construction. The Project will potentially result in significant direct impacts to the archaeological sites identified in the Project Area due to potential physical damage during construction. The Applicant's cultural resource team recommends avoidance and preservation of historic resources, if possible. In consultation with Native American tribes, CRSs, and other local stakeholders, avoidance of an adverse impact on many cultural resources within the Project Area can be achieved through careful design planning and coordination. Avoidance of historical resources is recommended where feasible. In areas where avoidance is not possible, mitigation measures are suggested to prevent adverse impacts to both known and unknown archaeological resources.

As such, with the implementation of proposed mitigation measures, the Project will not have the potential to cause a substantial adverse change to historically significant archaeological resources (pursuant to CEQA Section 15064.5).

5.3.3.1.2 Built Environment Resources

Potential impacts such as demolition or physical damage to built environment resources are not expected as a result of the current Project; however, indirect visual impacts to historic resources may occur. Potential visual impacts to historic resources could include visual obstruction of a major scenic view toward a historic resource and alterations to aesthetics. Loss of a major scenic view and loss of feeling, setting, or association would be considered significant impacts. For an alteration to be considered a substantial adverse change, it must be shown that the integrity and/or significance of the historic resource would be materially impaired by the change in views toward or from a historic resource.

As a result of the built environment survey, the Applicant's cultural resources team identified 109 historic built environment resources within the BESA. Of those 109 resources, ten were previously CRHR-listed or eligible or newly recommended CRHR-eligible for the purposes of this Project. The cultural resources team conducted an assessment of impacts on these ten historical resources.

- The Project will not result in any direct impacts to historical resources.
- The Project will not result in significant indirect visual impacts to the Willow Springs International Raceway, the Rosamond Palms Motel, the Zabriski Place, The Nazarian Duplexes, the segment of the Vincent 220 kV Transmission Line in the BESA, or the four assumed eligible residences identified in the BESA.
- The Project may result in potentially significant visual impacts to the proposed CRHR-eligible Tropico Gold Mine Historic District. With avoidance and minimization measures already in place based on proposed design considerations and the implementation of suggested mitigation measures (outlined below), the potential impact to the historical resource will be reduced to less than significant.

As such, the Project as proposed will not result in a substantial adverse change or significant impact to built environment historical resources in accordance with CEQA Section 15064.5(b).

5.3.3.2 Operations Impacts

Operation of the WRESC facility will occur primarily within the main facility and will not require additional ground disturbance following construction. Section 5.13, Visual Resources, discusses impacts and mitigation measures related to the WRESC's aesthetics. As such, impacts on cultural resources from the WRESC's operations will be less than significant or cause no impact.

5.3.4 Cumulative Effects

Section 15355 of the CEQA Guidelines defines “cumulative impacts” as “two or more individual effects which, when considered together, are considerable or which compound or increase other environmental impacts.” Subsection b of Section 15355 states, in part, that “The cumulative impact from several projects is the change in the environment which results from the incremental impact of the project when added to other closely related past, present, and reasonably foreseeable probable future projects.” Thus, cumulative impacts under CEQA involve the potential interrelationships of two or more projects, not the impacts from a single project. Specifically, under Section 15130 of the CEQA Guidelines, an Environmental Impact Report is required to discuss cumulative impacts when the project’s incremental effect is “cumulatively considerable.” Section 15065(a)(3) then defines “cumulatively considerable” as meaning “that the incremental effects of an individual project are significant when viewed in connection with the effects of other closely related past projects, the effects of other current projects and the effects of probable future projects.”

The WRESC is located in a mostly undeveloped area and most of the projects in the vicinity of the WRESC involve minor modifications to existing buildings. Of 34 projects identified within the cumulative setting (see Section 5.0 Table 5.0-2 Cumulative Projects List), the Mojave Micro Mill and Gem Hill Quarry projects were identified as having potential cumulative impacts to cultural resources given their scale. However, these projects together with the WRESC will not have a cumulative impact on identified historical resources as the project locations are located more than 0.5 miles from the WRESC and are not within the view of any known cultural resources.

Despite the minimal nature of most projects in the WRESC vicinity, the impacts on unknown subsurface cultural resources may occur as a result of future road and drainage improvements, specifically those associated with SR-14 and other transportation thoroughfares in the immediate area. As a result, impacts associated with the WRESC may combine cumulatively with other related past, present, and foreseeable future projects to affect cultural resources, but mitigation measures presented in this section of this AFC may greatly reduce impacts.

5.3.5 Best Practices, Design Features, and Mitigation Measures

5.3.5.1 Potential Tropico Gold Mine Historic District

The proposed design of the transmission line includes installation of 90-foot, single-circuit steel poles featuring three crossarms near the top of each pole. The poles are expected to be spaced approximately 600 to 900 feet from each other within existing roadway allowances.

Because the proposed design routes new poles and transmission lines along the west side of Mojave Tropico Road and the north side of Felsite Avenue in the vicinity of the potential historical resource, the following mitigation measures are suggested to reduce the potential significant visual impact on the potential Tropico Mine Historic District to less than significant:

1) In the vicinity of this historical resource, the proposed transmission line will travel along the north side of Felsite Avenue from 65th Street W east to Mojave Tropico Road. To avoid intruding on the significant setting and views of Tropico Hill from the historic Worker’s Housing along this road it is recommended that the gen-tie route be moved to the south side of Felsite Avenue, if possible.
2) The Applicant will consult with the California OHP on a Determination of Eligibility for the potential Tropico Gold Mine Historic District. The DPR forms to support this determination are provided in Appendix 5.3B.
3) If OHP determines the resource is eligible for CRHR listing, then the Applicant plans to conduct a visual impact assessment of the proposed Project in the vicinity of the potential Tropico Gold Mine Historic District to analyze the potential visual impacts to the historical resource.
4) The Applicant will complete mitigation measures in consultation with the CEC and the California OHP to reduce expected potential visual impacts to the historical resource based on the results of the visual impact assessment.

5.3.5.2 Known Archaeological Sites

Avoidance of archaeological sites identified as historical resources within the Project Area is recommended where feasible, but in areas of the WRESC Site subject to complete grading and vegetation removal or surficial impacts from waste rock and other staging, surface collection of all recorded sites and isolates is recommended to prevent the destruction of the resources.

Prior to ground disturbing construction activities, subsurface testing is also recommended for all sites identified within the WRESC Site and P1 and P2 staging areas, to ensure that development of the Project would not cause adverse impacts to unknown resources within these sites, which could include interments and funerary items.

Monitoring of all ground-disturbing activities associated with Project development is also recommended. Where feasible, the locations of poles along the transmission alignment should avoid the locations of identified sites. However, if not feasible, data recovery and testing of known sites should be conducted prior to ground disturbance at pole locations that could cause impacts to these sites. An appropriate repository should be arranged prior to the initiation of site testing and data recovery to curate historic period collections and arrangements should be made with consulting Native American tribes prior to Project initiation for the appropriate disposition of cultural resources of Native American origin.

To fulfill these measures, the Applicant will prepare an Archaeological Treatment Plan for the potentially impacted historic resources that cannot be avoided.

5.3.5.3 Undiscovered Archaeological Sites

The Applicant will implement measures, based on state and federal regulations and guidelines, to mitigate any potential adverse impacts that could occur if there were an inadvertent discovery of subsurface cultural resources. These measures include, but are not limited to, the following:

- Designation of a CRS to assess and evaluate any cultural resource finds made during construction
- Implementation of a construction worker cultural resources awareness training program
- Monitoring of all ground disturbance associated with vegetation removal, grading, and excavation at the plant site
- Monitoring of all ground disturbance associated with the installation of underground and overhead transmission lines
- Procedures for halting construction if there is an inadvertent discovery of archaeological deposits or human remains
- Procedures for evaluating an inadvertent archaeological discovery
- Procedures to mitigate adverse impacts to any inadvertent archaeological discovery determined to be significant

5.3.5.3.1 Designated Cultural Resources Specialist

The Applicant shall retain a designated CRS who will be available during the earth-disturbing portion of the WRESC's construction. The CRS will assess and evaluate any finds pertaining to subsurface archaeological resources that may be encountered during the construction phase. The CRS will meet the minimum qualifications for Principal Investigator on federal projects under the Secretary of the Interior's Standards and Guidelines for Archaeology and Historic Preservation. The CRS will be qualified in site assessment, evaluations of significance, consultation with regulatory agencies and Tribal partners, and planning of site evaluation and mitigation procedures.

If a discovery of archaeological resources does occur during construction, the CRS, in conjunction with the construction superintendent and environmental compliance manager, will ensure that construction activity halts within the vicinity of the find. Construction in the vicinity of the find shall remain halted until the CRS can evaluate the find and assess its significance. The CRS will inspect and evaluate the potential significance in consultation with the CEC staff and the CEC compliance project manager (CPM). The CRS will make a recommendation as to the significance of the find and any measures that will mitigate adverse impacts of construction if the find is

determined to be significant. Once the Applicant's CRS has completed their evaluation and any associated mitigation efforts, construction within the vicinity of the find may resume.

5.3.5.3.2 Construction Worker Training

The Applicant's CRS will prepare a construction worker awareness training program for cultural resource sensitivity to ensure that all Project personnel adheres to mitigation measures in the event that cultural resources are encountered during the construction of the WRESC. The Applicant's CRS will provide this training to every member of the Project development and construction team as part of their environmental, health, and safety training. This training will include visual aids and replicas of various types of historic and pre-Contact cultural resources, and it will describe the specific steps that workers should take in the event of an unanticipated discovery of cultural materials, including human remains. The construction worker sensitivity training program will explain the importance of, and legal basis for, the protection of significant archaeological resources. The training will also be presented in the form of a written brochure.

5.3.5.3.3 Emergency Discovery

If construction personnel or other members of the development team identify archaeological resources during construction, they shall immediately notify the CRS and the site superintendent, who will halt construction near the find, if necessary. The archaeological monitor or the CRS will delineate a site boundary and buffer by means of flagging tape, fencing, rope, stakes, or other implements of delineation to define the area surrounding the find within which construction will halt. The delineated area may include graded planes with a widened horizontal buffer, vertical trenches, and borings containing cultural resources and any soil or rock spoils and stockpiles that may have resulted from the associated ground disturbing activity. Construction within the delineated area of the find may not resume until the CRS, in consultation with CEC staff and the CEC CPM, have inspected and evaluated the find.

5.3.5.3.4 Site Recording and Evaluation

The CRS will follow accepted professional standards, including the OHP's *Instructions for Recording Historical Resources* (OHP 1995), in recording any find and will submit an associated DPR Series 523 form(s) and location information to the SSJVIC, which is the appropriate CHRIS repository for Kern County, as an appendix to a final report, disclosing summary and findings of all ground disturbing activities associated with the development of the WRESC. If the CRS determines that a find is not significant and the CEC CPM concurs, construction will proceed without further delay. If the CRS determines that additional information is needed to make an adequate determination of significance, the designated CRS will, in consultation with the CEC, prepare a plan and timetable for evaluation.

5.3.5.3.5 Mitigation Planning

If the CRS and the CPM determine that a find is significant, the CRS will prepare and execute a mitigation plan and program in accordance with state guidelines. This plan will emphasize the avoidance, if possible, of significant archaeological resources. If avoidance is not possible, recovery of the resource may be considered as an effective mitigation measure to avoid damage to or destruction of the resource.

The mitigation program, if necessary, will be carried out as soon as possible to avoid construction delays. Construction will resume at the location of the find once the CRS completes the field data collection of any data recovery efforts. The CRS will verify the completion of field data collection by letter and email to the Applicant and the CPM so that they may authorize the continuation of construction activities.

5.3.5.3.6 Curation

The CRS will arrange for the curation of eligible archaeological materials collected during an archaeological data recovery mitigation program. Curation will be performed at a qualified curation facility meeting the standards outlined in the California State Historical Resources Commission and the OHP's *Guidelines for the Curation of Archaeological Collections* (1993). The CRS will submit field notes, stratigraphic drawings, DPR forms, contextual background, and other materials developed as part of the data recovery/mitigation program to the curation facility along with the archaeological collection, in accordance with the mitigation plan.

5.3.5.3.7 Report of Findings

If a data recovery program is planned and implemented during construction as a mitigation measure, the Applicant's CRS will prepare a detailed technical report summarizing the results of the excavations to recover data from an archaeological site. This report will describe the site deposition and describe and analyze artifacts and other recovered materials. The report will also draw scientific conclusions regarding the results of the excavations, which will aid in the development of a determination of significance. The Applicant's CRS will submit this report to the curation facility as an accompaniment to the collections.

5.3.5.4 Inadvertent Discovery of Human Burials

If human remains are found during the WRESC's construction, all construction activities in the area must stop and Project officials are required by Section 7050.5 of the California Health and Safety Code to contact the Kern County coroner. If the coroner determines that the remains are of Native American origin, the coroner will notify the NAHC, who will determine the Most Likely Descendant (MLD) per California PRC §5097.98. The NAHC will notify the MLD and the MLD will inspect the burial location within 48 hours and make recommendations for the appropriate treatment, which may include on-site reinterment in an area determined to be exempt from future disturbance.

5.3.6 Laws, Ordinances, Regulations, and Standards

Among the local LORS discussed in this section are certain ordinances, plans, or policies of Kern County and the State of California. Federal LORS apply and a portion of the gen-tie crosses land managed by the BLM. **Table 5.3-4** presents a summary of applicable LORS.

Table 5.3-4: Laws, Ordinances, Regulations, and Standards for Cultural Resources

Jurisdiction	LORS	Requirements/Applicability	Administering Agency	AFC Section Explaining Conformance
Federal	Antiquities Act of 1906	Applies when a scientific archaeological investigation may occur on federal public lands. Antiquities Act establishes permitting precedent for archaeological investigations and criminal and civil penalties for the intentional theft of destruction of cultural resources.	Bureau of Land Management	Section 5.3.4.1
Federal	National Historic Preservation Act, Section 106	Applies to among other things, a project, activity, or program funded in whole or in part by a federal agency, those carried out with federal financial assistance and those requiring a federal permit, license or approval that has the potential to cause adverse effect to historic properties listed on or eligible for the National Register of Historic Places. The lead federal agency must consider ways to avoid, minimize and mitigate these adverse effects and provide the Advisory Council on Historic Preservation an opportunity to comment, prior to the issuance of permits or funding of the undertaking.	US Department of Energy, Bureau of Land Management, California Office of Historic Preservation	Section 5.3.4.1

Jurisdiction	LORS	Requirements/Applicability	Administering Agency	AFC Section Explaining Conformance
Federal	Archaeological Resources Protection Act	Applies when an undertaking has the potential to affect archaeological resources on federal or Indian lands. Reinforces permitting and penalty statutes established by the Antiquities Act and further establishes the prohibition of public disclosure of documents pertaining to the nature and location of archaeological resources, first defined in Section 304 of the National Historic Preservation Act	Bureau of Land Management	Section 5.3.6.1
Federal	Native American Graves Protection and Repatriation Act	Applies if Native American human remains and other cultural items are removed from federal or tribal lands.	Bureau of Land Management	Section 5.3.6.1
State	CEQA Guidelines (PCR Sections 21002(b), 21083.2, and 21084.1)	Provides for consideration of archaeological and/or historical resources.	CEC	Section 5.3.6.2
State	California Public Resources Code §§ 5024.1	Establishes the criteria for the California Register of Historical resources and creates the California Historic Landmarks Committee. Authorizes the Department of Parks and Recreation, through the Office of Historic Preservation and the State Historical Resources Commission, to designate California Historical Landmarks and California Points of Historical Interest. Establishes criteria for the protection and preservation of historic resources.	CEC; Office of Historic Preservation, State Historical Resources Commission	Section 5.3.6.2
State	California Public Resources Code § 5097.98	Construction may encounter Native American graves; Native American Heritage Commission assigns Most Likely Descendant.	State of California and Native American Heritage Commission	Section 5.3.6.2
State	California Public Resources Code § 5097.5	Prohibits the willing destruction or unpermitted excavation of historical or archaeological resources on state lands. May apply to portion of the gen-tie that may cross or perimeter a parcel owned by the California State Lands Commission.	California State Lands Commission	Section 5.3.6.2
State	California Public Resources Code § 5097.9	Prohibits interference in the free expression or exercise of Native American religion on public property.	California State Lands Commission and Native American Heritage Commission	Section 5.3.6.2
State	California Health & Safety Code §7050.5	Requires that construction be halted and that the coroner be notified in the event of the discovery of human remains outside of the context of a formal cemetery. Requires coroner to notify the Native American Heritage Commission if remains are determined to be Native American in origin.	State of California, Kern County Sheriff's Office, and Native American Heritage Commission	Section 5.3.6.2
Kern County	General Plan: Policy 25	The County will promote the preservation of cultural and historic resources which provide ties with the past and constitute a heritage value to residents and visitors.	Kern County Planning and Natural Resources Department	Section 5.3.6.3

Jurisdiction	LORS	Requirements/Applicability	Administering Agency	AFC Section Explaining Conformance
Kern County	Willow Springs Specific Plan: Cultural Resources Goal 1 Policy 1	To preserve cultural resources contained on sensitive sites located within the Willow Springs Specific Plan area.	Kern County Planning and Natural Resources Department	Section 5.3.6.3

AFC = Application for Certification; CEC = California Energy Commission; CEQA = California Environmental Policy Act; LORS = laws, ordinances, regulations, and standards

5.3.6.1 Federal Laws, Ordinances, Regulations, and Standards

The **Antiquities Act of 1906** was enacted as a response to widespread looting and vandalism of archaeological sites in the American Southwest, is the earliest cultural resource law to establish a process for the permitting of archaeological investigations on federal lands, and establishes criminal and civil penalties for the intentional destruction and/or theft of cultural resources. The Archaeological Resources Protection Act of 1979 further elaborates on these early permitting requirements and penalties for greater protections of archaeological resources on federal lands.

Section 106 of the **National Historic Preservation Act**, as amended, and its implementing regulations, defined in 36 Code of Federal Regulations (CFR) 800, requires that a federal agency consider the effects of their actions on historic properties and provide the Advisory Council on Historic Preservation an opportunity to comment on federal undertakings that may cause adverse effects on historic properties. “Historic properties” are defined as sites and resources meeting eligibility criteria defined in 36 CFR 60.4 for inclusion in the NRHP, and effects of these actions on historic properties must be considered before the administration of funds for the undertaking or permits. Section 106 applies when the following two thresholds are met: 1) there is a Federal or federally licensed action, including grants, licenses, and permits; and 2) that action has the potential to affect properties listed in or eligible for listing in the NRHP.

The **Native American Graves Protection and Repatriation Act (NAGPRA)** was enacted in 1990 and governs the return of native American remains, funerary objects, sacred objects, and objects of cultural patrimony to lineal descendants, culturally-affiliated Indian Tribes, and Native Hawaiian organizations. As applied to the current Project, NAGPRA requires the Bureau of Land Management to repatriate or transfer Native American human remains and other cultural items to the appropriate parties, in the event they are found during construction or operation of the Project, by protecting and planning for native American human remains and other cultural items that may be removed from federal or Tribal lands”.

5.3.6.2 State Laws, Ordinances, Regulations, and Standards

California Environmental Quality Act (CEQA): CEQA requires a cultural resource review to determine whether a project will have significant impacts on archaeological sites or a property of historic or cultural significance to a community or ethnic group that is eligible for inclusion in the CRHR. CEQA equates a substantial adverse change in the significance of a historical resource with a significant effect on the environment and defines substantial adverse change as demolition, destruction, relocation, or alteration that would impair historical significance. CEQA requires a lead agency to identify and examine environmental effects that may result in significant adverse effects. The following PRCs considered under CEQA are relevant to this analysis of archaeological and historical resources:

- PRC Division 13 Environmental Quality – Chapter 2.6 General:
  - Section 21084.1 stipulates that any resource listed in, or eligible for listing in, the CRHR is presumed to be historically or culturally significant. Resources listed in a local historic register or deemed significant in a historical resource survey are presumed historically or culturally significant unless the preponderance of evidence demonstrates that they are not. A resource that is not listed in or determined eligible for listing in the CRHR, is not included in a local register of historic resources, or is not deemed significant in a historical resource survey may nonetheless be historically significant.

  - When an archaeological resource is listed in or is eligible to be listed in the CRHR, Section 21084.1 requires that any substantial adverse effect to that resource be considered a significant environmental effect.
  - Where a project may adversely affect a unique archaeological resource, Section 21083.2 requires the lead agency to treat that effect as a significant environmental effect and prepare an environmental impact report.
- PRC Division 5 Parks and Monuments – Chapter 1.7 Archaeological, Paleontological, and Historical Sites:
  - Section 5024.1(a) establishes the CRHR. Section 5014.1(c-f) provides criteria for CRHR eligibility listing. This criterion is applicable to the identification of historical resources for the purposes of CEQA as applied above.
  - If human remains are discovered, the county coroner must be notified within 48 hours and there should be no further disturbance to the site where the remains were found. Health and Safety Code 7050.5(b) requires notification to coroner. 7050.5(c) requires coroner to determine if remains are Native American and contact NAHC.
  - Section 5097.5 prohibits the willing destruction or unpermitted excavation of historical or archaeological resources on state lands. May apply to portion of the gen-tie that may cross or perimeter a parcel owned by the California State Lands Commission.
  - Section 5097.94 requires that if a coroner determines the remains to be Native American, the coroner is responsible for contracting the NAHC within 24 hours.
  - Section 5097.98 requires the NAHC to immediately notify those persons it believes to be most likely descended from the decedent so that may inspect the burial location and make recommendations for treatment and reinterment in accordance with cultural practices.

The Applicant will comply with these requirements related to cultural resources through the implementation of the mitigation measures outlined in Section 5.3.5.

5.3.6.3 Local Laws, Ordinances, Regulations, and Standards

Kern County's General Plan promotes the preservation of archaeological, paleontological, cultural, and historical resources. Several archaeological sites are known to exist within the Willow Springs Specific Plan area. The Willow Springs Specific Plan requires that the County stipulate project-by-project mitigation measures to reduce impacts to cultural resources to less than significant levels. This plan also requires archaeological investigations for specific properties proposed for development (Kern County 2008a; Kern County 2008b).

5.3.7 Agencies and Agency Contacts

Table 5.3-5 lists the agencies involved in cultural resources management for the Project and a point of contact at each agency. These agencies include the NAHC, the OHP, and the Bureau of Land Management for federal undertakings.

Table 5.3-5: Agency Contacts for Cultural Resources

Issue	Agency	Contact
Native American traditional cultural properties	Native American Heritage Commission	1550 Harbor Blvd Suite 100 West Sacramento, CA 95691 (916) 373-3710
Federal agency National Historic Preservation Act Section 106 compliance	California Office of Historic Preservation	Julianne Polanco, SHPO 1725 23rd Street, Suite 100 Sacramento, CA 95816 (916) 445-7000
Federal agency Antiquities Act of 1906,	Bureau of Land Management	George Herbst, Deputy Preservation Officer

Issue	Agency	Contact
National Historic Preservation Act Section 106 compliance, Archaeological Resources Protection Act, And Native American Graves Protection and Repatriation Act		California State Office, BLM State Office (916) 978-4684

5.3.8 Permits and Permit Schedule

In addition to certification by the CEC, Section 106 consultation by the Department of Energy is underway, in advance of loan administration and disbursement. A Standard Form 299 (SF-299) may be filed with the BLM Ridgecrest Field Office for any portion of the overhead gen-tie line that will cross a portion of BLM's landholding, which may also require a Fieldwork Authorization to Conduct Cultural Resource Investigations under the CRS' Cultural Resources Use Permit prior to ground disturbance within the BLM's jurisdiction.

5.3.9 References

Bancroft. Hubert Howe. 1885. *The Works of Hubert Howe Bancroft: History of California Volume 1*. San Francisco: A.L. Bancroft & Co. Accessed electronically November 2023. https://archive.org/details/bancrofthistcal01bancroft

Bergin, Kathleen Ann, and David D. Ferraro. 1999. Historic Properties Treatment Plan: Geotechnical Investigations of the CP Alignment of the Foothill Transportation Corridor—South, Orange, and San Diego Counties, California. LSA Associates, Inc. Ms. on file, LSA Associates, Inc., 20 Executive Park, Suite 200, Irvine, California, 92614; Southwest Division, Naval Facilities Engineering Command, 1220 Pacific Highway, San Diego, California; and AC/S Environmental Security Office, MCB Camp Pendleton, California.

Bettinger, Robert L., and Martin A. Baumhoff. 1982. The Numic Spread: Great Basin Cultures in Competition. *American Antiquity* 47(3):485–503.

Blackburn, Thomas C. and Lowell John Bean. 1978. Kitanemuk. In *The Handbook of North American Indians Vol 8.: California* (Sturtevant general ed.). Washington, DC: Smithsonian Institution.

Bright, William. 1975. Two Notes on Takic Classification: Paper Read at the Third Annual Friends of Uto-Aztecan Conference, Flagstaff, June 19–20, 1975. (Copy, Manuscript No. 76-66 in National Anthropological Archives, Smithsonian Institution, Washington, DC).

California Energy Commission (CEC). 2023. *Rules of Practice and Procedure and Power Plant Site Certification Regulations.* State of California, CEC.

California Office of Historic Preservation (OHP). 1995. *Instructions for Recording Historical Resources.* California OHP, Sacramento, March 1995. https://ohp.parks.ca.gov/pages/1054/files/manual95.pdf.

California Office of Historic Preservation (OHP). 1993. *Guidelines for the Curation of Archaeological Collections.* California OHP, Sacramento, May 1993. https://ohp.parks.ca.gov/pages/1069/files/guide-93.pdf.

Coues, Elliott. 1900. *On the Trail of a Spanish Pioneer: the Diary and Itinerary of Francisco Garces (Mission Priest) in his Travels through Sonora, Arizona and California 1775–1776*. New York: Francis P. Harper.

Davis, E.L. 1970. Archaeology of the North Basin of Panamint Valley, Inyo County, California. *Nevada State Museum Anthropological Papers* 15:83–141, Carson City, Nevada.

Department of Defense. Not dated. Edwards AFB. *Military OneSource.* https://installations.militaryonesource.mil/in-depth-overview/edwards-afb.

Earle, David W. 2005. The Mojave River and the Central Mojave Desert: Native Settlement, Travel and Exchange in the Eighteenth and Nineteenth Centuries. *Journal of California and Great Basin Anthropology* 25(1):1–38

Edwards Air Force Base. Not dated. Edwards' History. *Edwards Air Force Base.* https://www.edwards.af.mil/About/Fact-Sheets/Display/Article/393907/edwards-history/.

Fernandeño Tataviam Band of Mission Indians. Not dated. History. *Fernandeño Tataviam Band of Mission Indians.* https://www.tataviam-nsn.us/history/

Glennan, William Stuart. 1971. *A Glimpse at the Prehistory of Antelope Valley: Archaeological Investigations at the Sweetser Site* (KER-302). Rosamond: The Kern Antelope Historical Society, Inc.

Gumprecht, Blake. 1999. *The Los Angeles River: its life, death and possible rebirth*. Baltimore: Johns Hopkins University.

Gurba, Norma. 2013. *Legendary Locals of the Antelope Valley.* Charleston, South Carolina: Arcadia Publishing.

Hall, M.C. 2000. Archaeological Survey of 2472 Acres in Adjacent Portions of Lava, Lead Mountain, and Cleghorn Pass Training Areas, Marine Corps Air Ground Combat Center, Twentynine Palms, California (Volume I).

Report prepared by the Archaeological Research Unit, University of California, Riverside, for the United States Marine Corps Natural Resources and Environmental Affairs Division.

Harrington, John Peabody. 1917. *The Papers of John Peabody Harrington in the Smithsonian Institution 1907–1957, Volume Three, A Guide to the Field Notes: Native American History, Language and Culture of the Southern California/Basin* (Mills and Brickfield eds [1985]). White Plains, New York: Kraus International Publications.

Hine, Robert V. and John Mack Faragher. 2000. *The American West: A New Interpretive History*. New Haven, Connecticut: Yale University Press.

Hoover, Mildred Brooke, Hero Eugene Rensch, Ethel Grace Rensch, and William N. Abloe. 2002. *Historic Spots in California.* Revised by Douglas E. Kyle. Palo Alto, California: Stanford University Press.

Jackson, Leroy M. 1968. State of California Resources Agency Department of Parks and Recreation Point of Historical Interest: Clay Pits. On file at the Southern San Joaquin Valley Information Center at California State University, Bakersfield, at 15-007591.

Kern County. 2008a. Willow Springs Specific Plan. https://psbweb.co.kern.ca.us/planning/pdfs/SPs/WillowSprings_SP.pdf. Website accessed July 20, 2021.

Kern County. 2008b. Kern County General Plan. https://psbweb.co.kern.ca.us/planning/pdfs/kcgp/KCGP_Complete.pdf. Website accessed July 20, 2021.

King, Chester and Thomas C. Blackburn 1978. Tataviam. In *The Handbook of North American Indians, Volume 8, California*, William C. Sturtevant, general editor, Smithsonian Institution, Washington, DC.

Lamb, Sydney N. 1958. Linguistic Prehistory in the Great Basin. *International Journal of American Linguistics* 24(2):95-100.

Lien, Lauren. 2021.The History of Willow Springs. *Lancaster Museum of Art and History.* https://www.lancastermoah.org/single-post/the-history-of-willow-springs

Little, Barbara, and Erika Martin Seibert. 2000. *Guidelines for Evaluating and Registering Archaeological Properties*. National Register Bulletin. USDI, National Park Service.

Madsen, D., and D. Rhode (eds.). 1994. *Across the West: Human Population Movement and the Expansion of the Numa*. University of Utah Press, Salt Lake City.

Moratto, Michael J. 1984. *California Archaeology*. San Diego: Academic Press.

Office of Historic Preservation (OHP). Not dated. Fort Tejon State Historic Park. *Office of Historic Preservation.* https://parks.ca.gov/?page_id=585

Plata, Julie. 2021. HISTORY: The Tropico Gold mine Camp: a glimpse into Kern County's Past. *The Bakersfield Californian.* https://www.bakersfield.com/bakersfield-life/history-the-tropico-gold-mine-camp-a-glimpse-into-kern-countys-past/article_bb4c9a6e-cd2f-11eb-b762-9b7e675ca5ae.html.

Schiffman, Robert A., and Alan P. Garfinkel. 1981. Prehistory of Kern County – An Overview. *Bakersfield College Publications in Archaeology* 1. Bakersfield: Bakersfield College.

Serpico, Phil. 2000. *Railroading through the Antelope Valley*. Palmdale, California: Omni Publications.

Sutton, Mark Q. 1980. Some Aspects of Kitanemuk Prehistory. *Journal of California and Great Basin Anthropology* 2(2):214–225.

Sutton, Mark Q. 1981. Archaeology of the Antelope Valley, Western Mojave Desert, California. Manuscript in possession of the author.

Sutton, Mark Q. 1996. The Current Status of Archaeological Research in the Mojave Desert. *Journal of California and Great Basin Archaeology* 18(2):221–257.

Sutton, Mark Q. 2017. Chasing ghosts? Rethinking the prehistory of the Late Holocene Mojave Desert. *Pacific Coast Archaeological Society Quarterly* 5: 1–78.

Sutton, Mark Q., Mark E. Basgall, Jill K. Gardner, and Mark W. Allen. 2007. Advances in Understanding Mojave Desert Prehistory. In *California Prehistory: Colonization, Culture, and Complexity*, edited by T.L. Jones and K.A. Klar, pp. 229–245. AltaMira Press, New York.

Sutton, Mark Q. and David D. Earle. 2017. The Desert Serrano of the Mojave River. *Pacific Coast Archaeological Society Quarterly* 52(2&3):1–61.

U.S. Army Air Forces. 2020. October 22, 1935: Formation of Muroc Bombing and Gunnery Range. *Air Force Test Center.* https://www.aftc.af.mil/News/On-This-Day-in-Test-History/Article-Display-Test-History/Article/2363631/october-22-1935-formation-of-muroc-bombing-and-gunnery-range/.

Wallace, William J. 1955. A Suggested Chronology for Southern California Coastal Archaeology. *Southwestern Journal of Anthropology* 11(3):214–230.

Wallace, William J.1978 Post-Pleistocene Archaeology. In *California*, edited by R. Heizer, pp. 550–563. *Handbook of North American Indians, Vol. 8.* W.C. Sturtevant, general editor. Smithsonian Institution, Washington, DC.

Warren, Claude N. 1968. Cultural Tradition and Ecological Adaptation on the Southern California Coast. Eastern New Mexico University Contributions in Anthropology 1(3). Portales.

Warren, Claude N. 1984. The Desert Region. In *California Archaeology*, by M. Moratto with contributions by D.A. Fredrickson, C. Raven, and C. N. Warren, pp. 339–430. Academic Press, Orlando, Florida.

Warren, Claude N., and Robert H. Crabtree. 1986. Prehistory of the Southwestern Area. Edited by W.L. D'Azevedo, 183–193,, *Handbook of North American Indians, Volume 11, Great Basin Indians*, William C. Sturtevant, general editor, Smithsonian Institution, Washington, DC.

Whitesitt, Sheila and Richard E. Moore (eds.). 1987. *A Memoir of the Indian War: The reminiscences of Ezra M. Hamilton.* Originally written by Ezra M. Hamilton. Ashland, Oregon: Tree Stump Press.

Willow Springs International Raceway. 2018. About Willow Springs – Our History. *Willow Springs International Raceway.* https://www.willowspringsraceway.com/about/our-history/.

Zigmond, Maurice L.1981. *Kawaiisu Ethnobotany.* Salt Lake City: University of Utah Press.

Zigmond, Maurice L. 1986. Kawaiisu. In *Handbook of North American Indians, Volume 11, Great Basin Indians*, William C. Sturtevant, general editor, Smithsonian Institution, Washington, DC.

5.4 Geological Hazards and Resources

GEM A-CAES LLC's (GEM, the Applicant) Willow Rock Energy Storage Center (WRESC, or Willow Rock) will be located on approximately 88.6 acres of private land immediately north of Dawn Road and between State Route (SR) 14 and Sierra Highway within unincorporated, southeastern Kern County, California. The WRESC will be a nominal 520-megawatt (MW) gross (500 MW net) and 4,160 megawatt-hour (MWh) gross (4,000 MWh net) facility using Hydrostor, Inc.'s (Hydrostor's) proprietary, advanced compressed air energy storage (A-CAES) technology. Energy stored at the WRESC will be delivered to Southern California Edison's Whirlwind Substation located southwest of the WRESC at the intersection of 170th Street W and Rosamond Boulevard, via a new approximately 19-mile 230-kilovolt (kV) generation-tie (gen-tie) line. The WRESC will be capable of operating on a 24-hour basis, 365 days a year with an approximately 50-year lifespan.

The Project or Project Area encompasses the WRESC Site, the parcels within the Project Boundary, and the right-of-way associated with the WRESC's gen-tie line. The Project Boundary encompasses the WRESC Site and the parcels of land (an additional 133 acres of private land surrounding the WRESC) that will be allocated for potential temporary staging and laydown area (referred to herein as the Staging Area) during construction, or the construction of a permanent architectural berm constructed from the material excavated during cavern construction. The Staging Area consists of groups of assessor's parcels referred to as P1, P2N, P2S, and VH.

This section provides an evaluation of the proposed WRESC in terms of potential exposure to geological hazards and potential to affect geologic resources of commercial, recreational, or scientific value. The information presented in this section is based on readily available online resources that is limited to surficial soils only, a geotechnical data report prepared by Yeh and Associates, Inc. (Yeh) (2023), and a geotechnical characterization report by Agapito Associates, Inc. (Agapito) (2024). The Yeh (2023) report is described in more detail in Section 5.11 since it is more applicable to surficial soils and subsurface conditions approximately 50 to 70 feet below the existing ground surface (bgs) within the permanent impact parcel. The Yeh (2023) report indicates a supplementary *Preliminary Geotechnical Report* is forthcoming, but said report was not available at the time this document was prepared. The Yeh (2023) report is provided as Appendix 5.11-A for reference. The Agapito (2024) report summarizes a geotechnical exploration that was performed in 2023 for the purpose of characterizing the subsurface conditions within the cavern target horizons that would be 2,000 to 2,500 feet bgs. The exploration included the following:

- A desktop study to evaluate the geotechnical setting
- Advancing three geotechnical core holes to depths of 3,015 to 3,167 feet bgs using initial rotary drilling followed by setting HW casing from ground surface to 70 to 171 feet bgs and then implementing HQ rock coring methods
- Packer testing to estimate the hydraulic conductivity of the rock mass within the cavern target horizon
- Geophysical logging essentially the full depth of each corehole to evaluate the direction and inclinations of discontinuities in the rock mass
- Laboratory testing of select representative samples of rock core
- Characterizing the geomechanical properties of intact rock, the rock mass, in-situ stress conditions, seismic risk, and rock mass strength and deformation properties

The Agapito (2024) report is provided as Appendix 5.4-A for reference and can be referred to for additional information regarding the details of the exploration that was completed.

Construction of the proposed WRESC will involve the construction of various surface facilities and features (i.e., buildings, air processing facility, compressors, turbines, etc.), excavation of deep vertical shafts on the order of 8 to 24 feet wide and 2,000 to 2,500 feet deep bgs, excavation of an underground cavern, and construction and filling of a hydrostatic compensation surface reservoir. Options for managing the rock extracted during construction of the cavern include onsite storage re-use in the form an architectural berm around portions of the WRESC or off-taker transport for either commercial use or permanent offsite storage. Each of these options may be implemented alone or in combination. Section 2.0, Project Description, provides more detailed information about the Project.

The best practices, Project design features, and mitigation measures proposed as part of this application will avoid or minimize potentially significant effects (see Section 5.4.4, below).

5.4.1 Affected Environment

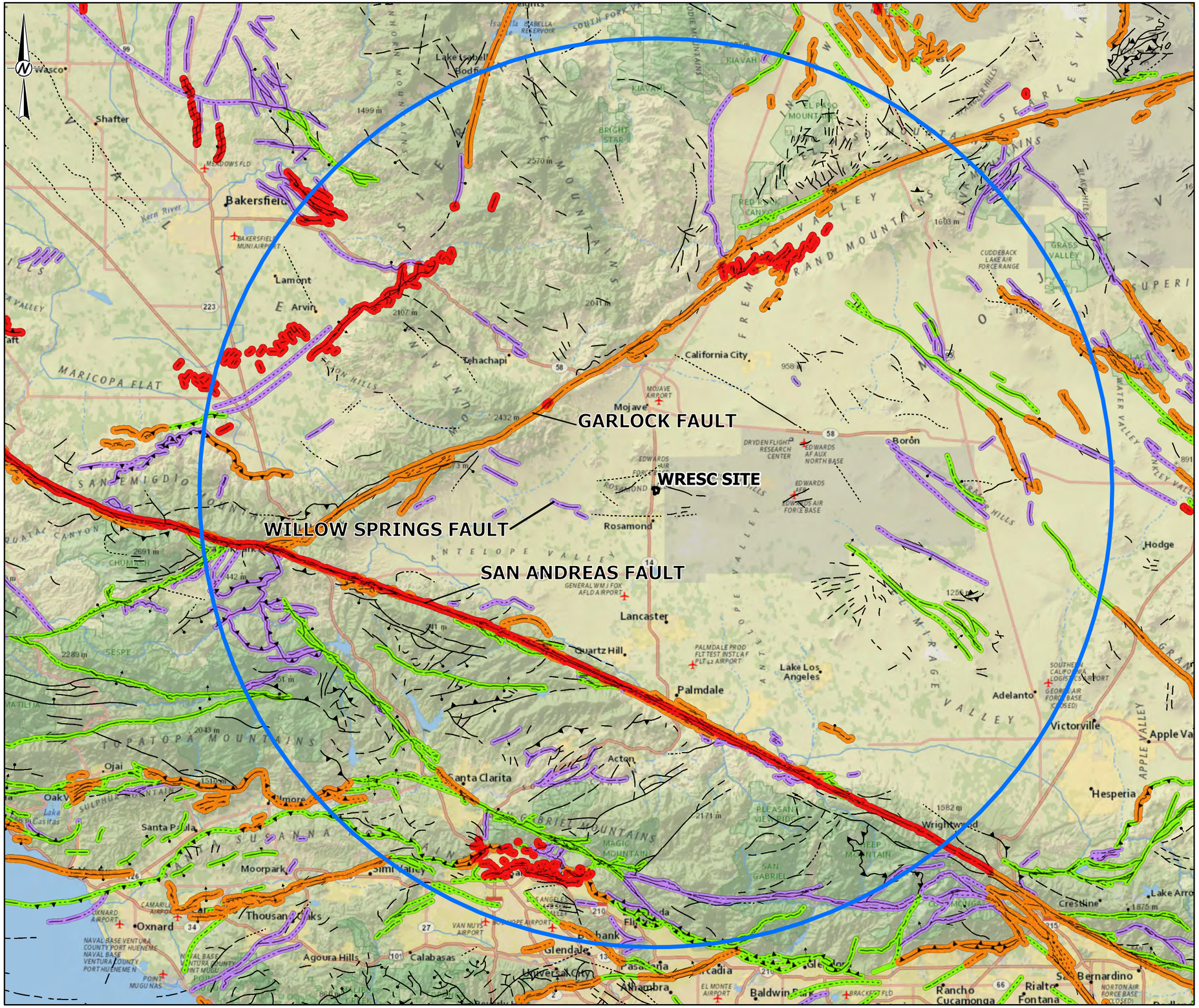
5.4.1.1 Regional Geology

The proposed Project Area is located within the Mojave Desert geomorphic province of California (CGS 2002). The Mojave Desert province is a broad region of isolated mountain ranges that are separated by desert plains. The western edge of this geomorphic province is wedged between the Garlock Fault and the San Andreas Fault. The proposed site is located within the Rosamond 15-minute quadrangle in the Rosamond Hills. The Rosamond Hills are covered mainly by alluvial gravel and sand of the Quaternary Period. The alluvial deposits within the valley are underlain mostly by a quartz monzonite bedrock (USGS 1959). Agapito (2024) and Yeh (2023) provide additional descriptions of the regional and local geology.

5.4.1.1.1 Faulting and Seismicity

The CGS Fault Activity Map web application was used to identify major fault zones, such as the San Andreas and Garlock Faults, within 62 miles of the WRESC Site (CGS 2015). The State of California defines an active fault as one that has ruptured in the last 11,700 years (CGS 2018a). Potentially active faults are those with evidence of movement within the last 1.6 million years (CGS 2010).

The active Garlock Fault is approximately 15 miles northwest of the proposed WRESC Site. The active San Andreas Fault Zone is approximately 20 miles southwest of the proposed WRESC Site. Both faults are very active and have generated major earthquakes. Additionally, the potentially active Willow Springs Fault is approximately 8 miles west/southwest of the proposed WRESC Site. **Figure 5.4-1** shows the faults identified within a 62-mile radius of the proposed A-CAES facility.



LEGEND

PROJECT BOUNDARY
62 MILE RADIUS

REPRESENTATION: CGS.DOC.PREQT_FLTS_POLYLINE_REP

<ALL OTHER VALUES>
FAULT, CERTAIN
FAULT, APPROX. LOCATED
FAULT, CONCEALED
THRUST FAULT, CERTAIN
THRUST FAULT, APPROX. LOCATED
THRUST FAULT, APPROX. LOCATED, QUERIED
FAULT, CERTAIN (BALL AND BAR)
FAULT, APPROX. LOCATED (BALL AND BAR)
FAULT, CONCEALED (BALL AND BAR)

REPRESENTATION: CGS.DOC.QT_FLT_VER3_PRINT_020410_FI_REP

FAULT, CERTAIN
FAULT, APPROX. LOCATED
FAULT, APPROX. LOCATED, QUERIED
FAULT, INFERRED, QUERIED
FAULT, CONCEALED
FAULT, CONCEALED, QUERIED
THRUST FAULT, CERTAIN
THRUST FAULT, APPROX. LOCATED
THRUST FAULT, CONCEALED
DEXTRAL FAULT, CERTAIN
DEXTRAL FAULT, APPROX. LOCATED
DEXTRAL FAULT, CONCEALED
SINISTRAL FAULT, CERTAIN
SINISTRAL FAULT, APPROX. LOCATED
SINISTRAL FAULT, CONCEALED
THRUST FAULT, CERTAIN (2)
THRUST FAULT, APPROX. LOCATED (2)
THRUST FAULT, CONCEALED (2)
FAULT, CERTAIN (BALL AND BAR)
FAULT, APPROX. LOCATED (BALL AND BAR)
FAULT, CONCEALED (BALL AND BAR)
DEXTRAL FAULT, CERTAIN (BALL AND BAR)
FAULT, CONCEALED, QUERIED (BALL AND BAR)
FAULT, CONCEALED, QUERIED (BALL AND BAR, 2)
FAULT,CERTAIN (DIP)
FAULT, APPROX. LOCATED (DIP)
FAULT, CONCEALED (DIP)
REVERSE FAULT, CERTAIN
REVERSE FAULT, APPROX. LOCATED
REVERSE FAULT, CONCEALED

REPRESENTATION: CGS.DOC.PREQT_FLTS_POLYLINE_REP

<ALL OTHER VALUES>
FAULT, CERTAIN
FAULT, APPROX. LOCATED
FAULT, CONCEALED
THRUST FAULT, CERTAIN
THRUST FAULT, APPROX. LOCATED
THRUST FAULT, APPROX. LOCATED, QUERIED
FAULT, CERTAIN (BALL AND BAR)
FAULT, APPROX. LOCATED (BALL AND BAR)
FAULT, CONCEALED (BALL AND BAR)

REFERENCE(S)

1. COORDINATE SYSTEM: NAD 1983 STATEPLANE CALIFORNIA V FIPS 0405 FEET
2. FAULT DATA: HTTPS://GIS.CONSERVATION.CA.GOV/SERVER/REST/SERVICES/CGS/FAULTACTIVITYMAPCA/MAPSERVER

CLIENT
GEM A-CAES LLC

PROJECT
WILLOW ROCK ENERGY STORAGE CENTER
SUPPLEMENTAL AFC

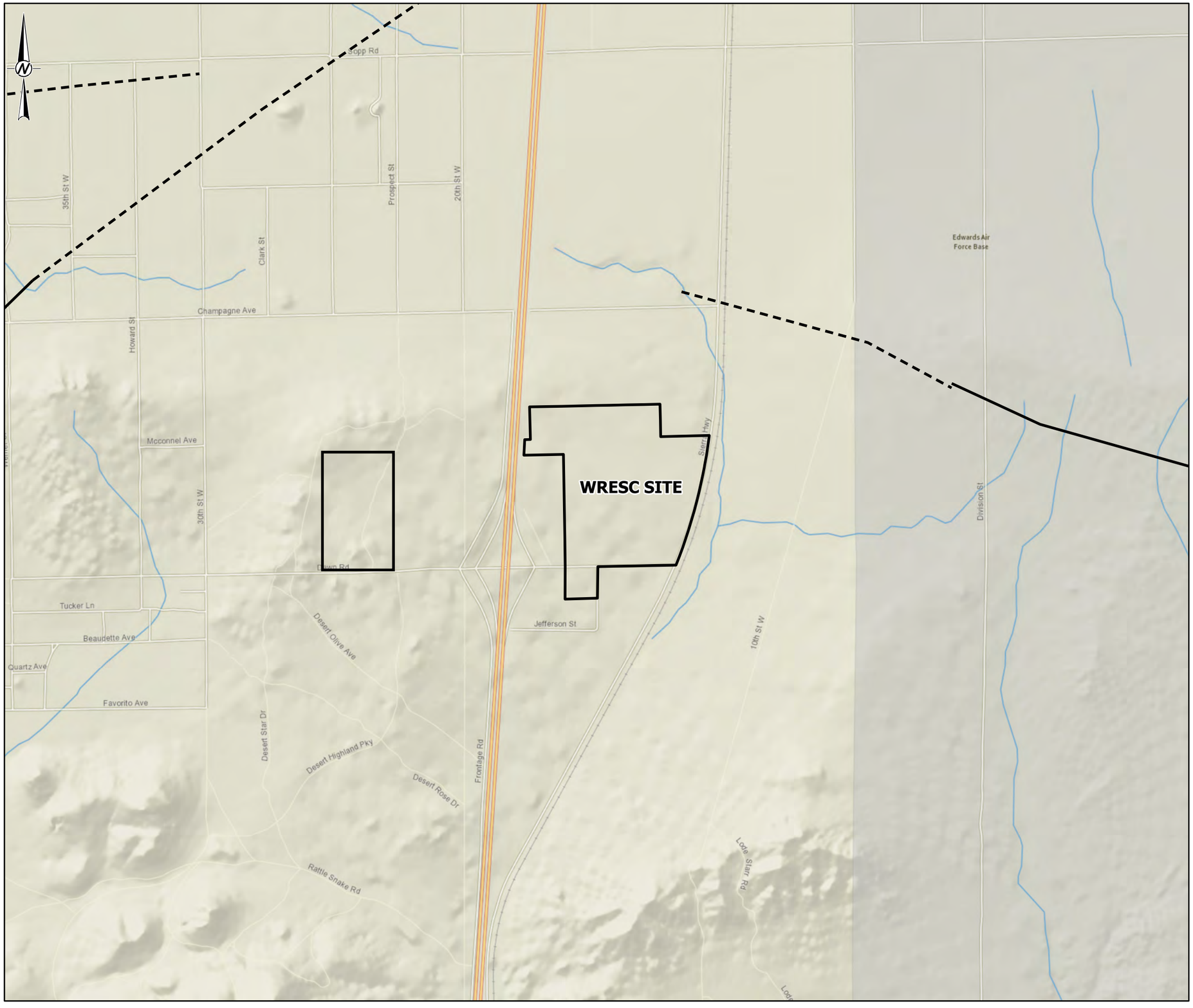
TITLE
FAULT MAP

CONSULTANT

YYYY-MM-DD	2024-02-28
DESIGNED	JAM
PREPARED	JAM
REVIEWED	LK
APPROVED	RPCE

PROJECT NO.
31406639.003

FIGURE
5.4-1a



LEGEND

- PROJECT BOUNDARY
- FAULT, CERTAIN
- FAULT, CONCEALED

1:24,000

0 1,000 2,000 4,000 US Feet

REFERENCE(S)

1. COORDINATE SYSTEM: NAD 1983 STATEPLANE CALIFORNIA V FIPS 0405 FEET
2. 2010 FAULT DATA: HTTPS://GIS.CONSERVATION.CA.GOV/SERVER/REST/SERVICES/CGS/FAULTACTIVITYMAPCA/MAPSERVER

CLIENT
GEM A-CAES LLC

PROJECT
WILLOW ROCK ENERGY STORAGE CENTER
SUPPLEMENTAL AFC

TITLE
FAULT MAP

CONSULTANT

YYYY-MM-DD	2024-02-28
DESIGNED	JAM
PREPARED	JAM
REVIEWED	LK
APPROVED	RPCE

PROJECT NO.
31406639.003

FIGURE
5.4-1b

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0 25mm

The CGS Data Viewer application was also used to determine the epicenter locations of historic earthquakes around California (CGS 2017a). The program shows known magnitude 5.0 or greater earthquakes occurring from 1769 through 2015. The closest identified earthquake to the WRESC Site during this time period had a magnitude of 5.9 and occurred approximately 14.5 miles to the southwest. Two earthquakes with magnitude 7.0 or higher have occurred within 62 miles of the WRESC Site at the Pleito and San Andreas fault zones.

5.4.1.2 Local Geology and Stratigraphy

According to the Geologic Map and Sections of the Rosamond Quadrangle, California map, quartz monzonite covers the extent of the proposed WRESC site, including both permanent and temporary impact zones (CGS 2022a; USGS 1959). However, the Yeh (2023) site-specific geotechnical exploration better delineates the extent of alluvium or quartz monzonite and confirmed there is a fairly thin (less than 10 feet thick) layer of alluvium at the existing ground surface across most of the permanent impact parcel. Areas north and east of the WRESC Site, possibly in portions of the temporary impact areas, can be expected to contain a varying thickness alluvial sands and gravels at the surface overlying the quartz monzonite. **Figure 5.4-2** shows a geologic map of Project Area and surrounding area.

5.4.1.3 Seismic Setting

The tectonic setting of Southern California is complex and is made up of numerous fault systems, including strike-slip, oblique, thrust, and blind thrust faults. Therefore, any given area is subject to seismic hazards of varying degrees, dependent on the proximity to and the length of nearby active faults, potentially active faults, and the local geologic and topographic conditions. Seismic hazards include primary hazards such as seismic shaking and ground rupture along the fault trace, and secondary hazards resulting from strong ground shaking such as liquefaction and lateral spreading. The proposed A-CAES site area can be characterized as an active seismic area, with the potential for large-magnitude earthquakes to occur.

5.4.1.4 Potential Geologic Hazards

The following subsections present the potential geological hazards that may occur within the Project Area.

5.4.1.4.1 Ground Rupture

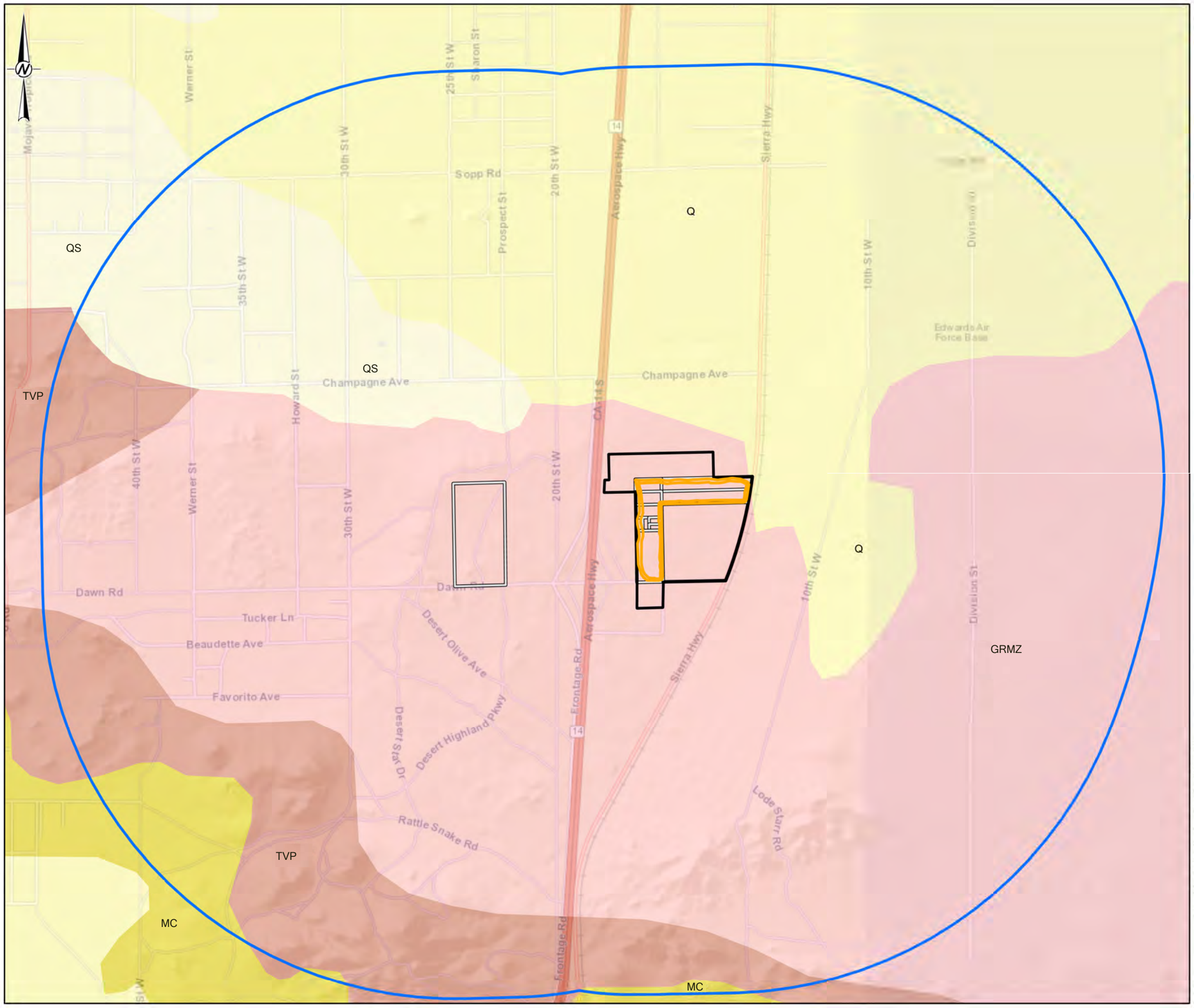
The CGS Seismic Hazards Program web application was used to determine the WRESC Site's proximity to any known Alquist-Priolo earthquake fault zones (CGS 2017b). Alquist-Priolo earthquake fault zones are regulatory zones that encompass the minimum distance for human occupancy from active faults that have the potential for surface rupture. No structures designed for human occupancy can be placed over the fault or within 50 feet in any direction. According to the CGS Fault Activity Map, the proposed WRESC site is not bisected by any known active or potentially active faults, and the web application shows that the WRESC Site is approximately 15 miles southwest from the nearest Alquist-Priolo fault zone, which is the Garlock fault zone.

The likelihood for a ground rupture to occur at the proposed WRESC site is considered low to negligible and its corresponding impacts are less than significant.

5.4.1.4.2 Seismic Shaking

Due to the WRESC Site's proximity to surrounding fault zones, the WRESC Site may experience strong ground motions in the event of an earthquake. The CGS Earthquake Shaking Potential Map web application categorizes areas based on their expected intermediate period ground motion with a 2 percent exceedance probability in 50 years (2,475 -year return period) (CGS 2017c). This application incorporates anticipated amplification of ground motions by local soil conditions and places the earthquake shaking potentials in a qualitative ranking system from highest to lowest. The WRESC Site is ranked by the web application as having low to medium shaking potential.

Site-specific hazard analyses have not been performed for the Project Area. However, a cursory assessment using the U.S. Geological Survey Earthquake Hazard Toolbox (USGS 2018), assuming a 2,475-year return period and Site Class B (rock) conditions, indicates a peak ground acceleration of 0.40g (where g represents acceleration due to gravity) and mean earthquake magnitude of 7.09.



LEGEND

- PROJECT BOUNDARY
- ARCHITECTURAL BERM
- QS - EXTENSIVE MARINE AND NONMARINE SAND DEPOSITS, GENERALLY NEAR THE COAST OR DESERT PLAYAS.
- Q - ALLUVIUM, LAKE, PLAYA, AND TERRACE DEPOSITS; UNCONSOLIDATED AND SEMI-CONSOLIDATED. MOSTLY NONMARINE, BUT INCLUDES MARINE DEPOSITS NEAR THE COAST.
- MC - SANDSTONE, SHALE, CONGLOMERATE, AND FANGLOMERATE; MODERATELY TO WELL CONSOLIDATED.
- TVP - TERTIARY PYROCLASTIC AND VOLCANIC MUDFLOW DEPOSITS.
- GRMZ -MESOZOIC GRANITE, QUARTZ MONZONITE, GRANODIORITE, AND QUARTZ DIORITE.
- TEMPORARY IMPACT PARCEL
- PARCEL 2 MILE BUFFER

1:30,000

0 1,250 2,500 5,000 Feet

REFERENCE(S)

1. COORDINATE SYSTEM: NAD 1983 STATEPLANE CALIFORNIA V FIPS 0405 FEET
2. ROCK TYPE: HTTPS://GIS.CONSERVATION.CA.GOV/SERVER/REST/SERVICES/CGS/GEOLOGIC_MAP_OF_CALIFORNIA/FEATURESERVER

CLIENT
GEM A-CAES LLC

PROJECT
WILLOW ROCK ENERGY STORAGE CENTER
SUPPLEMENTAL AFC

TITLE
GEOLOGIC MAP

CONSULTANT
wsp

YYYY-MM-DD	2024-01-19
DESIGNED	JAM
PREPARED	JAM
REVIEWED	RPCE
APPROVED	VG/LL

PROJECT NO.
31406639.003

FIGURE
5.4-2

A site-specific probabilistic and deterministic seismic hazard analysis for the proposed Project Boundary will be completed to determine the magnitude and duration of seismic shaking and related impacts. Seismic shaking impacts can be mitigated to less than significant if an appropriate seismic hazard analysis is conducted, and WRESC facilities are designed to withstand seismic ground motions in compliance with applicable seismic design codes (i.e., Section 1613 of the California Building Code [CBC] [ICC 2022], Chapter 20 of the American Society of Civil Engineers Minimum Design Loads for Buildings and Other Structures [ASCE 2022]).

Furthermore, advancement of the Project is contingent on sound bedrock that is seismically stable at the depth of the underground cavern. Based on the information provided in Agapito (2024), it is expected that the bedrock at the cavern target horizons will be seismically stable.

5.4.1.4.3 Liquefaction

Liquefaction is a phenomenon in which the strength and stiffness of a typically loose, cohesionless (i.e., sand), saturated soil are reduced by earthquake shaking or other rapid or cyclic loading. Liquefaction is also a function of the presence of groundwater. As explained in Section 5.11.2.6.2, Potential for Shallow Groundwater, groundwater at the proposed WRESC site is likely at least 30 feet bgs. Liquefaction generally occurs in the upper 50 to 60 feet of soil. If groundwater is deeper than 60 feet, the possible impacts of liquefaction are typically less than significant. If groundwater is present at shallower depths, the effects of liquefaction may be significant if not mitigated.

The CGS Seismic Hazards Program: Liquefaction Zones map shows that mapping has not been performed within the proposed WRESC Project Boundary (CGS 2022b). This does not preclude the possibility of liquefaction potential within the proposed Project Boundary.

As described in Section 5.11, Soils, soil maps from the Natural Resource Conservation Service (NRCS) identify three surficial soil units within the WRESC Site: the Muroc, Cajon, and Hi Vista soils (NRCS 2021). Two additional surficial soil units, the Torriorthents and Rosamond Clay Loam, were identified in the temporary impact areas. In summary, the Muroc and Hi Vista soils are dominated by sandy loam and the Cajon soils are dominated by sand. The Torriorthents are reported to be variable soils, and it is not clear what their particle sizes and textures are, while the Rosamond soils are dominated by sandy or silty clay loam. Based on the available information provided by the NRCS, all five soil units present may be susceptible to liquefaction. The Rosamond soils are less likely to be susceptible to liquefaction than the other soil units due to their higher clay fraction. However, the NRCS data is very limited and cannot be solely relied on to determine liquefaction susceptibility.

Section 5.11 also describes the subsurface conditions encountered during the Yeh (2023) geotechnical exploration within the permanent impact parcel. Based on the conditions encountered described in the Yeh (2023) report, most of the permanent impact parcel has a surficial layer of alluvium that is up to 7.5 feet thick and portions of which have a loose relative density as described in Section 5.11.2.4. Theoretically, the loose zones of the alluvium may be susceptible to liquefaction. However, considering the current understanding of the depth to groundwater described in Section 5.11.2.6.2, the alluvium would not have the potential for liquefaction unless the groundwater elevation increased significantly. To conduct a quantitative liquefaction analysis, the historic highest groundwater elevation is typically applied and at the time this document was prepared, the historic highest groundwater elevation was unknown. The quartz monzonite encountered per the Yeh (2023) report is considered not susceptible to liquefaction.

Based on the information presented in Yeh (2023), the risk of liquefaction within the permanent impact parcel is considered low to negligible depending on the historic highest groundwater elevation and fluctuations in the groundwater seasonally or over time. Based on the NRCS data, some of the surficial soils may be susceptible to liquefaction, but additional information is needed to confirm subsurface conditions and evaluate the risk of liquefaction in the temporary impact parcels. Regardless of susceptibility, the consequences of liquefaction within the temporary parcels may be of little or no importance depending on the use of those areas. The potential impacts and geologic hazards associated with liquefaction can be mitigated to less than significant by performing additional site-specific geotechnical exploration and implementing recommendations to mitigate liquefaction, if applicable.

As stated in Section 5.4.1.4.2, above, advancement of the Project is contingent on the presence of sound bedrock that is seismically stable at the depth of the underground cavern. Therefore, the potential impacts and geologic

hazards associated with liquefaction are applicable to the surficial structures but are not applicable to the underground cavern and, based on the conditions encountered described in Yeh (2023), are not applicable to the vertical shafts that extend down to the cavern elevation.

5.4.1.4.4 Mass Wasting

The potential for mass wasting (landsliding) to occur depends on a variety of factors, including, but not limited to, the steepness of the slope, geology, and soil moisture.

The CGS Deep-Seated Landslide Susceptibility Map web application estimates an area's susceptibility to mass wasting events based on the location of past landslides, location and relative strength of rock units, and steepness of surrounding slopes (CGS 2018b). Landslide susceptibility is characterized by the use of classes, zero (0) through ten (X), with class X having the highest landslide potential. The permanent and temporary impact parcels are relatively flat and defined as class 0, as is the area adjacent to the parcels. The Project is considered to have a negligible susceptibility to the propagation of landslides from within or into the Project Boundary, including both permanent and temporary impact areas. **Figure 5.4-3** shows the CGS Deep-Seated Landslide Susceptibility at the proposed WRESC location.

5.4.1.4.5 Subsidence

Subsidence is the gradual settling of the ground surface over time due to underground material movement. Subsidence is most often caused by the removal of groundwater through pumping activities, hydraulic fracturing activities for oil extraction, or mining of other mineral resources. Soil compaction, sinkhole formation, and earthquakes can also cause subsidence to occur.

Construction of the proposed WRESC will involve filling the hydrostatic compensation surface reservoir using water purchased from Antelope Valley East Kern Water Agency. Additionally, at the time this document was prepared, operation of the WRESC will not involve the installation or use of any onsite wells for any purposes, including to control the reservoir level. However, some localized dewatering may be necessary during excavation of the reservoir over a finite period of time. The potential impacts related to subsidence are considered to be less than significant.

5.4.1.4.6 Expansive Soils

Expansive soils have the potential to shrink and swell with variations in moisture, which could cause ground instability in the form of differential settlement and potentially damage shallow foundations.

For the proposed WRESC and its features, the presence of expansive soils would only be a possible concern for buildings and foundations. A site-specific geotechnical exploration was conducted within the permanent impact boundary (Yeh, 2023) and its findings indicate the soils within the permanent impact boundary are considered to have negligible shrink-swell potential. Site-specific conditions have not been explored or confirmed across the temporary impact parcels but based on the conditions encountered in the permanent impact parcel (Yeh, 2023) and review of the geologic map shown in **Figure 5.4-2**, it is unlikely that the temporary impact parcels harbor expansive soils. Furthermore, neither buildings nor foundations are proposed within the temporary impact parcels, so regardless of possible shrink/swell potential, the presence of any expansive soils in those areas would be inconsequential. Section 5.11, Soils, discusses additional information on expansive soils.

5.4.1.4.7 Tsunamis and Seiches

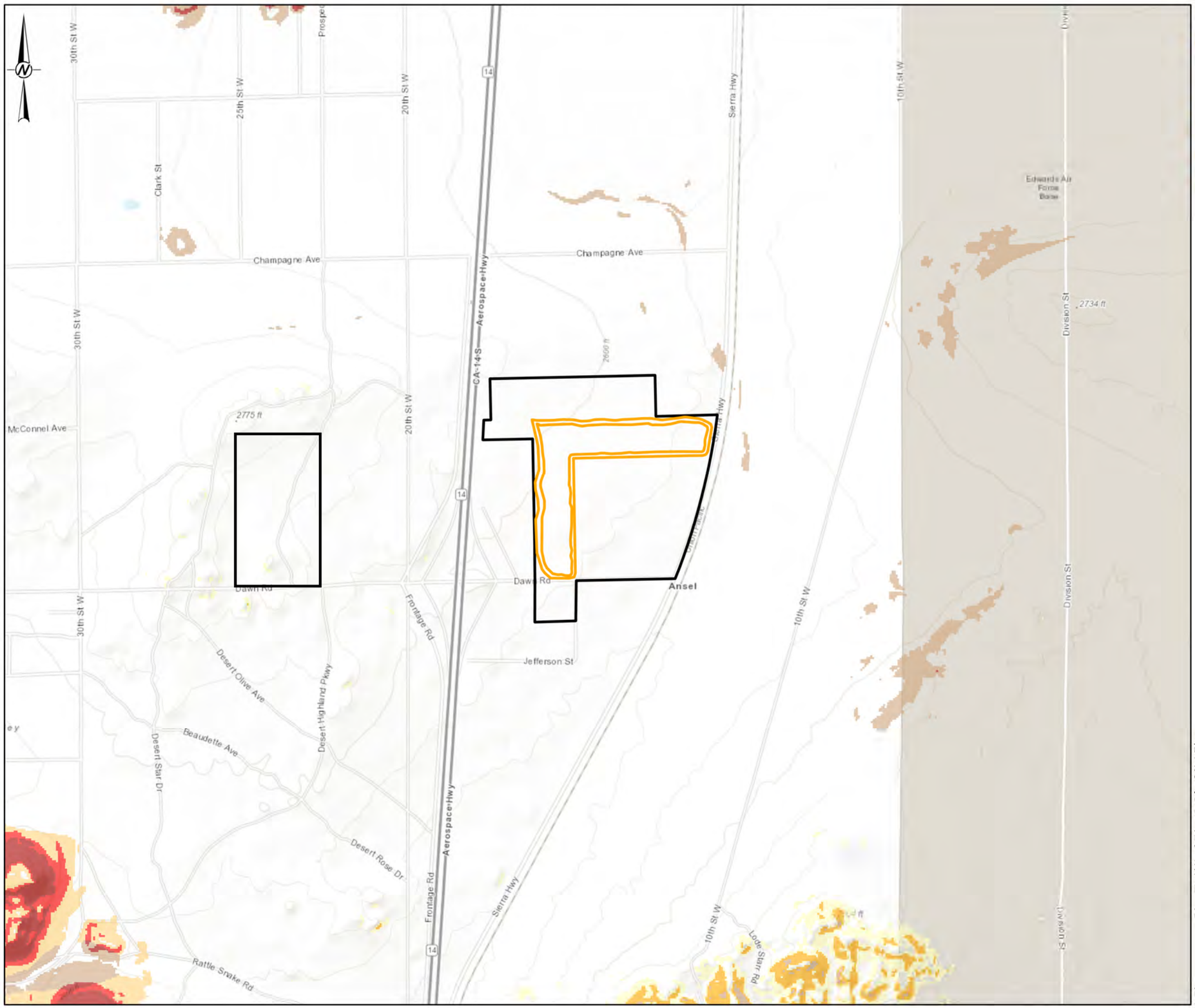
Tsunamis are large ocean waves that are seismically induced and often the result of offshore earthquakes or landslides. The proposed site is over 70 miles from the coastline, so the potential for the WRESC Site to be affected by a tsunami is negligible. Additionally, the CGS map of tsunami hazard areas classifies the Project Area as outside of a tsunami hazard area (CGS 2022c).

Seiches are waves and oscillations within confined bodies of water that are seismically induced by ground shaking. There are no large, confined bodies of water immediately adjacent to or uphill of the WRESC Site, so the potential for an offsite seiche to impact the WRESC Site is negligible. The planned compensation reservoir for site operations will be designed to be seismically stable and with adequate freeboard to mitigate overtopping and loss

of containment, including from possible seiches. Section 5.15, Water Resources, provides further information regarding the onsite compensation reservoir.

5.4.1.4.8 Permanent Slopes and Embankments

Construction of the proposed WRESC includes permanent embankments for the hydrostatic compensation surface reservoir and potentially permanent slopes should the architectural berm be implemented. The embankment, and any other permanent slopes, will be analyzed for slope stability and designed to achieve appropriate minimum factors of safety for both static and seismic conditions. Refer to Section 5.15, Water Resources, for additional information on the compensation reservoir and Division of Safety of Dams requirements.



LEGEND

- PROJECT BOUNDARY
- ARCHITECTURAL BERM

LANDSLIDE SUSPECTIBILITY MAP

- 0
- III
- V
- VI
- VII
- VIII
- IX
- X

1:19,000

0 0.15 0.3 0.6 Miles

REFERENCE(S)

1. COORDINATE SYSTEM: NAD 1983 STATEPLANE CALIFORNIA V FIPS 0405 FEET
2. LANDSLIDE DATA: HTTPS://GIS.CONSERVATION.CA.GOV/SERVER/REST/SERVICES/CGS/GEOLOGIC_MAP_OF_CALIFORNIA/FEATURESERVER

CLIENT
GEM A-CAES LLC

PROJECT
WILLOW ROCK ENERGY STORAGE CENTER
SUPPLEMENTAL AFC

TITLE
LANDSLIDE SUSCEPTIBILITY MAP

CONSULTANT

YYYY-MM-DD	2024-01-19
DESIGNED	JAM
PREPARED	JAM
REVIEWED	RPCE
APPROVED	VG/LL

PROJECT NO.
31406639.003

FIGURE
5.4-3

5.4.1.4.9 Settlement

The potential for settlement of native soils underlying the WRESC Site will depend on the thickness and characteristics (e.g., stiffness modulus, compression indices) of the native soil and the loading it is subject to. Based on the conditions encountered within the permanent impact parcel described in the Yeh (2023) report, the surficial alluvium would likely be susceptible to settlement. However, because the alluvium was up to 7.5 feet thick in the Yeh (2023) borings, settlement of the alluvium is likely minor. Settlement of the quartz monzonite is likely negligible. Impacts related to settlement beneath features within the permanent impact parcel boundary (e.g., foundations, structures, storage tanks, the hydrostatic compensation reservoir) will be mitigated to less than significant by analyzing and accounting for settlement as part of the design of the WRESC, and/or implementing construction and/or earthwork techniques to reduce or eliminate the potential impacts.

Impacts related to settlement within the temporary impact parcels is less than significant. Should the architectural berm be constructed, it will not be sensitive to minor amounts of settlement, including differential settlement. Impacts related to settlement caused by staging and other intended uses of the temporary impact parcel are less than significant.

5.4.1.4.10 Collapse of Below-Grade Features

Construction of the proposed WRESC will include the excavation of deep vertical shafts and an underground cavern. The collapse of either, or both, of these below-grade features may result in surface settlement and subsidence which may impact the public (e.g., roadways, utilities). The potential impacts related to the possible collapse of these features may not be significant, depending on their design (i.e., depths, extents, etc.) and the site-specific subsurface conditions present at the proposed WRESC Site. However, if necessary, potential impacts can be mitigated to less than significant by properly designing and constructing (i.e., rock bolts, lined shaft, etc.) as warranted based on the subsurface conditions.

Additionally, below-grade features will be properly closed, as described in Section 2.0, Project Description.

5.4.1.4.11 Anthropologically Induced Seismicity

It is possible for anthropologically induced seismicity to occur when human activities impose additional strain on underlying rock masses below the existing ground surface, particularly along active faults. Possible triggering mechanisms of this phenomenon that could occur at the proposed WRESC are reservoir-induced seismicity and compressed air at depth, discussed below.

Reservoir-Induced Seismicity

Reservoir-induced seismicity can be triggered by rising water levels through one of the two following mechanisms (Dojchinovski and Guoxin 2012):

- The adaptation of the foundation rock to changes in stress due to the weight of water
- Reservoir seepage that reaches active faults located underneath or adjacent to the reservoir

The first mechanism may occur if there are specific conditions at the WRESC Site such as cavities, voids, or potentially open discontinuities. This mechanism tends to result in small-magnitude events that would be less than the design earthquake that is selected per the outcome of the seismic hazard analysis and used for the design of the WRESC. Potential impacts associated with this mechanism can be mitigated to less than significant.

Potential impacts associated with the second mechanism are considered less than significant at the WRESC site because all four of the following conditions must exist for this to be a concern:

- The reservoir is deep to very deep, defined as 263 to more than 492 feet (USGS 1996).
- Seismogenic structures (i.e., faults) are present in or near the reservoir.
- The seismogenic structure is active and therefore is likely close to the failure point prior to filling the reservoir.
- Hydrological conditions are present that allow infiltration of water from the reservoir to deep layers of the rock mass.

The proposed reservoir will be shallow (less than 100 feet deep), lined with an engineered low permeability liner, and there are no known active seismogenic structures near the WRESC Site, so none of these conditions are present at the WRESC Site and, therefore, the potential impacts from induced seismicity are considered to be less than significant.

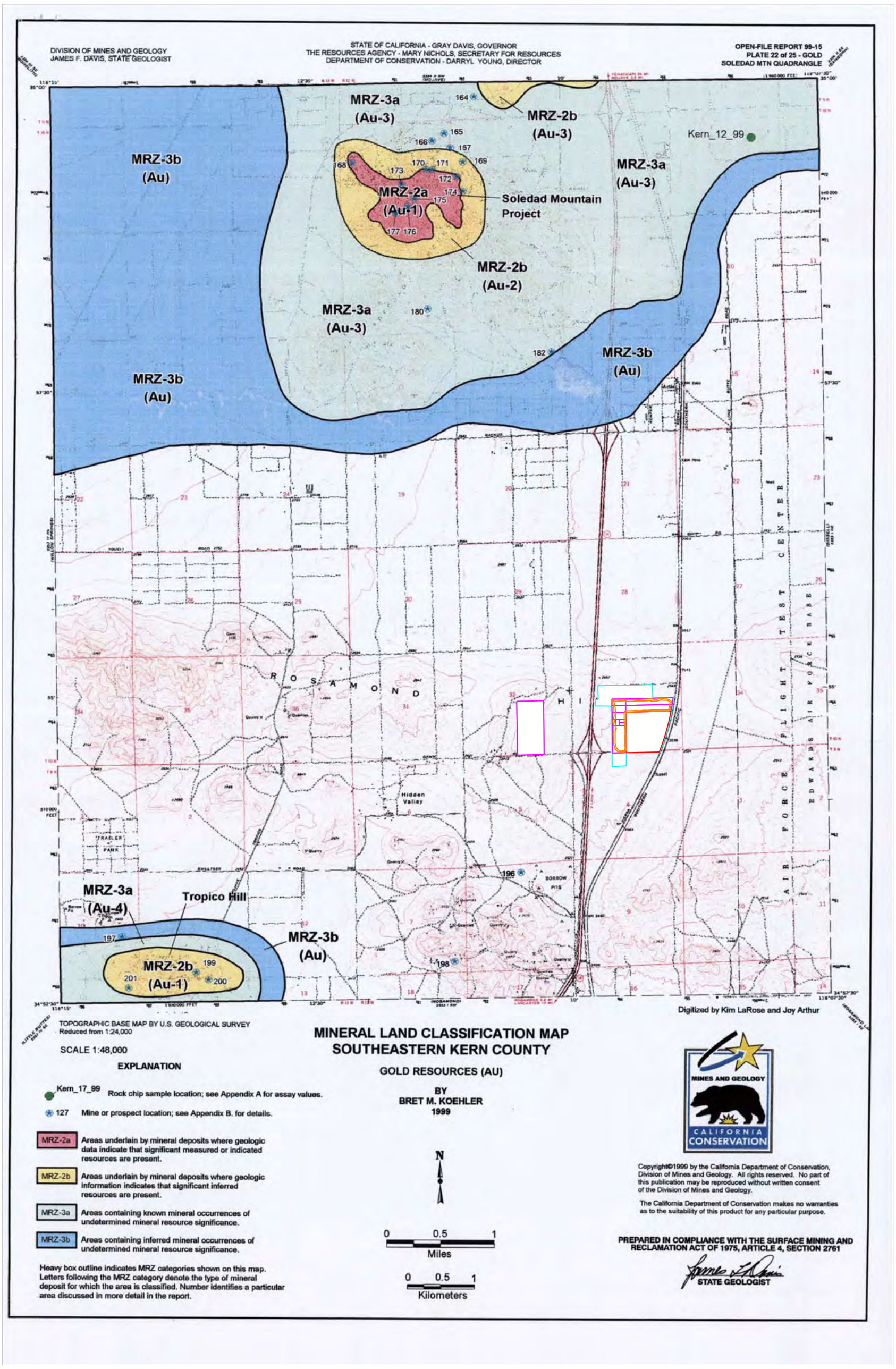
Compressed Air Induced Seismicity

Potential impacts related to compressed air or water induced seismicity would be considered credible if the vertical shafts and/or underground cavern of the proposed WRESC intersected an active fault. Because there are no known active faults near the proposed WRESC Site, the potential impacts are considered to be less than significant.

Hydraulic fracturing of rock for oil and gas exploration, and deep wastewater injection wells, have occasionally caused seismic events. These types of projects differ fundamentally from the WRESC Project in that they intentionally fracture rock under pressures of 9,000 pounds per square inch (psi) or more and/or involve the permanent disposal of significant volumes of liquids. In contrast, the successful performance of the WRESC Project will depend on the surrounding rock remaining intact during operation (i.e., not fracturing) in order to retain air and water, which will be addressed during the design of the Project. In addition, operating pressures for the WRESC Project are expected to be 1,000 psi or less, which are considerably lower than that for hydraulic fracturing and most deep injection wells.

5.4.1.5 Geologic Resources of Recreational, Commercial, or Scientific Value

The geology throughout the proposed site vicinity mostly includes alluvial deposits with igneous intrusions. These deposits are not unique in terms of recreational or scientific value, and they occur throughout southeastern Kern County. The California Department of Conservation Division of Mines and Geology published a mineral land classification map for Southeast Kern County in 1999 (CDOC 1999). The mineral land classification map evaluates areas based on the presence of gold, limestone, borates, dimension stone, silica, and pozzolan deposits. The Project location is in an area with no known mineral occurrences where geologic information does not rule out either the presence or absence of significant mineral resources. These designated areas are located well outside of the proposed Project Boundary; therefore, potential impacts to geologic resources of recreational, commercial, or scientific value are less than significant. Mineral Land Classification maps are included as **Figure 5.4-4** and **Figure 5.4-5**.



LEGEND

- PERMANENT IMPACT PARCEL
- ARCHITECTURAL BERM
- WRESC SITE
- TEMPORARY IMPACT PARCEL

CLIENT
GEM A-CAES LLC

CONSULTANT
wsp

YYYY-MM-DD	2024-01-22
DESIGNED	JAT
PREPARED	JAT
REVIEWED	RPCE
APPROVED	RPCE

PROJECT
WILLOW ROCK ENERGY STORAGE CENTER SUPPLEMENTAL AFC

TITLE
MINERAL LAND CLASSIFICATION MAP
GOLD RESOURCES

PROJECT NO.
31406639.003

FIGURE
5.4-4

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B
1 in
0

DIVISION OF MINES AND GEOLOGY
JAMES F. DAVIS, STATE GEOLOGIST

STATE OF CALIFORNIA - GRAY DAVIS, GOVERNOR
THE RESOURCES AGENCY - MARY NICHOLS, SECRETARY FOR RESOURCES
DEPARTMENT OF CONSERVATION - DARRYL YOUNG, DIRECTOR

OPEN-FILE REPORT 99-15
MINERAL LAND CLASSIFICATION OF SOUTHEASTERN KERN COUNTY - PLATE 2A

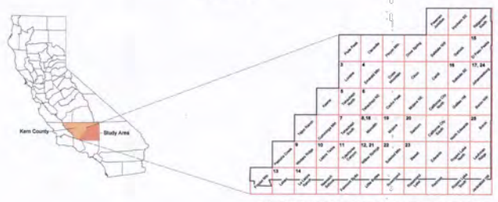
MINERAL LAND CLASSIFICATION OF SOUTHEASTERN KERN COUNTY, CALIFORNIA

Areas Classified for Borates (B), Limestone (LS), Gold (Au), Dimension Stone (DS), Silica (S), and Pozzolan (P)

with mines and prospects

By
Bret M. Koehler
1999

LOCATION MAP



Index to U.S. Geological Survey 7.5-minute quadrangles covered in the study area. Numbers in corners refer to individual 1:48,000 scale plates 3-2B.

EXPLANATION

- ★ Mine or prospect location, see Appendix B.
- MRZ-2a — Areas underlain by mineral deposits where geologic data indicate that significant measured or indicated resources are present.
- MRZ-2b — Areas underlain by mineral deposits where geologic information indicates that significant inferred resources are present.
- MRZ-3a — Areas containing known mineral occurrences of undetermined mineral resource significance.
- MRZ-3b — Areas containing inferred mineral occurrences of undetermined mineral resource significance.

Letters following the MRZ category denote the type of mineral deposit for which the area is classified. Number identifies a particular area discussed in more detail in the report.

PREPARED IN COMPLIANCE WITH THE SURFACE MINING AND RECLAMATION ACT OF 1975, ARTICLE 4, SECTION 2761

STATE GEOLOGIST

N

0 2.5 5 Miles
0 2.5 5 Kilometers

SCALE 1:110,000

Digitizing and layout by Joy Arthur and Kim LaRose

LEGEND

- PERMANENT IMPACT PARCEL
- ARCHITECTURAL BERM
- WRESC SITE
- TEMPORARY IMPACT PARCEL

CLIENT
GEM A-CAES LLC

CONSULTANT
wsp

YYYY-MM-DD	2024-01-22
DESIGNED	JAT
PREPARED	JAT
REVIEWED	RPCE
APPROVED	RPCE

PROJECT
WILLOW ROCK ENERGY STORAGE CENTER SUPPLEMENTAL AFC

TITLE
MINERAL LAND CLASSIFICATION MAP

PROJECT NO.
31406639.003

FIGURE
5.4-5

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B

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Path: \\gridder.gdb\complexdata\office\Sacramento\Acad\SiteshHydrostor Willow Rock\CIVIL 3D\Geologic Hazards Chapter Figures\ | File Name: Figure 5.4-5.dwg | Last Edited By: jothornton Date: 2024-01-22 Time:1:19:52 PM | Printed By: JoThornton Date: 2024-01-22 Time:1:54:04 PM

5.4.2 Environmental Analysis

The following sections present the potential effects from the construction and operation of the proposed WRESC on geologic resources and risks to life and property from geologic hazards.

5.4.2.1 Significance Criteria

Factors used to evaluate the significance of project-related geological hazards and resources are set forth in Appendix G of the California Environmental Quality Act (CEQA). Appendix G is a screening tool, not a method for setting thresholds of significance. Appendix G is typically used in the Initial Study phase of the CEQA process, asking a series of questions. The purpose of these questions is to determine whether a project requires an Environmental Impact Report, a Mitigated Negative Declaration, or a Negative Declaration. As the Governor's Office of Planning and Research stated, "Appendix G of the Guidelines lists a variety of potentially significant effects but does not provide a means of judging whether they are indeed significant in a given set of circumstances." The answers to the Appendix G questions are not determinative of whether an impact is significant or less than significant. Nevertheless, the questions presented in CEQA Appendix G are instructive.

In terms of potential impacts to geological hazards and resources associated with the construction and operations of the project, Appendix G, asks if the project would:

- Directly or indirectly cause potential adverse effects, including the risk of loss, injury, or death involving the following:
  - 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
  - Strong seismic ground shaking
  - Seismic-related ground failure, including liquefaction
  - Landslides
- 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 offsite landslide, subsidence, liquefaction, or collapse.
- Directly or indirectly destroy a unique paleontological resource or site or unique geologic feature.
- Result in the loss of availability of a known mineral resource that would be of value to the region and the residents of the state.
- Result in the loss of availability of a locally important mineral resource recovery site delineated on a local plan, specific plan, or other land use plan.

5.4.2.2 Geological Hazards

As described in Section 5.4.1.4, above, the following potential geological hazards, with corresponding impact assessment, have been identified. Mitigation measures to reduce the impact(s) to less than significant are described in Section 5.4.4, below.

- Impacts related to ground rupture are less than significant.
- Impacts related to seismic shaking can be mitigated to less than significant.
- Impacts related to liquefaction are less than significant within the permanent impact parcel and can be mitigated to less than significant in the temporary impact parcels.
- Impacts related to mass wasting are considered less than significant.
- Impacts related to subsidence are less than significant.
- Impacts related to expansive soils are less than significant.
- Impacts related to tsunamis and seiches are less than significant.
- Impacts related to permanent slopes and embankments can be mitigated to less than significant.
- Impacts related to settlement can be mitigated to less than significant.

- Impacts related to collapse of below-grade features can be mitigated to less than significant.
- Impacts related to reservoir-induced seismicity are less than significant.
- Impacts related to compressed air induced seismicity are less than significant.

5.4.2.3 Geological Resources

The proposed WRESC facility will not result in a loss of availability of any known valuable mineral resources. Additionally, the WRESC will not result in the loss of availability of a locally important mineral resource recovery site delineated on a local plan, specific plan, or other land use plan.

5.4.3 Cumulative Effects

Section 15355 of the CEQA Guidelines defines "cumulative impacts" as "two or more individual effects which, when considered together, are considerable or which compound or increase other environmental impacts." Subsection b of Section 15355 states, in part, that "The cumulative impact from several projects is the change in the environment which results from the incremental impact of the project when added to other closely related past, present, and reasonably foreseeable probable future projects." Thus, cumulative impacts under CEQA involve the potential interrelationships of two or more projects, not the impacts from a single project. Specifically, under Section 15130 of the CEQA Guidelines, an Environmental Impact Report is required to discuss cumulative impacts when the project's incremental effect is "cumulatively considerable." Section 15065(a)(3) then defines "cumulatively considerable" as meaning "that the incremental effects of an individual project are significant when viewed in connection with the effects of other closely related past projects, the effects of other current projects and the effects of probable future projects."

Most areas of Kern County are considered seismically active, to a less or greater extent depending on their proximity to active regional faults. Cumulative projects would also be subject to similar seismic hazards since they are in the vicinity. However, the effects of these projects are not of a nature to cause cumulatively significant effects from geologic impacts because such impacts are site-specific and would only have the potential to combine with impacts of the proposed Project if they occurred in the same location. Implementation of mitigation measures outlined in this section would reduce the potential impacts associated with geology and soils resulting from the Project; therefore, cumulative geological impacts are not considered cumulatively considerable.

5.4.4 Best Practices, Design Features, and Mitigation Measures

The following best management practices, design features, and mitigation measures will reduce potential impacts related to geological hazards to less than significant during construction and operation of the proposed WRESC:

- Furnish a geotechnical report that augments the Yeh (2023) data report and is applicable to the Project.
- Verify that the recommendations provided in the geotechnical report are followed during the construction and operation of the proposed WRESC.
- Perform a site-specific probabilistic and deterministic seismic hazard analysis to evaluate seismicity and provide a basis for selecting design ground motion parameters.
- If the temporary impact parcels are susceptible to liquefaction, and if the consequences of liquefaction in these areas in determined to be meaningful, then reduce potential liquefaction-derived settlement to acceptable levels by the use of either ground improvement techniques (i.e., excavate and replace, compaction grouting, vibro replacement, or deep soil mixing).
- Design structures and equipment to meet seismic requirements of the most recent version of the CBC (CBSC 2019).
- Ancillary features (tanks, utility towers, etc.) will be designed and constructed in accordance with their respective design standards consistent with the standard of practice.
- Analyze static and seismic stability of all permanent slopes and embankments.
- Design structures and equipment to withstand anticipated settlement of underlying native soils.

- If applicable, comply with the Division of Safety of Dams requirements for the construction and operation of hydraulic retention structures that are considered a jurisdictional dam (i.e., the hydrostatic compensation surface reservoir).
- Assign a geotechnical engineer and/or engineering geologist to the Project to carry out the duties required by the CBC to assess geologic conditions during construction and to approve actual mitigation measures used to protect the facility from geological hazards.
- Design and construct the below-grade features to prevent collapse during all phases of the Project life-cycle (i.e., construction, operation, closure, and post-closure).

5.4.5 Laws, Ordinances, Regulations, and Standards

Federal, state, county, and local laws, ordinances, regulations, and standards (LORS) applicable to geological hazards and resources are discussed below and summarized in **Table 5.4-1**. The local LORS discussed in this section are certain ordinances, plans, or policies of the City of Rosamond and Kern County. There are no federal LORS that apply to geological hazards and resources.

Table 5.4-1: Laws, Ordinances, Regulations, and Standards for Geological Hazards and Resources

LORS	Requirements/Applicability	Administering Agency	Application for Certification Section Explaining Conformance
State			
California Building Code, 2022	*Acceptable design criteria for structures with respect to seismic design and load-bearing capacity*	*California Building Standards Commission, State of California*	*Section 5.4.4*
Alquist-Priolo Earthquake Fault Zone Act (Title 14, Division 2, Chapter 8, Subchapter 1, Article 3, CCR)	*Identifies areas subject to surface rupture from active faults*	*California Building Standards Commission, State of California*	*Section 5.4.1.4.1*
The Seismic Hazards Mapping Act (Title 14, Division 2, Chapter 8, Subchapter 1, Article 10, CCR)	*Identifies secondary seismic hazards (liquefaction and seismically induced landslides)*	*California Building Standards Commission, State of California*	*Section 5.4.4*
California Water Code, Division 3, Dams and Reservoirs, Part 1	*Jurisdictional dam oversight*	*Division of Safety of Dams*	*Section 5.15.5.2.5*
Local			
Kern County Municipal Code	*Standards for grading, including permit requirements*	*Kern County, Building Inspection Division*	*Section 5.4.7*

5.4.6 Agencies and Agency Contacts

Compliance of building construction with CBC standards is covered under engineering and construction permits for the WRESC. There are no applicable permit requirements that specifically address geologic resources and hazards. However, excavation/grading and inspection permits may be required before construction, and they will be included in the overall Project construction permit (see Section 5.6, Land Use).

5.4.7 Permits and Permit Schedule

No additional permits are required for compliance with geological LORS.

5.4.8 References

Agapito Associates, Inc. (2024). Geotechnical Characterization Report for the Willow Rock-Dawn Road Project Site. February 16, 2024.

American Society of Civil Engineers (ASCE). 2022. Minimum Design Loads for Buildings and Other Structures, ASCE Standard, ASCE/SEI 7-22.

California Geological Survey (CGS). 2002. California Geomorphic Provinces, Note 36. California Department of Conservation. December.

California Geological Survey (CGS). 2010. *An Explanatory Text to Accompany the Fault Activity Map of California.* Available online: https://www.conservation.ca.gov/cgs/Documents/Melange/FAM_phamplet.pdf. Accessed August 8, 2023.

California Geological Survey (CGS). 2015. *Fault Activity Map. Geologic Data Map No. 6*. California Department of Conservation. Available online: https://maps.conservation.ca.gov/cgs/fam /https://maps.conservation.ca.gov/cgs/fam/. Accessed August 8, 2023.

California Geological Survey (CGS). 2017a. *CGS Map Sheet 48: Historic Earthquakes, 1769 to 2015 – California (Magnitude 5.0-plus)*. California Department of Conservation. Available online: https://maps.conservation.ca.gov/cgs/DataViewer/. Accessed August 8, 2023.

California Geological Survey (CGS). 2017b. *CGS Seismic Hazards Program: Alquist-Priolo Fault Hazard Zones*. California Department of Conservation. Available online: https://maps.conservation.ca.gov/cgs/ EQZApp/app/. Accessed August 8, 2023.

California Geological Survey (CGS). 2017c. *CGS Map Sheet 48: Earthquake Shaking Potential for California*. California Department of Conservation. Available online: https://maps.conservation.ca.gov/ cgs/DataViewer/. Accessed July 28, 2021.

California Geological Survey (CGS). 2018a. *Earthquake Fault Zones: A Guide for Government Agencies, Property Owners/Developers, and Geoscience Practitioners for Assessing Fault Rupture Hazards in California.* California Department of Conservation, Special Publication 42. Available online: https://www.conservation.ca.gov/cgs/documents/publications/special-publications/SP_042-a11y.pdf. Accessed August 8, 2023.

California Geological Survey (CGS). 2018b. *CGS Map Sheet 58: Deep-Seated Landslide Susceptibility*. California Department of Conservation. Available online: https://maps.conservation.ca.gov/cgs/DataViewer/. Accessed August 8, 2023.

California Geological Survey (CGS) 2022a. *Compilation of Quaternary Surficial Deposits*. California Department of Conservation. Available online: https://maps.conservation.ca.gov/cgs/QSD/. Accessed August 8, 2023.

California Geological Survey (CGS). 2022b. *Seismic Hazards Program: Liquefaction Zones*. Available online: https://maps.conservation.ca.gov/cgs/informationwarehouse/regulatorymaps/. Accessed July 21, 2023.

California Geological Survey (CGS). 2022c. *Tsunami Hazard Areas*. California Department of Conservation. Available online: https://maps.conservation.ca.gov/cgs/informationwarehouse/index.html?map=mlc. Accessed August 8, 2023.

Division of Mines and Geology, California Department of Conservation (CDOC). 1999. *Mineral Land Classification of Southeastern Kern County, California. Open-File Report 99-15*

Dojchinovski, D., L. Pekevski, and W. Guoxin, September 2012, Estimating Reservoir Induced Seismicity RIS Potential. Case Study – Kozjak Dam, 15th World Conference on Earthquake Engineering 2012, Lisbon Portugal, Vol. 16, pp. 12730–12736.

International Code Council, Inc. (ICC). 2022. 2022 California Building Code, California Code of Regulations, Title 24, Volume 1 of Part 2. Available online: https://codes.iccsafe.org/content/CABC2022P2.

Natural Resources Conservation Service (NRCS), U.S. Department of Agriculture. 2021. Web Soil Survey. Available online: http://websoilsurvey.nrcs.usda.gov/. Accessed July 20, 2023.

U.S. Geological Survey (USGS). 1959. Diblee, T.W. *Geology of the Rosamond Quadrangle, California*. U.S. Geological Survey.

U.S. Geological Survey (USGS). 2018. Earthquake Hazard Toolbox. Available online: https://earthquake.usgs.gov/nshmp/. Accessed August 8, 2023.

Yeh and Associates, Inc. (Yeh). 2023. Geotechnical Data Report, Zevsar Energy Storage Project Sierra Highway and Dawn Road, Kern County, California. November 17, 2023.

5.5 Hazardous Materials Handling

GEM A-CAES LLC's (GEM, the Applicant) Willow Rock Energy Storage Center (WRESC, or Willow Rock) will be located on approximately 88.6 acres of private land immediately north of Dawn Road and between State Route (SR) 14 and Sierra Highway within unincorporated, southeastern Kern County, California. The WRESC will be a nominal 520-megawatt (MW) gross (500 MW net) and 4,160 megawatt-hour (MWh) gross (4,000 MWh net) facility using Hydrostor, Inc.'s (Hydrostor's) proprietary, advanced compressed air energy storage (A-CAES) technology. Energy stored at the WRESC will be delivered to Southern California Edison's Whirlwind Substation located southwest of the WRESC at the intersection of 170th Street W and Rosamond Boulevard, via a new approximately 19-mile 230-kilovolt (kV) generation-tie (gen-tie) line. The WRESC will be capable of operating on a 24-hour basis, 365 days a year with an approximately 50-year lifespan.

The Project or Project Area encompasses the WRESC Site, the parcels within the Project Boundary, and the right-of-way associated with the WRESC's gen-tie line. The Project Boundary encompasses the WRESC Site and the parcels of land (an additional 133 acres of private land surrounding the WRESC) that will be allocated for potential temporary staging and laydown area (referred to herein as the Staging Area) during construction, or the construction of a permanent architectural berm constructed from the material excavated during cavern construction. The Staging Area consists of groups of assessor's parcels referred to as P1, P2N, P2S, and VH.

This section discusses the use and storage of hazardous materials associated with the WRESC and the potential effects on human health and the environment. Section 5.5.1 describes the existing environment that may be affected, and Section 5.5.2 identifies potential impacts on the environment and on human health during construction and operations. Section 5.5.3 discusses potential cumulative effects; Section 5.5.4 identifies proposed mitigation measures; Section 5.5.5 presents laws, ordinances, and standards applicable to hazardous materials; Section 5.5.6 identifies agencies involved and provides agency contacts; Section 5.5.7 describes permits; and Section 5.5.8 provides all references used to develop this section.

5.5.1 Affected Environment

5.5.1.1 Land Use

The WRESC will be located about 3.5 miles north of Rosamond, California. As discussed in Section 5.6, Land Use, the immediate vicinity is dominated by what appears to be undeveloped or empty lots of land. The nearest residence is approximately 2 miles west of the WRESC Site. No schools or medical facilities are present within a 3-mile radius of the WRESC Site. A small landing airport is located 2.61 miles northwest of the WRESC Site, and a few businesses are present southwest of the WRESC Site in the area surrounding Rosamond Boulevard. Further details on the land use are included in Section 5.6, Land Use.

5.5.1.2 Hazardous Materials Use

Hazardous materials will be used during construction and operation of the WRESC; the facility will comply with all applicable laws and regulations. Proper use and storage of hazardous materials will minimize potential for accidental release. Additionally, the Applicant will conduct an emergency response planning session to address public health concerns regarding hazardous materials storage and use. The following sections describe use, followed by general characteristics of hazardous materials.

5.5.1.2.1 Construction and Commissioning Phase

General construction will require the use of hazardous materials such as sealants, adhesives, spent welding materials, paint and paint thinner, solvents, detergents, glycols, and refrigerants. Passivating and chemical cleaners and lubricating oil will be used on various mechanical equipment during construction. Hydraulic fluid, motor oil, diesel fuel, and gasoline will also be used onsite for motorized equipment and emergency generator use. There are no feasible alternatives to vehicle fuels and oils for operating construction equipment. To power small equipment, lead acid batteries, alkaline batteries, and electrical fuses will be used onsite. The types of paint required are dictated by the equipment and structures that must be coated, and by the service conditions and environment. As discussed in 5.17, Worker Health and Safety, construction of the cavern will require drilling and

charging with explosives for the controlled detonation work. Should regulated substances be used during construction of the WRESC, they will be stored and handled in compliance with all applicable regulations.

5.5.1.2.2 Operations Phase

Most of the hazardous substances that will be stored and used at the WRESC are required for water treatment. Some hazardous materials, such as lubricating oil and insulating oil, will also be stored for equipment maintenance. An electric-motor-driven pump that is connected to an emergency backup generator, as well as a diesel-powered pump, will be used for the fire protection system onsite. Therefore, a 600-gallon capacity aboveground, dual-walled integral tank will store diesel onsite to provide temporary operation in the event of an emergency. Regulated substances used during WRESC operations will be minimized, stored, and handled per regulations.

Hazardous water treatment chemical use and storage locations are described in **Table 5.5-1**. Trade names, chemical names, Chemical Abstract Service (CAS) numbers, maximum quantities onsite, reportable quantities (RQs), California Accidental Release Program (CalARP) threshold planning quantities (TPQs), and status as Proposition 65 chemicals (chemicals known to the state of California to be carcinogenic or cause reproductive problems in humans) are summarized in **Table 5.5-2**. **Table 5.5-3** summarizes the health hazards, flammability data, and incompatible chemicals.

Table 5.5-1: Use and Location of Hazardous Materials

Chemical	Use	Quantity Initial Fill/ Continuous Storage	Storage Location	State	Type of Storage
ChemTreat BL 1280	Thermal Management System Water Treatment	70 gallons/ 180 gallons	Onsite	Liquid	Continuously onsite
ChemTreat BL 1559	Thermal Management System Water Treatment	30 gallons/ 180 gallons	Onsite, tight, closed container, cool, and locked	Liquid	Continuously onsite
ChemTreat CL 2900	Cooling Water Treatment	8,400 gallons/ 660 gallons	Onsite	Liquid	Continuously onsite
ChemTreat CL 2150	Slimicide	5,200 gallons/ 660 gallons	Onsite, store locked	Liquid	Continuously onsite
Sodium Hypochlorite	Oxidant Wash, Chlorination, Pre-chlorination	180 gallons/ 180 gallons	Onsite,	Liquid	Continuously onsite
Diesel Fuel	Vehicle Use and Emergency Generator	11,800 gallons/ 11,800 gallons	Onsite	Liquid	Continuously onsite

Source: Hydrostor and Kiewit 2024

Table 5.5-2: Chemical Inventory, Description of Hazardous Materials Stored Onsite, and Reportable Limits

Storage on WRESC Site				Regulatory Constraints					
Trade Name	Chemical Name	CAS Number	Maximum Quantity Onsite	CERCLA SARA RQ [a]	RQ of Material as Used Onsite [b]	EHS TPQ [c]	Federal Regulated Substance TQ [d]	State Regulated Substance TQ [d]	Prop 65 [f]
ChemTreat BL 1280	Diemethyl-hydroxidylamine and hydroquinone	3710-84-7, 123-31-9	180 gallons	100 lbs	157 gallons	500 or 10,000	See note [e]	500 or 10,000 [g] lbs	No
ChemTreat BL 1559	Cyclohexylamine. Methoxypropylamine	108-91-8, 5332-73-0	180 gallons	See note [e]	See note [e]	10,000 lbs	15,000 lbs	10,000 lbs	No
ChemTreat CL 2900	Sodium Molybdate	7631-95-0	8,400 gallons	See note [e]	See note [e]	See note [e]	See note [e]	See note [e]	No
ChemTreat CL 2150	5-chloro-2-methyl-4-isothiazolin-3-one, 2-methyl-4-isothiazolin-3-one	26172-55-4, 2682-20-4	5,200 gallons	See note [e]	See note [e]	See note [e]	See note [e]	See note [e]	No
Sodium Hypochlorite	Hypochlorous Acid	7681-52-9	180 gallons	100 lbs	See note [e]	See note [e]	See note [e]	See note [e]	No
Diesel Fuel	Diesel Fuel	68476-34-6	11,800 gallons	See note [e]	25 gallons	See note [e]	See note [e]	See note [e]	Yes

Source: Hydrostor and Kiewit 2024

[a] RQs for a pure chemical, per the CERCLA SARA (Ref. 40 CFR 302, Table 302.4). Release equal to or greater than RQ must be reported. Under California law, any amount that has a realistic potential to adversely affect the environment or human health or safety must be reported.

[b] Applicated calculated RQ for materials as used onsite. Because some of the hazardous materials are mixtures that contain only a percentage of an RQ, the RQ of the mixture can be different than for a pure chemical. For example, if a material only contains 10 percent of a reportable chemical and the RQ is 100 lbs., the RQ for that material would be (100 lbs.)/(10 percent) = 1,000 lbs.

[c] EHS TPQ (Ref. 40 CFR Part 355, Appendix A). If quantities of extremely hazardous materials equal to or greater than the TPQ are handled or stored, they must be registered with the local administering agency.

[d] Source of TQ is from 19 CCR 2770.5 (state) or 40 CFR 68.130 (federal).

[e] No reporting requirement. Chemical has no listed threshold under this requirement.

[f] Source from California Office of Environmental Health Hazard Assessment, The Proposition 65 List

[g] These extremely hazardous substances are solids. The lesser quantity listed applies only if in powdered form and with a particle size of less than 100 microns; or if handled in solution or in molten form; or the substance has a National Fire Protection Association rating for reactivity of 2, 3, or 4. Otherwise, a 10,000-lb threshold applies. The exemption in Section 2770.2(b)(1)(B) regarding portions of a process where these regulated substances are handled at partial pressures below 10 millimeters of mercury does not apply to these substances.

ºC = degrees Celsius; ºF = degrees Fahrenheit; CAS = Chemical Abstract Service; CCR = California Code of Regulations; CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act; CFR = Code of Federal Regulations; EHS = Extremely Hazardous Substance; lbs = pounds; Prop 65 = Proposition 65; SARA = Superfund Amendments and Reauthorization Act; TQ = threshold quantity; RQ = reportable quantity; TPQ = threshold planning quantity; WRESC = Willow Rock Energy Storage Center

Table 5.5-3: Toxicity, Reactivity, and Flammability of Hazardous Substances Stored Onsite

Hazardous Materials	Physical Description	Health Hazard	Reactive and Incompatibles	Flammability [a]
ChemTreat BL 1280	Liquid, straw-colored, clear	Acute health hazard: eye and skin irritation. Acute toxicity if inhaled or ingested.	None	Not flammable
ChemTreat BL 1559	Liquid, clear, colorless	Corrosive, acute toxicity, health hazard.	Acids, strong oxidizing agents, aluminum	Flammable
ChemTreat CL 2900	Liquid, clear, colorless	May be harmful in contact with skin. May be harmful if inhaled. Harmful if swallowed.	None	Not flammable
ChemTreat CL 2150	Liquid, green, clear	Causes skin irritation. May cause an allergic skin reaction. Causes serious eye irritation.	Strong oxidizers, strong bases	Not flammable
Sodium Hypochlorite	Liquid, clear/pale greenish-yellow	Causes severe burns to the mouth and throat (mist). May release toxic and irritating chlorine gas. Causes burns to the mouth and throat. Causes severe skin burns. Causes serious eye damage.	May be corrosive to metals. Reacts violently with acids and oxidizing agents, such as oxygen, hydrogen peroxide, sulfuric and nitric acids, and permanganates. Reducing agents, such as hydrogen, sodium borohydride, sulfur dioxide, thiosulphates, hydrazine, phosphites, carbon, and oxalic, formic, and ascorbic acid. Organic material, such as wood, paper, gasoline, diesel, solvents, and some glycol-based heat transfer fluids. Metals, such as aluminum, steel, and brass.	Not flammable
Diesel Fuel	Liquid, straw, clear	Flammable liquid and vapor. Harmful if inhaled. Causes skin irritation. Suspected of causing cancer. Suspected of damaging fertility or injuring an unborn child. May cause damage to organs (blood, thymus, liver) through prolonged or repeated exposure. May be fatal if swallowed and entering airways.	None	Flammable

Source: Hydrostor and Kiewit 2024

[a] Per California Department of Transportation regulations, under 49 CFR 173, “Flammable” liquids have a flash point less than or equal to 141 degrees Fahrenheit (60.6 degrees Celsius); “Combustible” liquids have a flash point greater than 141 degrees Fahrenheit.

5.5.2 Environmental Analysis

Construction and operation of the WRESC will involve the use of various hazardous materials and one regulated substance. The use of hazardous materials and their potential to cause adverse environmental and human health effects are discussed in the sections below.

5.5.2.1 Significance Criteria

Factors used to evaluate the significance of project-related hazardous materials are set forth in Appendix G of the California Environmental Quality Act (CEQA). Appendix G is a screening tool, not a method for setting thresholds of significance. Appendix G is typically used in the Initial Study phase of the CEQA process, asking a series of questions. The purpose of these questions is to determine whether a project requires an Environmental Impact Report, a Mitigated Negative Declaration, or a Negative Declaration. As the Governor's Office of Planning and Research stated, "Appendix G of the Guidelines lists a variety of potentially significant effects but does not provide a means of judging whether they are indeed significant in a given set of circumstances." The answers to the Appendix G questions are not determinative of whether an impact is significant or less than significant. Nevertheless, the questions presented in CEQA Appendix G are instructive.

In terms of potential Hazardous Materials associated with the construction and operations of the project, Appendix G, asks if the project would:

- Create a significant hazard to the public or environment through routine transport or use of hazardous materials.
- Create a significant hazard to the public or environment through reasonably foreseeable upset and accident conditions involving the release of hazardous materials into the environment.
- Emit handled materials, substances, or waste within 0.25 mile of an existing or proposed school.
- Site is included on a list of hazardous materials sites compiled pursuant to Cortese List outlined in Government Code Section 65962.5 and results in a significant hazard to the public or environment.
- Impair implementation of, or physically interfere with, an adopted emergency response plan or emergency plan.

Each of these criteria are discussed below in relation to the proposed WRESC.

5.5.2.2 Transportation of Hazardous Materials

Transportation of hazardous materials will be required once the WRESC is operating. All transportation of hazardous materials will comply with:

- U.S. Environmental Protection Agency (U.S. EPA)
- U.S. Department of Transportation (U.S. DOT)
- California Department of Transportation (Caltrans)
- California Department of Toxic Substance Control (DTSC)
- California Highway Patrol (CHP)
- California State Fire Marshal Regulations

To manage and prevent potential impacts caused by transporting hazardous materials, WRESC and contractors will adhere to U.S. EPA, U.S. DOT, Caltrans, DTSC, CHP, and California State Fire Marshal regulations. Transportation of explosives and detonators will be in accordance with California Code of Regulations (CCR) Title 8, §5262 through §5270 (Division 1, Chapter 4, Subchapter 7, group 18, article 115). Compliance with applicable regulations will ensure that impacts from the transportation of hazardous materials will be less than significant. Refer to Section 5.12, Traffic and Transportation, for details on the proposed transportation routes.

5.5.2.3 Hazardous Materials Use

5.5.2.3.1 Construction Phase

As discussed in Section 5.5.1.2.1, construction will involve storage and use of hazardous materials; there are minor risks associated with the use of those materials.

Oil and diesel fuel for mechanized equipment and emergency generators is expected to be used during construction. Small oil or diesel fuel spills may occur during refueling activities or lubrication of equipment. There are no adjacent or nearby surface water bodies within 100 feet of the proposed WRESC Site. However, as discussed in Section 5.2, Biological Resources, ephemeral drainages are located throughout the Project Area. A vehicle accident involving a service or refueling truck is the largest chemical release incident that could occur onsite and is considered to be the worst-case scenario for a hypothetical spill. To prevent environmental impacts during fueling, refueling areas for the WRESC will be graded to prevent stormwater runoff from contaminants. There are no adjacent or nearby surface water bodies within 100 feet of water of the WRESC Site. If practical, oil and diesel refueling activities will occur within a limited area of the WRESC Site to prevent large or multiple areas of contamination, if an accidental release should occur.

Best management practices (BMPs) and mitigation procedures for spill response described in Section 5.5.4.1 will be adopted to reduce the risk of potential release of hazardous materials and explosives handled during construction. All BMPs will be implemented by specialty staff and contractors who are also responsible for training affected personnel; therefore, the potential for environmental impacts will be less than significant.

Environmental analysis on the use of explosives and detonators for cavern construction can be found in Section 5.5.2.4.1.

5.5.2.3.2 WRESC Operation

As discussed in Section 5.5.1.2.2, operation will involve use and storage of hazardous materials. Most of the hazardous materials stored onsite will consist of water treatment chemicals and an approximately 12,000-gallon diesel storage tank for backup generators. Uncontrolled release of liquid chemicals could run off and drain into the stormwater system and potentially have harmful effects. However, the use and storage of hazardous materials will pose minor risks for release if BMPs are adopted, as discussed in 5.5.4.2.

The use and storage of hazardous materials will be contained in designated areas onsite that will be outlined in the Hazardous Materials Business Plan (HMBP) mandated by the Kern County Public Health Services Department (KCPHSD) Hazardous Materials Program (KCPHSD 2023a). The risk of public exposure, with appropriate BMPs, is low and would not be significant.

Regulated Substances. The WRESC facility will store two substances listed in the federal and/or state regulated substance list: ChemTreat BL1280 and ChemTreat BL1559 (**Table 5.5-2**). The quantity stored onsite for ChemTreat BL 1559 (180 gallons) is significantly smaller than the federal and state regulated threshold quantity listed and are therefore exempt from being classified as a regulated substance. However, the quantity of ChemTreat BL 1280 (180 gallons) surpasses the state regulated substance threshold quantity, therefore classifying it as a regulated substance. ChemTreat BL1280 will be used in the thermal management system water treatment cycle and will be delivered to the WRESC Site as needed for continuous operation.

5.5.2.3.3 Accidental Release Hazards

Without proper engineering controls, the public could be at risk of exposure to harmful vapors in the event of an accidental release, as incompatible chemicals have the potential to mix, causing vapors that could also have harmful effects. However, the WRESC will meet California Fire Code (Articles 79 and 80) requirements for safe storage and handling of hazardous materials. The proposed WRESC staff and affiliated staff will use engineering controls to reduce the potential for release of hazardous materials and mixing of incompatible materials.

In the unlikely event of a release, no schools or other sensitive receptors, as defined in Section 5.9, Public Health, are within a 0.5-mile radius of the WRESC Site; therefore, the effects of potential emissions from an accidental release are less than significant. Onsite personnel would be trained on how to respond to an incident and have

personal protective equipment available in the unlikely event of an accidental upset. All transportation of hazardous substances will be with U.S. DOT-approved personnel and trucking/transport equipment. WRESC operations will not involve the handling of any other acutely hazardous materials that would have the potential to generate significant offsite consequences. Consequently, no protocol for modeling of hazardous materials releases is included in the Application for Certification and no modeling is proposed.

5.5.2.3.4 Fire and Explosion Hazards

Construction

Cavern construction will involve the use of explosives. Layout holes for cavern construction will occur only after the shafts have been bored. As required by CCR Title 8 (344.20), licensed lead construction personnel will perform controlled detonations. The BMPs described in Section 5.5.4.1 and Section 5.17, Worker Health and Safety, will be implemented by the contractor personnel. All use of explosives will occur underground, will comply with all applicable state and federal regulations, and will not impact surface resources.

Operations

The flammability of hazardous materials onsite during operation are described in **Table 5.5-3**. All hazardous material storage areas will be equipped with a fire extinguishing system and ventilation for enclosed substances per the requirement of Article 80 of the California Fire Code. Aside from any listed below, hazardous materials stored onsite will not be flammable or pose a significant explosion hazard.

Diesel. Diesel will be handled and stored in approved, dual-walled steel, integrated fuel tanks that are part of the emergency generation systems under the jurisdiction of the KCPHSD Aboveground Petroleum Storage Act (ASPA) Program (KCPHSD 2023b). With adherence to the HMBP, the potential for fire and explosion hazards would be less than significant.

Lubrication Oil. Machinery at the WRESC Site would require flammable lubrication oil. Lubrication oil will be stored in accordance with Article 80 of the California Fire Code. A fire extinguishing system will be located near the storage and lube oil pumping areas. Lubrication oil would be handled by Kern County standards. With proper storage and handling, the risk of fire and explosion at the WRESC will be less than significant.

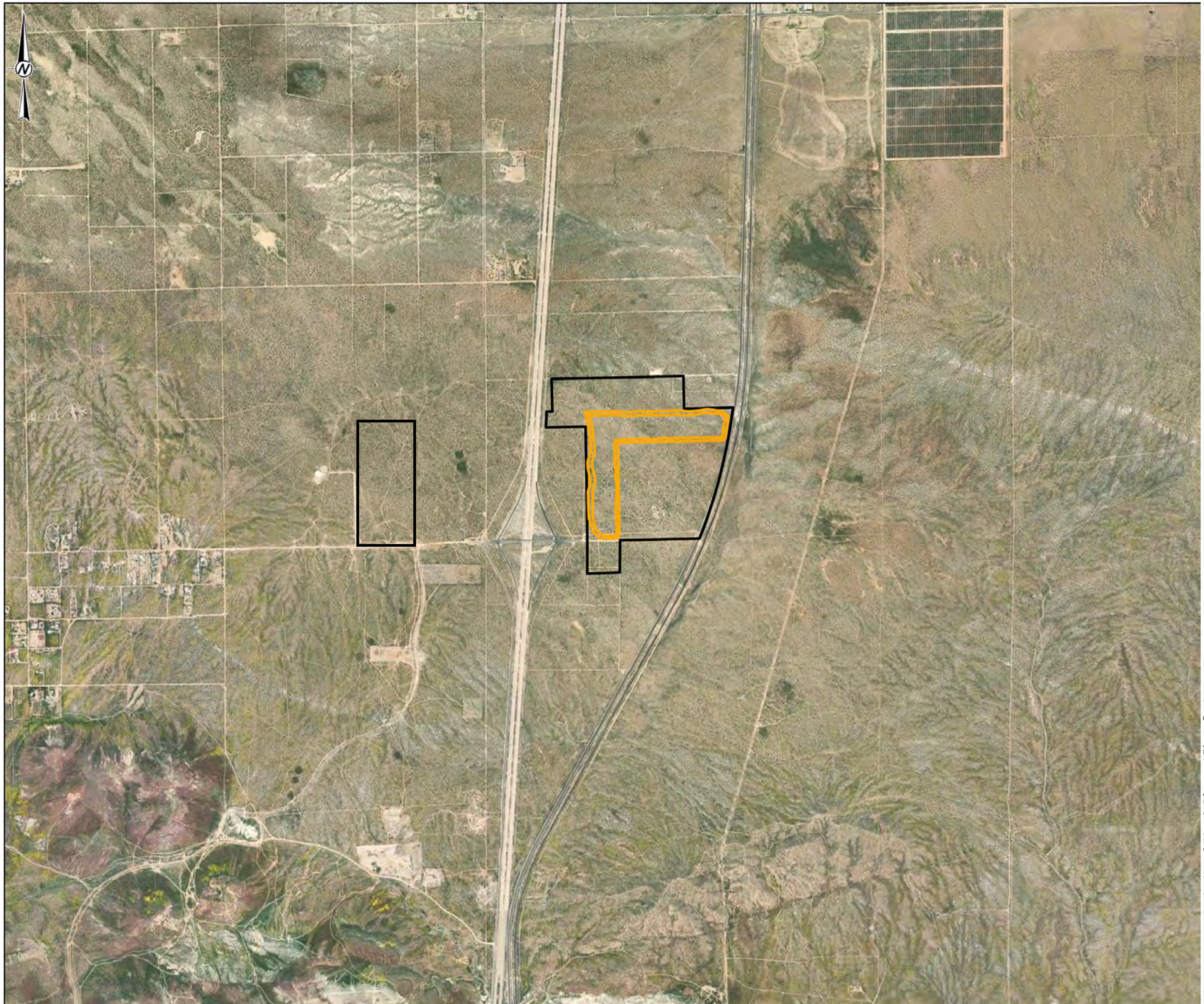
Natural Gas. The WRESC facility will not use natural gas or propane for operations.

Chemical Treatment. ChemTreat 1599 is the only flammable chemical used onsite (**Table 5.5-3)**. ChemTreat 1599 is a clear, colorless liquid that is characterized as being a strong oxidizing agent. This chemical would be used and stored in accordance with KCPHSD requirements.

For emergency spills or fire-related incidents, the closest fire station to the WRESC Site is Kern County Fire Station No. 15, located at 3219 35th Street W in Rosamond, California. The fire station is 8.1 miles southwest of the WRESC Site and would provide first response to fire at the WRESC Site. If a fire involves hazardous materials, the KCPHSD, Hazardous Materials Emergency hotline can be used to direct fire stations registered within the hazardous materials response team (HMRT), identified in the Kern County Hazardous Materials Area Plan, to the incident.

5.5.2.4 Schools and Sensitive Receptors

No sensitive receptors, including schools, hospitals, daycare facilities, emergency response facilities, and long-term health care facilities, are within a 0.5-mile radius of the WRESC Site. No residences are within close proximity of the WRESC Site, with undeveloped parcels dominating the surrounding area. A site receptors survey that maps sensitive receptors within 0.5 miles is included as **Figure 5.5-1**. A figure mapping sensitive receptors beyond 0.5 miles is included in Section 5.9, Public Health.



LEGEND

PROJECT BOUNDARY

BERM

1:24,000

0 1,000 2,000 4,000 Feet

NOTE(S)

1. SENSITIVE RECEPTORS INCLUDED: SCHOOLS, HOSPITALS, DAY-CARE FACILITIES, EMERGENCY RESPONSE FACILITIES AND LONG-TERM HEALTH FACILITIES.

REFERENCE(S)

1. AERIAL IMAGERY - ESRI PROVIDED BASEMAP SERVICE. IMAGERY COLLECTED 10/2/2021.

CLIENT

GEM A-CAES LLC

PROJECT

WILLOW ROCK ENERGY STORAGE CENTER
SUPPLEMENTAL AFC

TITLE

SENSITIVE RECEPTORS MAP

CONSULTANT

YYYY-MM-DD	2024-01-16
DESIGNED	JAM
PREPARED	JAM
REVIEWED	SCH
APPROVED	VG/LL

PROJECT NO. 31406639.003

FIGURE 5.5-1

PATH: G:\Hydrostor\Ansel\99_PROJECTS\31406639.000_Hydrostor\Ansel\LandUse\HY04.LU.LBR_Geohazards\02_PRODUCTION\MXD\FIGURES\Rev0\Figure5-5-1.aprx PRINTED ON: AT: 5:46:46 PM

The nearest school to the proposed WRESC Site is Rare Earth High School, located at 3082 Glendower St, Rosamond, California, approximately 3.7 miles southwest of the WRESC Site. The proposed transportation route for delivery of hazardous materials and regulated materials, such as sulfuric acid, to the WRESC would avoid the school, if possible. Transportation permits will be obtained for all heavy and oversize loads, as required by jurisdictional agencies. Proposed transportation routes for hazardous material deliveries are discussed in Section 5.12, Traffic and Transportation.

Due to the selected routes for hazardous material delivery and the distance from sensitive receptors during operation, effects on sensitive receptors will be less than significant.

5.5.2.5 Cortese List

An examination of the California Environmental Protection Agency Cortese List Data Resources (Cortese List) compiled pursuant to Government Code Section 65962.5 was conducted in Section 5.14 Waste Management. There are no Cortese List sites within a 2.5-mile radius of the WRESC Site (CalEPA 2021). Thus, it is highly unlikely that any impacts will result from Cortese-listed properties, nor will the WRESC Site present a significant hazard to the public or the environment.

5.5.2.6 Effects on Emergency Response Plan

Kern County is currently reviewing the 2019–2020 update to the Kern Multi-Jurisdiction Hazard Mitigation Plan. Approximately 62 other jurisdictions are participating in the plan to reduce losses resulting from natural disasters (Kern County 2020). The plan will include identifying actions for risk reduction; identifying resources at risk; building partnerships with citizens, organizations, businesses, and stakeholders; increasing education and awareness of threats and hazards; communicating priorities to state and local officials; and aligning risk reduction with other community objectives. Once the updated plan is released, the WRESC will adhere to all safety practices addressed in the plan; therefore, the WRESC is not anticipated to have effects on the Kern Multi-Jurisdiction Hazard Mitigation Plan.

5.5.2.7 Summary of Significant Criteria

The proposed WRESC will use and store hazardous materials during construction and operation. Adhering to BMPs, the HMBP, and Kern County local ordinances and codes would significantly reduce the risk of public health and environmental effects of handling and storing hazardous materials. In the unlikely event that a release would occur, a 0.5-mile radius would be at risk of exposure to hazardous materials. No sensitive receptors, including schools, hospitals, daycare facilities, emergency response facilities, and long-term health care facilities are within a 0.5-mile radius of the WRESC Site. Due to the WRESC Site's distance from sensitive receptors during operation (Section 5.5.2.5), proposed mitigation measures for use and storage of hazardous materials (Sections 5.5.2.3 and 5.5.4), use of engineering controls for storage of sulfuric acid as a regulated substance (Sections 5.5.2.3 and 5.5.4), and approved hazardous material delivery routes (Section 5.12 Traffic and Transportation), effects on the environment will be less than significant.

5.5.3 Cumulative Effects

Section 15355 of the CEQA Guidelines defines "cumulative impacts" as "two or more individual effects which, when considered together, are considerable or which compound or increase other environmental impacts." Subsection b of Section 15355 states, in part, that "The cumulative impact from several projects is the change in the environment which results from the incremental impact of the project when added to other closely related past, present, and reasonably foreseeable probable future projects." Thus, cumulative impacts under CEQA involve the potential interrelationships of two or more projects, not the impacts from a single project. Specifically, under Section 15130 of the CEQA Guidelines, an Environmental Impact Report is required to discuss cumulative impacts when the project's incremental effect is "cumulatively considerable." Section 15065(a)(3) then defines "cumulatively considerable" as meaning "that the incremental effects of an individual project are significant when viewed in connection with the effects of other closely related past projects, the effects of other current projects and the effects of probable future projects."

Historically, there is no evidence of industrial hazardous material use within the general vicinity of the proposed WRESC Site. Regions surrounding the WRESC are dominated by what appear to be agricultural farms, small

residences, and undeveloped natural landscapes. It is likely that residential quantities of gasoline products, pesticides, and fertilizers are used in the general vicinity. Historical spills of gasoline or diesel products were researched using the California Water Board GeoTracker tool. There are no records of historic petroleum hydrocarbon releases or environmental (soil and/or groundwater) remediation cases on nearby parcels within a 1-mile radius of the proposed WRESC facility. Future projects proposed, as identified in Table 5.0-1 of Section 5.0, are subject to, and likely to follow, federal, state, and local laws and ordinances for safe use and storage of hazardous materials; thus, cumulative effects are unlikely.

5.5.4 Best Practices, Design Features, and Mitigation Measures

The following sections present BMPs, design features, and impact avoidance and minimization measures for handling and storing hazardous materials during construction and operation to mitigate potential public health and environmental effects.

5.5.4.1 Construction Phase

5.5.4.1.1 Hazardous Material Use

Hazardous material use, identified in Section 5.5.1.2.1, would present relatively low public health risk, but could contaminate subsurface soils or ground water if a release or incident did occur. The use of BMPs would reduce the likelihood of potential incidents involving hazardous materials. A discussion of BMPs to reduce construction-related contaminants and hazardous materials released into stormwater can be found in Section 5.15, Water Resources. Additionally, for BMPs to mitigate risks from transportation of hazardous materials and hazardous waste, refer to Sections 5.12, Traffic and Transportation and 5.15, Waste Management, respectively. Fire and explosion hazards and mitigation measures are discussed in Section 5.5.2.4.1.1.

General industry health, safety, and environmental BMPs will be implemented by construction personnel. The following BMPs are designed to reduce incidents involving hazardous materials:

- Equipment and vehicles requiring refueling and maintenance will generally occur in designated areas that are designed to control potential spills. Designated areas will be bermed or covered by an impervious surface (asphalt or concrete) to control potential spills. Employees will be present during refueling activities. When mobile refueling is required, the refueling vehicle will be equipped with fire extinguishers and spill containment equipment, such as absorbents. The facility and surface drainage systems are designed to manage stormwater runoff within the property bounds.
- Only authorized personnel will conduct vehicle and equipment service maintenance.
- Only approved pumps, hoses, and nozzles will be used to refuel equipment and vehicles.
- During servicing, catch pans will be placed under equipment to catch potential spills or leaks.
- After servicing, disconnected hoses will be placed in containers to collect any residual fuel from the hoses.
- During refueling, vehicle engines will be shut off.
- Smoking, open flames, or welding will not be permitted in refueling and service areas, or hazardous waste storage areas.
- Refueling will be performed away from surface water or stormwater drains.
- Following refueling activities, service trucks will immediately leave the WRESC construction zone.
- All service trucks used to refuel equipment and vehicles onsite will be provided with fire extinguishers and spill containment equipment, such as absorbents.
- All maintenance and refueling areas will be inspected monthly. Results of inspections will be recorded in a logbook that will be maintained onsite.

In the unlikely event that a spill or leak were to occur and contaminate soil, the KCPHSD, Certified Unified Program Agency (CUPA) Program would be notified. All remedial activities, soil storage, and disposal will comply with federal, state, and local ordinances; generated waste will be disposed of within 90 days of generation. With competent and trained personnel, small spills can be contained and cleaned up immediately. Large spills will require reporting to local emergency contacts. A designated onsite health and safety person will be responsible

for implementing health and safety guidelines. For petroleum products, if the spill is over 42 gallons, all federal, state, and local reporting requirements will be followed. Onsite personnel will call local fire and emergency services in the event of a fire or injury.

5.5.4.1.2 Explosive Use

The BMPs identified in this section, as well as in Section 5.17, Worker Health and Safety, will be implemented by the contractor personnel. As required by CCR Title 8 (344.20), licensed lead construction personnel will perform controlled detonations. A third-party contractor will be responsible for acquiring necessary permits and establishing safety plans or BMPs used during construction.

WRESC construction personnel will store explosives in the proper magazine type, as outlined in California Occupational Safety and Health Administration (Cal/OSHA) Title 8; California Division of Industrial Safety, subchapter 7, General Industry Safety Orders, Group 18; Explosives and Pyrotechnic, Article 114, Storage of Explosives. Specifically, caps and detonators will be stored in separate magazines away from other explosives to prevent accidents. All use of explosives will occur underground, will comply with all applicable state regulations (cited above) and federal regulations (27 Code of Federal Regulations [CFR] Part 555 and Mine Safety and Health Administration CFR Title 30 Chapter I), and will not impact surface resources.

BMPs will be implemented during the cavern construction phase to reduce risk of accidental fire and explosion and include the following:

- No smoking or open flames will be permitted within 50 feet of explosive handling.
- No source of ignition, except during firing, will be permitted in the areas containing loaded holes.
- Only non-sparking tools will be used for opening containers and explosives.
- Explosives will be kept clear of electrical circuits by at least 25 feet.
- Unused explosives will be returned promptly to the magazine.
- A tally sheet at each magazine stored onsite will record all movement of explosives.
- All loaded holes and explosives at the detonation location will be attended.

5.5.4.2 Operation Phase

The following sections discuss mitigation measures for substance handling during WRESC operations. Hazardous material use is identified in Section 5.5.1.2.2.

5.5.4.2.1 Hazardous Materials

Hazardous materials will be stored onsite in accordance with applicable codes and regulations, as specified in Section 5.5.6. The California Fire Code outlines the provisions to reduce the risk of fire or potential release of hazardous materials that could affect public health or the environment and include the following:

- For any indoor hazardous material storage areas, an automatic fire-suppression (such as sprinklers and/or foam application system) and exhaust system will be incorporated.
- Incompatible materials will be isolated from one another by noncombustible partitions.
- Spill control measures and spill cleaning kits will be staged, readily accessible (with appropriate signage), in chemical storage, handling, and dispensing areas.
- Chemicals that require secondary containment storage systems will be present. In the event of a catastrophic spill, the secondary containment will have the sufficient capacity to adhere to the California Fire and California Health and Safety Code.

Additionally, to comply with federal and state regulations, an HMBP will be prepared and submitted to KCPHSD. The HMBP will include a hazardous materials inventory, including materials that are handled or stored in excess of threshold quantities. The HMBP will also include the following:

- Business activities
- Business owner/operator information

- Facility site map
- Emergency Response Plan to implement in the event of a spill
- Employee training documents
- Safety data sheets
- Chemical inventory, including minimum and maximum quantities stored onsite
- BMPs and appropriate safety procedures

The HMBP will be filed with the KCPHSD Hazardous Materials Program—the designated CUPA for the site—and will be updated as required (KCPHSD 2023a). Storage and use of hazardous materials will also comply with regulations outlined in Kern County Fire Code.

The first responders to a facility fire would be from Kern County Fire Station No. 15, located at 3219 35th Street W in Rosamond, California, 8.1 miles southwest of the proposed WRESC Site. In the event of a chemical emergency, personnel on the KCPHSD HMRT would be the first responders, notified through the HMRT hotline.

5.5.4.2.2 Petroleum Products

Federal and California regulations require a spill prevention, control, and countermeasure (SPCC) plan if stored quantities are equal to or greater than1,320 gallons total. The WRESC will store sufficient diesel to supply local backup power for fire pumps required to meet fire department and insurance requirements. Should this exceed 1,320 gallons total onsite, measures consistent with the KCPHSD, ASPA Program guidance will be followed in preparing the SPCC plan, which will be included in the HMBP (KCPHSD 2023b). Additionally, prior to operations, GEM will obtain a permit to install the dual-walled integrated tanks used to store diesel onsite and will not be accessible to the public, as discussed in Section 5.5.4.2.4. Storage of diesel will also comply with Kern County Fire Code.

5.5.4.2.3 Transportation/Delivery of Hazardous Materials and Regulated Substances

Periodically, hazardous materials mostly involving water treatment chemicals will be delivered to the facility. As discussed in Section 5.12, Traffic and Transportation, transportation of hazardous materials will comply with Caltrans, U.S. EPA, DTSC, CHP, and California State Fire Marshal regulations. The WRESC facility will also follow the Kern County General Plan, 2.4.5 Transportation of Hazardous Materials policies and implementation measures to comply with Kern County's goals of reducing risks to public health from transportation of hazardous materials (KCPD 2009). The WRESC will adhere to approved Caltrans routes for hazardous material transportation.

5.5.4.2.4 Security Plan

GEM will prepare a security plan, as required by 49 CFR 172.800, Subpart I, in addition to the standard business security measures. Site fencing with a security gate will surround the perimeter. GEM will establish evacuation procedures and a protocol for employees to contact law enforcement in the event of an incident. A fire alarm monitoring system will be installed. Consistent with federal and state laws regarding security and privacy, personnel background checks will be conducted for WRESC employees and routine onsite contractors. GEM will establish a site access protocol for vendors, including those that are transporting hazardous materials. The plan will also ensure that all perimeter security measures are adequate and will include security alarms for critical structures, perimeter breach detectors, onsite monitoring detectors, and video or still camera monitoring systems. No hazardous materials will be accessible to the public at any time during construction or operation.

5.5.4.3 Monitoring

WRESC personnel will regularly inspect all hazardous material storage areas for compliance with applicable federal, state, and local regulations and will ensure that any deficiencies are promptly resolved. The WRESC could also be subjected to inspections by the Kern County Hazardous Materials Program or the Kern County Fire Prevention Office.

5.5.4.4 Facility Closure

Facility closure includes temporary or permanent closure that could be caused by various reasons. Temporary closure is defined as a period of closure longer than the time required for normal maintenance, including overhaul or replacement of small system equipment. Causes of temporary closure can include disruption of off-peak power lines; damage to the WRESC Site from natural disasters such as earthquakes, floods, wildfires, or storms; labor disruptions; and other traditional force majeure events. Permanent is defined as consist of complete cessation of operations with no intention of restarting. Permanent closure could be caused by damage of the facility beyond repair, economic conditions, or other unforeseen reasons. How facility closure will be accomplished is discussed in Section 2.2.9, Section 2.2.10, and Section 5.14.4.3.

5.5.5 Laws, Ordinances, Regulations, and Standards

Storage and use of hazardous materials at the WRESC are governed by laws, ordinances, regulations, and standards established and enforced at the federal, state, and local levels. Applicable laws are addressed and described below and summarized in **Table 5.5-4**. No hazardous materials will be stored or used onsite that would subject the Project Area to CalARP.

Table 5.5-4: Laws, Ordinances, Regulations, and Standards for Hazardous Materials

LORS	Requirements/Applicability	Administering Agency	Application for Certification Section Explaining Conformance
Federal			
Section 302 EPCRA (Public Law 99-499, 42 USC 11022) Hazardous Chemical Reporting: Community Right-To-Know (40 USC 11002) California Health & Safety Code, Division 20, Chapter 6.95, Article 1, Sections 25500 to 25519	Requires one-time notification if environmental hazardous substances are stored in excess of threshold planning quantities.	Kern County Public Health Department – Hazardous Materials Program	An HMBP will be prepared for submittal to the Kern County Public Health Services Department, Hazardous Materials Program (Section 5.5.4.2.1).
Section 304, EPCRA (Public Law 99 – 499, 42 USC 11002) Emergency Planning Notification California Health and Safety Code, Division 20, Chapter 6.95,Article 1, Sections 25500 to 25519	Requires notification when there is a release of hazardous material in excess of its reportable quantity.	Kern County Public Health Services Department – Hazardous Materials Program	The HMBP will include notification and reporting procedures (Section 5.5.4.2.1).
Section 311, EPCRA (Public Law 99-499, 41 USC 11-21) Hazardous Chemical Reporting: Community Right-To-Know (40 CFR 370) California Health & Safety Code, Division 20, Chapter 6.95,Article 1, Sections 25500 to 25519	Requires that safety data sheets for all hazardous materials or a list of all hazardous materials be submitted to the State Emergency Response Commission, Local Emergency Planning Committee, and Kern County Public Health Services Department.	Kern County Public Health Services Department – Hazardous Materials Program	The HMBP prepared will include a list of hazardous materials for submission (Section 5.5.4.2.1).
Section 313 EPCRA (Public Law 99 – 499, 42 USC 11023) Toxic Chemical Release Reporting: Community-To-Know (40 CFR 372)	Requires annual reporting of releases of hazardous materials.	U.S. EPA	Not Applicable
Section 311, CWA (Public Law 92 – 500, 33 USC 1251 et seq.) Oil Pollution Prevention (40 CFR 112)	Requires the preparation of an SPCC plan if 660 gallons of oil/ petroleum products are stored in a single container or collectively the site stores 1,320 gallons or more.	Kern County Public Health Services Department - the local CUPA	GEM will prepare an SPCC plan (Section 5.5.4.2.2).
Commerce of Explosives (27 CFR Part 555)	This regulation explains requirements for manufacturing, importing, buying, selling, transporting, and storing explosive materials.	Federal Bureau of Alcohol, Tobacco, Fires and Explosives	Explosive purchase, transport, use and storage will be followed per regulation (Section 5.5.4.1.2).

LORS	Requirements/Applicability	Administering Agency	Application for Certification Section Explaining Conformance
State			
Health and Safety Code, Section 25500 et seq. (HMBP)	Requires preparation of an HMBP if hazardous materials are handled or stored in excess of threshold quantities	Cal EPA, but submitted to Kern County Public Health Services Department – Hazardous Materials Program	An HMBP will be prepared for submittal to the Kern County Public Health Services Department, Hazardous Materials Program (Section 5.5.4.2.1).
Occupational Safety and Health Act (19 CFR 1910.119)	For chemicals listed above thresholds listed in Appendix A, requires a process safety management plan for preventing or minimizing the consequences of catastrophic releases of toxic, reactive, flammable, or explosive chemicals. These releases may result in toxic, fire or explosion hazards.	Kern County Public Health Services Department – Hazardous Materials Program	A Process Safety Management plan will not be required because the regulations apply only to oleum with the CAS number 8014-95-7, which does not match the chemical and/or CAS number that WRESC will be using (Section 5.5.4.2.1).
Health and Safety Code, Section 25270 through 25270.13 (Aboveground Petroleum Storage Act)	Requires the preparation of an SPCC plan if products are stored at the site in quantities of 1,320 gallons or more	Kern County Public Health Services Department	GEM will prepare an SPCC plan (Section 5.5.4.2.2).
Cal/OSHA Title 8, Section 344.20	Requires lead construction personnel to have a valid California Blaster's License, and they will be physically present when performing, directing, and supervising the controlled detonations.	Cal/OSHA	GEM will have a third-party contractor with California Blaster's License, leading the cavern construction (Sections 5.5.2.4.1.1 and 5.5.4.1.2).
Cal/OSHA Title 8, California Division of Industrial Safety, subchapter 7, General Industry Safety Orders, Group 18; Explosives and Pyrotechnic, Article 114, Storage of Explosives	Outlines requirements for explosive storage used for construction operations.	Cal/OSHA	GEM will abide by all storage requirements and install BMPs to prevent fire and explosion risks (Sections 5.5.2.4.1.1 and 5.5.4.1.2).

LORS	Requirements/Applicability	Administering Agency	Application for Certification Section Explaining Conformance
Local			
Establishments of limits of Districts in which Storage of Liquefied Petroleum Gases is Restricted (Kern County Municipal Code 17.32.004)	Storage liquefied petroleum gas in excess of an aggregate of 2,000 gallons is restricted only in Kern County zones M-2 or M-3, provided that the following criteria is met: 1. The storage vessels are located at least ½ mile from property zoned or designated for residential use and at least ½ mile from existing residential development with a density greater than one dwelling unit per acre and at least ½ mile from any hotel or motel. 2. A Conditional Use Permit issued by the Planning and Natural Resources Department.	Kern County Fire Prevention Office	GEM will prepare an SPCC plan (Section 5.5.4.2.2)
Required Construction Permits for Flammable or Combustible Liquid Tanks Kern County Municipal Code 17.32.020 Section 105.7.7)	A construction permit is required to install an AST with a capacity of 125 gallons or more which hold flammable or combustible liquids.	Kern County Fire Prevention Office	Prior to construction and operations, GEM will obtain a construction permit to install dual-walled steel, integrated tanks (Section 5.5.4.2.2).
Aboveground Tanks Located Outside, Above Grade (Kern County Municipal Code 17.32.074 Section 2306.2.3)	ASTs that store Class I, II, or III motor liquid fuels stored outside shall 1) not be in areas accessible to the public 2) If in areas accessible to the public, shall be provided with separation requirements to buildings, property lines, dispensing areas and parking areas 3) tanks containing fuels shall not exceed 12,000 gallons in individual capacity or 48,000 gallons in aggregate capacity 4) tanks located on farms, construction projects or rural areas shall comply with Section 5706.2	Kern County Fire Prevention Office	Dual-walled steel, integrated tanks installed at the WRESC will not be accessible to the public and will have tank capacity of 600 gallons to 12,000 gallons or more (Section 5.5.4.2.2).
Transportation of Hazardous Materials (Kern County General Plan, 2.5.4)	To reduce risk to public health, hazardous materials transportation will conform with the adopted Kern County and Incorporated Cities Hazardous Waste Management Plan.	Kern County Public Health Services Department	GEM will confirm to local transportation regulations (Section 5.5.4.2.3)

LORS	Requirements/Applicability	Administering Agency	Application for Certification Section Explaining Conformance
Safety – Hazardous Materials (Kern County General Plan 4.9)	Facilities that use, manufacture, and store hazardous materials shall comply with the Uniform Fire Code, with requirements for siting or design to prevent onsite hazards from affecting surrounding communities in the event of inundation.	Kern County Public Health Services Department and the Kern County Fire Prevention Office	The WRESC will comply with Kern County fire code. (Section 5.5.4.2.1)

AST = aboveground storage tank; BMP = best management practice; Cal EPA = California Environmental Protection Agency; Cal/OSHA = California Occupational Safety and Health Administration; CAS = Chemical Abstract Service; CUPA = Certified Unified Program Agency; CWA = Clean Water Act; EPCRA = Emergency Planning and Community Right-to-Know Act; GEM = GEM A-CAES LLC; HMBP = Hazardous Materials Business Plan; MSHA = Mine Safety and Health Administration; SPCC = Spill Prevention Control and Countermeasure; U.S. EPA= U.S. Environmental Protection Agency; USC = United States Code

5.5.5.1 Federal Laws, Ordinances, Regulations, and Standards

5.5.5.1.1 29 CFR 1910 et seq. and 1926 et seq.

These sections contain requirements for equipment used to store and handle hazardous materials for the purpose of protecting worker health and safety. This regulation also addresses requirements for equipment necessary to protect workers in emergencies. It is designed primarily to protect worker health, but also contains requirements that affect general facility safety. The California regulations contained in Title 8 (California equivalent of 29 CFR) are generally more stringent than those contained in Title 29. The administering agencies for the above authority are the federal Occupational Health and Safety Administration (OSHA) and Cal/OSHA, respectively.

5.5.5.1.2 49 CFR Parts 172, 173, and 179

These regulations provide standards for labels, placards, and markings on hazardous materials shipments by truck (Part 172), for packaging hazardous materials (Parts 173), and for transporting hazardous materials in tank cars (Part 179). The administering agencies for the above authority are CHP and the U.S. DOT.

5.5.5.1.3 CERCLA

The Superfund Amendments and Reauthorization Act (SARA) amends the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and governs hazardous substances. The applicable part of SARA for the WRESC is Title III, otherwise known as the Emergency Planning and Community Right-to-Know Act, which requires states to establish a process for developing local chemical emergency preparedness programs and to receive and disseminate information on hazardous substances present at facilities in local communities. The law provides primarily for planning, reporting, and notification concerning hazardous substances. Key sections of the law are as follows:

- Section 302—Requires one-time notification when Extremely Hazardous Substance (EHSs) are present in excess of their TPQs. EHSs and their TPQs are found in Appendices A and B to 40 CFR Part 355.
- Section 304—Requires immediate notification to the Local Emergency Planning Committees (LEPC) and the State Emergency Response Commission when a hazardous material is released in quantities over its RQ. If a CERCLA-listed hazardous substance RQ is released, notification must also be given to the National Response Center in Washington, DC. (RQs are listed in 40 CFR Part 302, Table 302.4.) These notifications are in addition to notifications given to the local emergency response team or fire personnel.

- Section 311—Requires that either safety data sheets for all hazardous materials or a list of all hazardous materials be submitted to the State Emergency Response Commission, LEPC, and local fire department.
- Section 313—Requires annual reporting of hazardous materials released into the environment either routinely or as a result of an accident.

The administering agency for SARA Sections 302, 304, 311, and 312 is the KCPHSD. The U.S. EPA is the administering agency for SARA Section 313 in California. Additionally, the U.S. EPA Region 9 National Response Center may be involved with spill or release response.

5.5.5.1.4 Clean Water Act

The SPCC rule under the Clean Water Act (CWA) is designed to prevent or contain the discharge or threat of discharge of oil into navigable waters or adjoining shorelines. Regulations (40 CFR 112) under the CWA require facilities to prepare a written SPCC plan if they store oil, and its release would pose a threat to navigable waters. The SPCC rule is applicable if a facility has a total petroleum storage (including aboveground storage tanks [ASTs], oil-filled equipment, and drums) greater than 1,320 gallons, or underground storage capacity greater than 42,000 gallons. The SPCC rule is administered by the local CUPA, which, for the WRESC Project, is the KCPHSD. The WRESC will store sufficient diesel to supply local backup power for fire pumps required to meet fire department and insurance requirements. Should this exceed 1,320 gallons total onsite, measures consistent with the KCPHSD, ASPA Program guidance will be followed in preparation of the SPCC plan, which will be maintained at the WRESC Site and available for review by KCPHSD upon request.

Other related federal laws that address hazardous materials but do not specifically address their handling include the Resource Conservation and Recovery Act (discussed in Section 5.14, Waste Management) and the Occupational Safety and Health Act (discussed in Section 5.17, Worker Health and Safety).

5.5.5.1.5 Commerce of Controlled Detonations and Mine Safety and Health Administration

Regulations for manufacturing, importing, buying, selling, transporting, and storing explosive materials are outlined in 27 CFR Part 555 outline. This regulation explains requirements for manufacturing, importing, buying, selling, transporting, and storing explosive materials. Mine Safety and Health Administration regulations are outlined in Title 30, Mineral Resources, Chapter I. That chapter outlines all approved mining products, filing requirements, education, training, accidents, injuries, illnesses, employment and production rights, metal and nonmetal safety and health, and uniform mine health regulations. Construction of the underground cavern for the WRESC will abide by all health and safety requirements outlined herein.

5.5.5.2 State Laws, Ordinances, Regulations, and Standards

California laws and regulations relevant to hazardous materials handling at the WRESC facility include Health and Safety Code Section 25500 (hazardous materials), Health and Safety Code 25531 (regulated substances), and the Above Ground Petroleum Storage Act (petroleum in aboveground tanks).

5.5.5.2.1 Title 8, CCR, Section 339; Section 3200 et seq., Section 5139 et seq., and Section 5160 et seq.

Title 8 CCR Section 339 lists hazardous chemicals relating to the Hazardous Substance Information and Training Act; Title 8 CCR Section 3200 et seq. and 5139 et seq. address control of hazardous substances; and Title 8 CCR Section 5160 et seq. addresses hot, flammable, poisonous, corrosive, and irritant substances.

5.5.5.2.2 Health and Safety Code Section 25500

California Health and Safety Code, Section 25500, et seq., and the related regulations in 19 CCR 2620, et seq., require local governments to regulate local business storage of hazardous materials in excess of certain quantities. The law also requires that entities storing hazardous materials be prepared to respond to releases. Those using and storing hazardous materials are required to submit an HMBP to the California Environmental Reporting System (CERS) online database to be reviewed and approved by their local CUPA. GEM would be required to report releases from the WRESC to their CUPA and the State Office of Emergency Services. The TQs

for hazardous materials are 55 gallons for liquids, 500 pounds for solids, and 200 cubic feet for compressed gases measured at standard temperature and pressure.

5.5.5.2.3 Health and Safety Code Section 25531 (CalARP)

California Health and Safety Code, Section 25531, et seq., and CalARP regulate the registration and handling of regulated substances. Regulated substances are any chemicals designated as an EHS by the U.S. EPA as part of its implementation of SARA Title III. Health and Safety Code Section 25531 overlaps or duplicates some of the requirements of SARA and the Clean Air Act. Facilities handling or storing regulated substances at or above TPQs must register with their local CUPA and prepare a risk management plan, formerly known as a Risk Management and Prevention Program (19 CFR 1910.119). CalARP is found in Title 19 CCR, Chapter 4.5.

5.5.5.2.4 Aboveground Petroleum Storage Act

The California Health and Safety Code Sections 25270 to 25270.13 ensure compliance with the CWA. The law applies to facilities that maintain an aggregate storage capacity of 1,320 gallons or more of petroleum in AST containers or tanks with a shell capacity equal to or greater than 55 gallons. It also applies to oil-filled equipment where there is a reasonable possibility that the tank(s) or equipment may discharge oil in "harmful quantities" into navigable waters or adjoining shore lands. If a facility falls under these criteria, an SPCC plan must be prepared.

5.5.5.2.5 Proposition 65

This California law requires the state to identify chemicals that cause cancer and reproductive toxicity, contains requirements for informing the public of the presence of these chemicals, and prohibits discharge of the chemicals into sources of drinking water. Lists of the chemicals of concern are published and updated periodically by California's Office of Environmental Health Hazard Assessment. The most recent list was published in April 2023.

5.5.5.2.6 Cal/OSHA Title 8 CCR, Title 8, Division 1 Sections 5251 through 5258 establish general industrial safety orders for transportation, handling, storage of explosive materials and the controlled detonation units. Additionally, Sections 344.20 through 344.22 require licensed lead construction personnel who will perform controlled detonations.

5.5.5.3 Local Laws, Ordinances, Regulations, and Standards

5.5.5.3.1 Kern County General Plan

The WRESC Project will adhere to all policies within the Kern County General Plan, Section 4.9 Hazardous Materials. The following policies and implementation measures for Kern County were identified:

- **Policy 1.** The proposed siting or expansion of hazardous waste facilities will be in conformance with the adopted Kern County and Incorporated Cities Hazardous Waste Management Plan.
- **Policy 2.** Innovative technologies to manage hazardous waste streams generated in Kern County will be encouraged.
- **Implementation Measure A.** Facilities used to manufacture, store, and use of hazardous materials shall comply with the Uniform Fire Code, with requirements for siting or design to prevent onsite hazards from affecting surrounding communities in the event of inundation.
- **Implementation Measure B.** The proposed siting or expansion of hazardous waste facilities will be in conformance with the adopted Kern County and Incorporated Cities Hazardous Waste Management Plan.

5.5.5.3.2 Kern County and Incorporated Cities Hazardous Waste Management Plan

The Kern County and Incorporated Cities Hazardous Waste Management Plan was adopted in May 1991 and has been added as an amendment to the Kern County General Plan. Although the Kern County and Incorporated Cities Hazardous Waste Management Plan focuses in areas of county jurisdiction, the plan also applies to incorporated cities state and federal lands. The Hazardous Waste Management Plan includes an analysis of Kern County waste streams, siting criteria, and permit requirements for hazardous waste management facilities, and transportation routes for commercial shipping of hazardous waste. Transportation of hazardous materials will also

be done in conformance with the Kern County and Incorporated Cities Hazardous Waste Management Plan. (KCPD 1991)

5.5.5.3.3 Kern County Public Health Services Department

The designated CUPA for the WRESC Project is the KCPHSD. The WRESC Project is subject to the requirements of the HMBP program, Aboveground Petroleum Storage Tank Program, and CalARP program (KCPHSD 2023a), described below:

- **Hazardous Materials Business Plan Program**. To satisfy the California Health and Safety Code, Section 25500, et seq., and the related regulations in 19 CCR 2620, et seq., an HMBP will be developed and submitted to the KCPHSD.
- **Aboveground Petroleum Storage Tank Program.** To adhere to 40 CFR 112, this program requires any facility with an aggregate capacity of 1,320 gallons of petroleum products or greater to prepare and implement at Spill Prevention and Countermeasure (SPCC) plan. Permits for ASTs are acquired from the Kern County Fire Prevention Office (Kern County Fire Department 2023).

5.5.5.3.4 Codes

Hazardous materials storage and dispensing systems will be designed, engineered, constructed, and operated in accordance with all applicable codes and standards, including the following:

- Vehicle Code, 13 CCR 1160, et seq. – Provides CHP with authority to adopt regulations for the transportation of hazardous materials in California. CHP can issue permits and specify which routes are used for hazardous material delivery.
- The California Fire Code, Articles 79 and 80 – These are the hazardous materials sections of the Fire Code. Local fire agencies or departments enforce this code and can require that an HMBP and a Hazardous Materials Inventory Statement be prepared. The California Fire Code is based on the federal fire guidelines, which include the Uniform Fire Code.
- State Building Standard Code, Health and Safety Code Sections 18901 to 18949 – Incorporates the Uniform Building Code, Uniform Fire Code, and Uniform Plumbing Code

5.5.6 Agencies and Agency Contacts

Several agencies regulate hazardous materials, and they will be involved in regulating the hazardous materials stored and used at Willow Rock. Federal, and some state, agencies discussed in this section will all be involved in regulation of hazardous materials use and storage. However, the regulations are administered and enforced primarily through designated by local agencies. According to CERS, the designated CUPA for the region is the KCPHSD (CalEPA 2015). Contact information is provided in **Table 5.5-5.**

Table 5.5-5: Agency Contacts for Hazardous Materials Handling

Issue	Agency	Contact
Certified Unified Program Agency for Hazardous Materials Business Plan	Kern County Public Health Services Department - Hazardous Materials Program	Cilal Korin 661-862-8730
Aboveground Storage Tank Permits	Kern County Fire Prevention Office (661-391-3310)	Matt Redstone 661-330-0363
Hazardous Materials Response for Spills or Fires	Kern County Public Health Services Department Emergency Response Hotline	661-549-9927 [a]

[a] Kern County Public Health Services Department Hotline does not have a specified personnel contact.

5.5.7 Permits and Permit Schedule

The KCPHSD and Kern County Fire Prevention Office require that project developers obtain permits listed in **Table 5.5-6** before storing hazardous materials onsite.

Table 5.5-6: Permits and Permit Schedule for Hazardous Material Handling

Permit	Agency Contact	Schedule
AST	Kern County Fire Department Fire Prevention Office 3219 35th Street Rosamond, CA 93560 661-256-2401	Submittal prior to construction and operation. Permit Applications are available on the Kern County Fire Department website.
HMBP	Kern County Public Health Services Department Hazardous Materials Program 2700 M Street, Suite 300 Bakersfield CA 93301 (661)-862-8740	Submittal prior to operation. Permit Applications are available on the Kern County Public Health Services Department main website.

AST = aboveground storage tank; HMPB = hazardous materials business plan

5.5.8 References

California Environmental Protection Agency (CalEPA). 2015. Unified Program Regulator Directory. Available at https://cersapps.calepa.ca.gov/public/directory/. Accessed September 13, 2023..

California Environmental Protection Agency (CalEPA). 2023. Cortese List Data Resources. Available at: https://calepa.ca.gov/sitecleanup/corteselist/. Accessed September 13, 2023.

Kern County Fire Department. 2023. Fees, Permits, Apps. Available at: https://kerncountyfire.org/fees-permits-applications/. Accessed September 13, 2023.

Kern County Public Works Department. 2015. Kern County Integrated Waste Management Plan. Available at https://itsapps.kerncounty.com/clerk/minutes/granicus/2325775/2325796/2325801/2325850/2326098/Source%20Reduction%20and%20Recycling%20Element%20Amendment2326098.pdf Accessed September 13, 2023.

Kern County Planning and Natural Resources Department (KCPD). 2009. Kern County General Plan. Available at: https://psbweb.co.kern.ca.us/planning/pdfs/kcgp/KCGP_Complete.pdf. Accessed September 13, 2023.

Kern County. 2020. Kern Multi-Jurisdictional Hazard Mitigation Plan Executive Summary. Available at: http://mitigatehazards.com/county-of-kern/. Accessed September 13, 2023.

Kern County. Not dated. Kern County Interactive County Map (GIS Tool). Available at: https://www.kerncounty.com/government/gis-menu/interactive-county-map-gis-tool. Accessed September 13, 2023.

Kern County Public Health Services Department (KCPHSD). 2023a. Hazardous Materials Business Plan/California Environmental Reporting System (CERS). Available at: https://kernpublichealth.com/hazardous-materials-business-plan-california-environmental-reporting-system-cers/. Accessed September 4, 2023.

Kern County Public Health Services (KCPHSD). 2023b. Aboveground Petroleum Storage Act (ASPA). Available at: https://kernpublichealth.com/aboveground-petroleum-storage-tanks/. Accessed September 4, 2023.

U.S. Environmental Protection Agency (U.S. EPA). 2023. Risk Management Program (RMP) Rule Overview. Available at: https://www.epa.gov/rmp/risk-management-plan-rmp-rule-overview. Accessed September 4, 2023.